wythoff friday workshop

Hi everyone-

This is a decidedly rough draft of the introduction to a critical edition of Hugo Gernsback's writings I'm editing for the University of Minnesota Press's Electronic Mediations series. Right now, it's a book proposal that's only just begun to transform into an introduction.

I've also included a few of Gernsback's short essays to give you a sense of his voice, as well as some of the editorial challenges I'm encountering in building up what has to be a fairly extensive scholarly apparatus. Your thoughts on my footnotes would be greatly appreciated.

And for those who just can't get enough, the working versions of each Gernsback essay are available at http://gernsback.wythoff.net, a site tethered to the edits I make on my computer. This will give you a better sense of the scope of the book as a whole.

Looking forward to our conversation, and thanks as always for your input.

-Grant

The Perversity of Things: Writings on Media, Tinkering, and Scientifiction
Hugo Gernsback

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1 Introduction

Figure 1: The Electro Importing Company in Manhattan, c. 1910.

It's the summer of 1907 in downtown Manhattan and Lewis Coggeshall sits with a bucket of dimes in the back room of the Electro Importing Company's retail store, filing them down to a coarse powder. Sitting amid shelves of electrolytic detectors, circuit switches, dynamos, and Geissler tubes ready for sale to the city's growing community of amateur experimenters, Coggeshall lets the filings from the dimes fall into a cardboard box at his feet. He then measures and mixes the powder with the perfect proportion of iron (dimes were then printed on ninety percent silver). That mixture goes into a glass tube known as a coherer, one of the earliest forms of radio receiver.[1] When a radio frequency wave comes in contact with the device, the metal filings cling together or "cohere," allowing the signal to flow between the electrodes at either end of the tube and produce a "dot" or a "dash" in Morse code. Coggeshall, a former telegraph operator, finally connects the coherer to a spark gap transmitter, a sending key, four dry cell batteries, and mounts them all on a wooden base.[2] The final product is the Telimco, a portmanteau of the company's name and one of the first fully assembled home radio sets ever sold to the American public.

[1] Marconi's original coherer design called for nineteen parts nickel to one part silver. Receiving the strongest signals involved a degree of culinary improvisation, so to speak. Thomas H. Lee, "A Nonlinear History of Radio," in *The Design of CMOS Radio-Frequency Integrated Circuits* (Cambridge University Press, 2004), p. 4.

[2] "Telimco Wireless Telegraph," *Radio Museum* (2002), http://www.radiomuseum.org/r/electro_im_telimco_wireless_telegraph.html

Meanwhile in the offices upstairs, Coggeshall's investment partner and the founder of the Electro Importing Company, Hugo Gernsback, writes increasingly breathless advertising copy on the Telimco, promising it to be a means of advancement for any young go-getter. In one issue of the *Electro Importing Company Catalog*, which featured "Everything for the Experimenter" and claimed to be "the largest makers of experimental Wireless Material in the world," Gernsback promises, "We give you the opportunity to tick yourself up to the head of a future wireless telegraph company as did Marconi, De Forest and others." Gernsback priced the set at $8.50 and claimed that it required no more expertise than a working knowledge of Morse code (the transmission of audio or voice was not yet possible with what was then called "wireless telegraphy"). First advertised in the November 25, 1905 issue of *Scientific American*, the Telimco appeared thereafter every two weeks, quickly becoming one of the best selling items for sale in the Catalog.

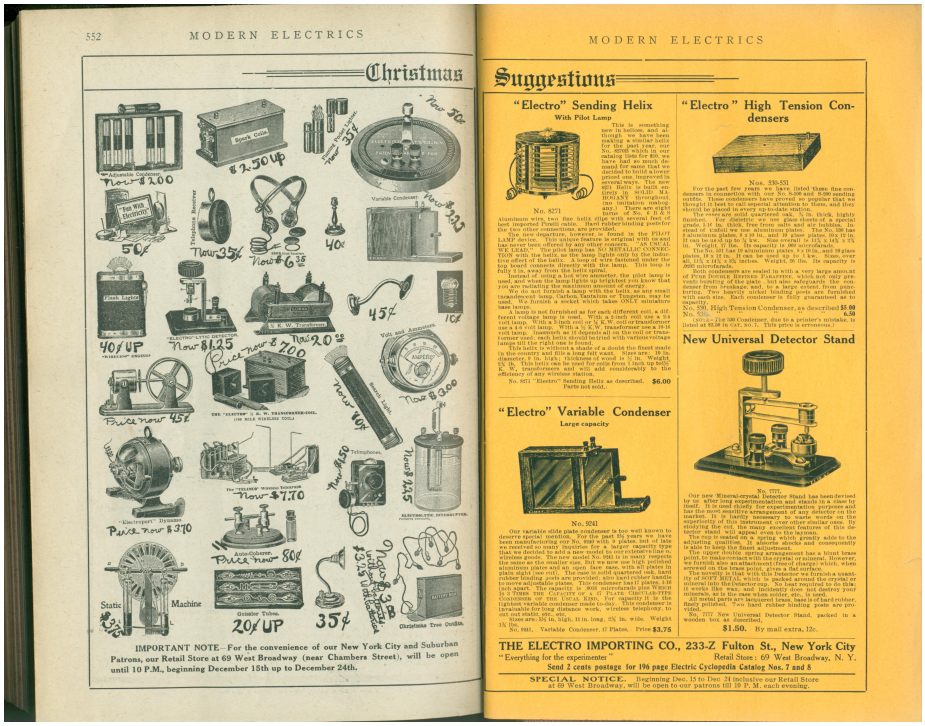


Figure 2: Electro Importing Company advertisement in *Modern Electrics* (1908).

But the Telimco was not exactly the revolutionary device that brought radio to the masses Gernsback later liked to claim it was. Though its advertisements claimed the set was "guaranteed to work up to one mile," the Telimco was notoriously finicky.[3] As it was sold, the outfit had a range of merely 300-

[3] "Wireless Telegraph [Advertisement]," *Scientific American* (November 1905): 85

500 feet and could only receive signals from further distances when a large antenna was hooked up. Further, it was highly susceptible to any kind of electrical interference, such as the elevator motor in the Electro Importing Company building, which caused difficulties during in-store demonstrations of the apparatus. The Telimco's untuned circuits, which would produce a high degree of interference for any nearby radio station, would be outlawed by the 1912 Radio Act. For these reasons, its metal filings coherers "had all but disappeared from commercial work in 1910" according to historian of early radio Thomas White.[4] From this perspective, the Telimco seems less a practical means of communication than a proof of concept for a growing group of "electrics" hobbyists.

What sort of artifact, then, is the Telimco for the historian and theorist of media technologies? Does it deserve credit for being a historical "first," one of the earliest consumer-friendly sets that would pave the way for radio broadcasting and domestic listening in later decades? Do we overlook its technical faults, as we do the almost unplayable tin foil phonograph cylinders first released by Edison, in favor of the idea behind the prototype and what it later would become? Or do we pass it by as a marketing gimmick, a fiction, in favor of technical developments that offer more objectively measurable achievements?

Perhaps the Telimco provides a nostalgic glimpse at an era when advanced media technologies were handmade by their users, their operation still more of an alchemy than a science. Today, critical practice and the culture at large are both infused with an "affective nostalgia" in thinking about technology, in the words of Jussi Parikka. "Vintage is considered better than the new, Super-8 and 8-bit sounds are objects of not only nostalgia but also revival and retrocultures seem to be as natural a part of the digital-culture landscape as high-definition screen technology and super-fast broadband."[5] Part of "the media-archaeological spirit of thinking the new and the old in parallel lines," argues Parikka, involves the acknowledgement that old or "dead" media are "continuously remediated, resurfacing, finding new uses, context, adaptations."

But what were some of the historically situated understandings of this technology? With the benefit of hindsight we can decide on the Telimco's feasibility, significance, and what kind of historicity we want to claim for it. What we'd miss, however, is the context in which this artifact emerged. More interesting than the gap between the actual abilities and the claims surrounding the Telimco and other Electro Importing devices is the structure through which these claims were made. Before Hugo Gernsback's most famous publication was released in 1926—*Amazing Stories*, the first science fiction magazine—a speculative language for assessing the cultural impact of new media was introduced in the *Electro Importing Company Catalog* and refined with his technology and

[4] Thomas H. White, "Pioneering Amateurs," *United States Early Radio History*, 1996, http://earlyradiohistory.us/1910ei.htm

[5] Jussi Parikka, *What Is Media Archaeology?* (Cambridge, UK; Malden, MA: Polity Press, 2012), p. 2

tinkering magazines like *Modern Electrics* (first published in 1908), *Electrical Experimenter* (1913), *Radio News* (1919), *Science & Invention* (1920), *Television* (1927), *Short-Wave Craft* (1930), and *Technocracy Review* (1933). Regardless of how advanced the devices detailed in the pages of Gernsback's magazines seemed—solar cells, automobile mounted radiotelephones, electric keyboards powered by vacuum tubes—his staff reported on them as if they only required a combination of already existing electrical principles and components. These new media appeared as little more than the sum of individual building blocks that one could pick and choose from out of the pages of the *Catalog*.

Technical literacy was encouraged not only through blueprints and instruction manuals for the amateur tinkerer, but also through thought experiments and graphical projections of what these new media might look like. This was Gernsback's forté: reading fantastic possibilities for the future of technologically advanced societies off the shape of the most mundane of material objects, techniques and processes—even the silver filings of a dime.

Figure 3: Gernsback presenting a replica of the Telimco to the Henry Ford Museum, 1957.

These amateur experimenter magazines covered not just the most spectacular and popular of the mass media, such as cinema and wireless telegraphy, but the

affordances of the smallest individual components: the selenium-coated plate, the tungsten lamp, the chromic plunge battery. In the blueprints of *Modern Electrics* all the way through the short fiction of *Amazing Stories*, the addition and subtraction of each wire, coherer, or tuning hookup constituted a full-scale shift in the abilities and sensory affects of the apparatus being constructed as well as the narrative form through which it was described. Moreover, these publications developed interleaving descriptive and narrative frameworks within which to describe these devices and experiences. No longer was it sufficient to profile the technical specifications of a device or the mechanical arrangement of its parts. Instead, magazines like *Radio News* and *Science and Invention* followed technological developments through to their most logical, and sometimes extreme, conclusions: the increased availability of a light-sensitive alloy implied that the coming of visual telephones was near, and the number of amateurs sending in their own designs for primitive television receivers only served to confirm the immanence of this new mode of communication.

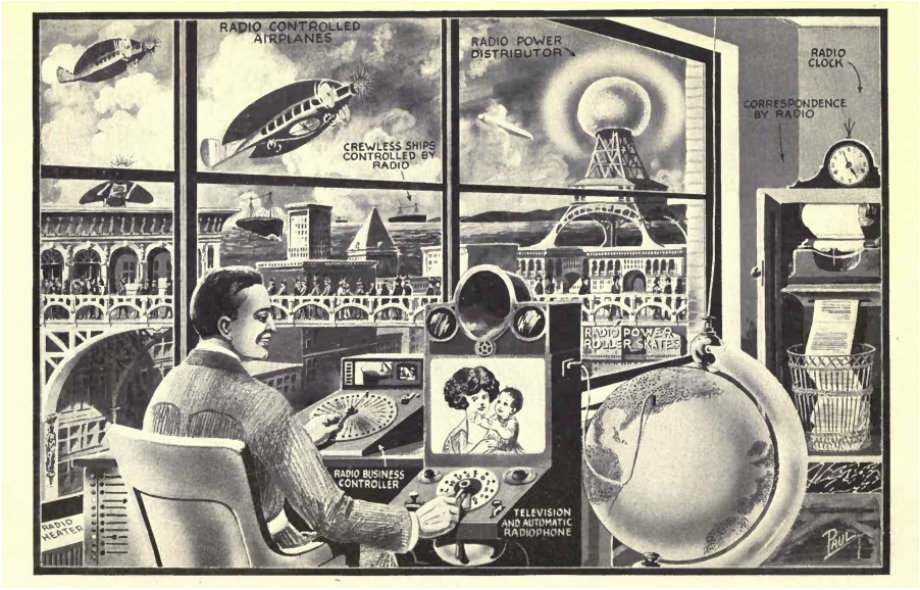


Figure 4: Frontispiece to Hugo Gernsback's *Radio for All* (1922).

The Telimco was one of countless artifacts profiled in the Gernsback magazines that blurred the lines between the real and the imaginary. Part branding exercise, part rallying call to a community of active amateur experimenters, Gernsback gave names to these ideas like the Aerophone (a name for wireless audio transmission, rather than merely telegraphic code), the Telephot (an early conceptualization of the videophone), and the Hypnobioscope (an automated thought transcription and playback machine). These gadgets appeared so frequently and in such diverse contexts—as props in short stories, homemade designs

in letters to the editor, and profiles of similar developments across Europe—that one gets the sense paging through the magazines that they are all part of a coherent fictional world, built up across many years and many issues. Given the pace of technological change in the early twentieth century, it seemed as if any one element of this fictional world could bleed into everyday life at any moment.

All of this began with the *Electro Importing Catalog.* Gernsback's *Modern Electrics* began as a mail-order catalogue for imported wireless parts and exotic electrical miscellany in 1905. After several issues of the mail order catalog and a growing subscription list, *Electro Importing* began including features, editorials, and letters to the editor. Between 1906 and 1910, the catalog grew into a series of monthly magazines for the wireless homebrewer, beginning with *Modern Electrics* in 1908 and the offshoot Experimenter Publishing Company in 1915, later expanding to a fleet of popular and specialist magazines like *Electrical Experimenter, Radio News, Science & Invention*, and the *Technocracy Review.* The transition from the mail-order catalog to the "slick paper" monthly magazine format was a smooth one, evidenced by the fact that the third edition (1908) of the Electro Importing catalog bears the title of the new full-format magazine, "Modern Electrics."

While *Modern Electrics* still advertised the equipment Electro Importing offered for sale in a familiar grid layout with ordering instructions, it also included feature articles detailing the latest research into experimental media technologies in America, Germany, France, and in Gernsback's own company offices. Regular reporters like H. Winfield Secor and René Homer, celebrity guest contributors such as Lee De Forest, Thomas Edison, and Nikola Tesla, as well as the unnamed Paris Correspondent and Berlin Correspondent provided reports on television, wireless telephony, and the use of novel electrical apparatuses in film and theatrical productions, each of which would go into a great degree of technical detail.

Though Hugo Gernsback is best remembered today for launching the first science fiction magazine, *Amazing Stories* (1926), and the Hugo Award is given out each year to the best works in the genre, he now receives little more than a one- to two-sentence nod in science fiction studies. He is associated with the gaudy covers of his magazines and a "crude and heavy-handed" editorial style that perpetuated many of the negative stereotypes still associated with science fiction today. Much of this attitude has been inherited from a generation of science fiction scholars who were not academics but editors themselves, and disparaged Gernsback's editorial practices as well as the infamously low wages he paid his writers. But this inherited version focuses only on the period from *Amazing Stories* and after, entirely overlooking the context of the genre's birth in Gernsback's experimenter magazines, as well as his work as a pioneer in media technologies and broadcasting techniques.

Titled after an essay of his on the influence that objects exert on thought, *The Perversity of Things: Writings on Media, Technology, and Science Fiction* makes available texts by Gernsback that were foundational for both science fiction and

the emergence of media studies. These editorials, speculative blueprints, literary critical essays, and media histories have been out of print since their original publication in Gernsback's magazines from 1905-1933. Together, they show how his publications evolved from an electrical parts catalog into a fully-fledged literary genre, an altogether untold story in American literary and media history. As the curator of a recent exhibit on Gernsback at the ZKM (Center for Art and Media Technology), Franz Pichler writes, "Hugo Gernsback is the father of American electronic culture."[6] With his monthly editorials, feature articles, and short fiction, Gernsback pioneered a kind of writing that combined hard technical description with an openness to the fantastic. It was a mixture out of which an entire literary genre emerged to tackle the question of the distinctive specificity of "medium" in a new wireless age in the opening decades of the twentieth century. *The Perversity of Things* will show that science fiction emerged in the United States as a discourse on media.

2 Background

2.1 Gernsback's biography

Born Hugo Gernsbacher in Luxembourg in 1884, the son of a successful wine wholesaler, Gernsback immigrated to the United States in 1904 at the age of 19. Carrying with him the design for a new kind of dry cell battery, Gernsback published his first article on the device a year later in *Scientific American* under that most American of names, "Huck." Gernsback sold the battery patent to the Packard Motor Car Company, who ended up using technology in their ignition systems. With the profits of his sale, Gernsback formed the Electro Importing Company, an importer of specialized electrical equipment from Europe and the first mail-order radio house in the country. Through their catalog and retail store at 84 West Broadway in New York, the company provided access to specialized wireless and electrical equipment not found anywhere outside of Europe. Electro Importing catered to a diverse clientele, providing their more advanced basement experimenters with the first vacuum tube offered for sale to the general public in 1911, and manufacturing for their novice users in 1905 the first ever fully assembled radio set commercially available in the United States, the Telimco.

After several issues of their mail order catalog and a growing subscription list, Electro Importing began including features, editorials, and letters to the editor. Between 1906 and 1910, the catalog grew into a series of monthly magazines for the wireless homebrewer, beginning with *Modern Electrics* in 1908 and the offshoot Experimenter Publishing Company in 1915. While *Modern Electrics* still advertised the equipment Electro Importing offered for sale in a familiar grid layout with ordering instructions, it also included feature articles detailing

[6] Franz Pichler, *Hugo Gernsback Und Seine Technischen Magazine* (Linz: Rudolf Trauner Verlag, 2013)

Figure 5: Electro Importing Company store, c. 1908.

the latest research into experimental media technologies in America, Germany, France, and in Gernsback's own company offices. Regular reporters and celebrity guest contributors like Lee De Forest, Thomas Edison, and Nikola Tesla.[7] provided reports on television, wireless telephony, and the use of novel electrical apparatuses in film and theatrical productions, each of which would go into a great degree of technical detail.

But the hallmark of the magazine became its more speculative articles, those that were willing to extrapolate fantastic scenarios out of the technical details at hand. In "Signaling to Mars," Gernsback detailed the conditions that would have to obtain in order for Earth to send messages via wireless telegraph to the red planet. The quantitative description of the transmitting apparatus in terms of its necessary output (70,000 kilowatts) and best time of year to signal (summer) only constitutes one aspect of this scenario. Gernsback goes on to take into account the nature of Martian intelligence that would be necessary for such a communicative circuit to be completed: "we can only hope that the Martians are further advanced than we and may signal back to us, using a method new to us and possibly long discarded by them, when thousands of years ago they stopped signaling to us, and gave us up, as we did not have intelligence enough to understand."[8] Continuing in the tradition of Percival Lowell and William Henry Pickering—the latter of whom offered a similar proposal on the front page of *The New York Times* to communicate with Mars using a series of mirrors[9]—the supposition of Martian technology (or biology, or ecology) provided a topos upon which readers might asses the direction of its terrestrial analogues.

[7] Tesla first published his autobiography in serial installments in *Electrical Experimenter,* a book that was recently rereleased by Penguin Classics. Nikola Tesla and Samantha Hunt, *My Inventions and Other Writings* (Penguin Classic, 2011)

[8] Hugo Gernsback, "Signaling to Mars," *Modern Electrics* 2, no. 2 (1909): 49

[9] "Planned Messages to Mars," *The New York Times* (April 1909): 1

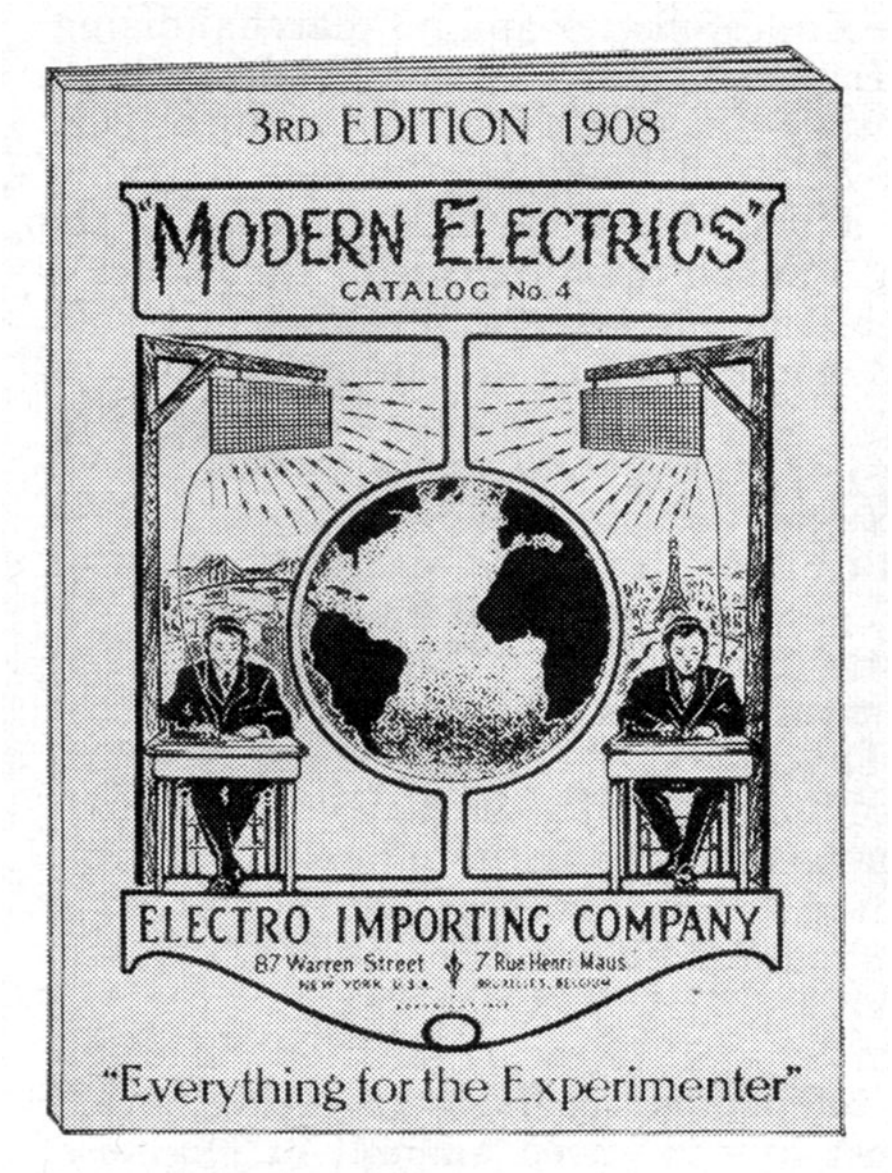


Figure 6: Modern Electrics in its original catalog form, 1908.

For readers of *Modern Electrics*, the technical context in which this highly speculative article appeared only led credence to the idea that contact with an alien civilization was right around the corner. In the copy of this issue at Princeton University's Firestone Library, someone inserted a newspaper clipping (now a permanently affixed leaf within the bound volume) that tells of a new distance record for wireless signaling, from San Francisco to the Pacific Mail Line steamship Korea as it made its way across the ocean. Left there as if to vouch for the plausibility of the idea that we'll soon be able to connect with our nearest planetary neighbor, the clipping provides a wonderful sense of how it was people read these magazines.[10] Though the Gernsback titles eventually became infamous for their sometimes outlandish claims – that electric current might clean us better than water; that the success of a marriage can be predicted using gadgets assembled out of various household supplies – they were always presented through a lens of supposedly scientific rationality. This frame affected the reception of the magazines by their readers, the design ethos that grew up around them, and the kind of fiction they eventually produced.

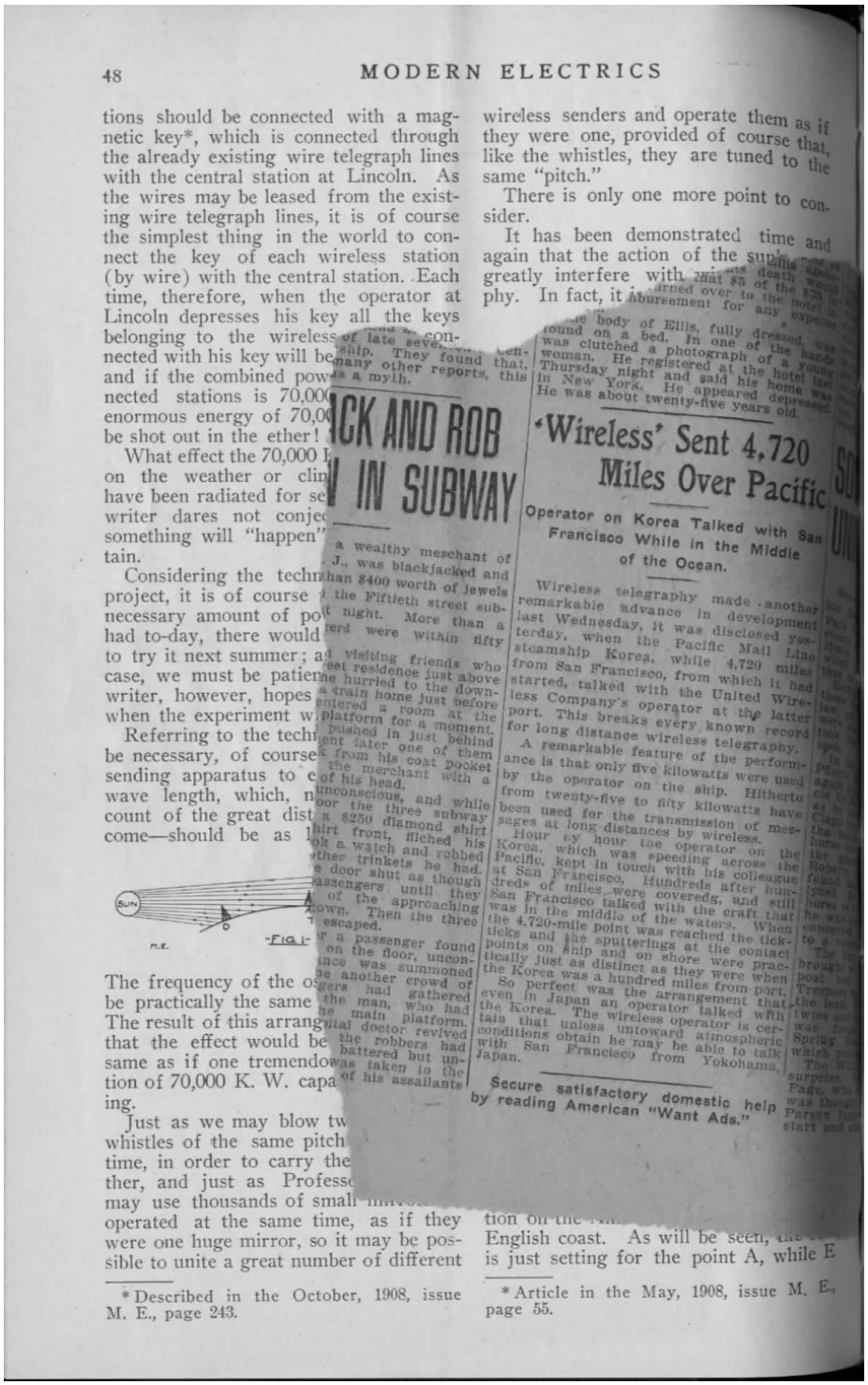
The shape of media to come took on an iconography all its own through the illustrations of Frank R. Paul. Paul's depictions of gadgetry circulated widely beyond their original publication venues in a way that has never before been given any attention. Plans for the osophon, a device Gernsback designed to replace headphones by transmitting sound through vibrations in the jawbone of the listener, were published and reviewed in the German journal *Der Radio-Amateur*.[11] Paul's sketch of a man using a tuning fork to calibrate the speed of the 1928 *Science and Invention* Nipkow disk television receiver was republished the following year in the Chinese film journal *Yingxi zazhi* (*Shadow Play Magazine*) as an illustration of recent research into television, what was referred to in the article as, directly translated, "wireless cinema."[12] Paul's images, now in the public domain, accompanied Gernsback's writings and will form an important part of this collection as well.

The incredibly rich context of the science fiction's birth in Gernsback's fleet of technical publications for the amateur experimenter, as well as his work as a pioneer in media technologies and broadcasting techniques, have been entirely overlooked. In his illustrated magazines and compendiums of amateur designs, one could find a literary treatise on what the genre of "scientifiction" should look like alongside blueprints for a homebrewed television receiver well before

[10] While I haven't been able to determine the provenance of this particular article, other pieces reporting on the Korea's distance signaling record were published in the *New York Times*on November 8, 1909 and the *Boston Evening Transcript*, November 6, 1909.

[11] Eugen Nesper, "Das Osophon von H. Gernsback," *Der Radio-Amateur* 2, no. 1 (1924): 10

[12] Weihong Bao, "Sympathetic Vibrations: Hypnotism, Wireless Cinema, and the Invention of Intermedia Spectatorship in 1920s China," in (Columbia University, New York, 2011). Bao located Paul's illustration of the *Science and Invention* television receiver in Xiaose Shen, "Dianyingjie de Jiizhong Xin Faming [Several New Inventions in the Film World]," *Dianying Yuebao* 9 (1929): 1–64. The term for television used in this article is "wuxian dianying (wireless cinema, or, more literally, wireless electric shadow, or radio shadow)." Paul's images were originally published in Hugo Gernsback, "Radio Movie," *Science and Invention* 16, no. 7 (November 1928): 622–623.



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tions should be connected with a magnetic key*, which is connected through the already existing wire telegraph lines with the central station at Lincoln. As the wires may be leased from the existing wire telegraph lines, it is of course the simplest thing in the world to connect the key of each wireless station (by wire) with the central station. Each time, therefore, when the operator at Lincoln depresses his key all the keys belonging to the wireless stations are connected with his key will be [illegible] and if the combined pow[illegible] nected stations is 70,000 enormous energy of 70,0[illegible] be shot out in the ether!

What effect the 70,000 [illegible] on the weather or clim[illegible] have been radiated for se[illegible] writer dares not conjec[illegible] something will "happen" tain.

Considering the techn[illegible] project, it is of course [illegible] necessary amount of po[illegible] had to-day, there would [illegible] to try it next summer; a[illegible] case, we must be patien[illegible] writer, however, hopes [illegible] when the experiment w[illegible]

Referring to the tech[illegible] be necessary, of course[illegible] sending apparatus to e[illegible] wave length, which, n[illegible] count of the great dist[illegible] come—should be as l[illegible]

The frequency of the o[illegible] be practically the same [illegible] The result of this arrang[illegible] that the effect would be [illegible] same as if one tremendo[illegible] tion of 70,000 K. W. capa[illegible] ing.

Just as we may blow tw[illegible] whistles of the same pitch [illegible] time, in order to carry the [illegible] ther, and just as Professo[illegible] may use thousands of small [illegible] operated at the same time, as if they were one huge mirror, so it may be possible to unite a great number of different wireless senders and operate them as if they were one, provided of course that, like the whistles, they are tuned to the same "pitch."

There is only one more point to consider.

It has been demonstrated time and again that the action of the sun[illegible] greatly interfere with [illegible] phy. In fact, it [illegible]

* Described in the October, 1908, issue M. E., page 243.

* Article in the May, 1908, issue M. E., page 55.

Figure 7: *Science and Invention* illustrations republished in Chinese film journal *Yingxi Zazhi*.

its commercial possibility. Gernsback's translation of an influential German handbook titled *The Practical Electrician* ran next to a speculative article on what it would take to provide a global system of free electricity powered by ocean currents. Long before Gernsback founded *Amazing Stories,* these magazines used speculative fiction to find a language suited to the analysis of emerging media like radio, television, or the more exotic osophone and telegraphone.

The Perversity of Things thus seeks to provide a reappraisal of both the "hard" technical roots of American science fiction and the highly speculative orientation toward media technologies during this period. Science fiction in its early days wasn't just a literary form, it was a mode of interacting with new media. The literary historical gambit of this book is to recover the radical sense of openness that greeted not only the basement tinkerer working through the feasibility of transmitting images over a wire, but also the author of "scientifiction" stories who possessed a highly sophisticated awareness of the fact that "Two hundred years ago, stories of this kind were not possible." Often, these individuals were one and the same, weaving together functional and fictional devices in a manner that served for them as a form of scientific discovery in itself.

2.2 Gernsback's reputation in the critical literature

Hugo Gernsback has been given very little attention in science fiction studies, with the field's leading critics often assuming that *Amazing Stories* was little more than a marketing gimmick for Gernsback's technical ventures. The fiction published in the pages of his magazines is often seen to have very little aesthetic or literary value. So when Gernsback is given credit in the foundation of modern American SF, it is as a kind of marketer of a new brand name, rather than a writer or editor. As Alexi and Cory Panshin write, "In the pages of *Amazing*, SF literature at last became identified by a single name: 'scientifiction.' It was provided with a history. It was defined and demonstrated. It was consolidated and unified. In *Amazing*, SF became conscious of itself."[13] According to John Clute and Peter Nicholls, Gernsback "gave the genre a local habitation and a name," and for James Gunn, he "provided a focus for enthusiasm, for publication, for development," and bestowed science fiction with its "characteristic content, a characteristic form, and characteristic purposes."[14]

These critical histories (each of which are written by SF novelists in their own right) proceed as if propelled by their own fantastic, alternate history: what if science fiction left us with texts as highly valued as the works of modernism from the very beginning? No doubt the field of science fiction studies has done a great deal of work in order to elevate certain works of the genre (mainly from the 1960s

[13] Alexi Panshin and Cory Panshin, *The World Beyond the Hill: Science Fiction and the Quest for Transcendence* (Los Angeles: Jeremy P. Tarcher, Inc, 1989), 170.

[14] John Clute and Peter Nicholls, *The Encyclopedia of Science Fiction* (St. Martin's Griffin, 1995), 491. James E Gunn, *Alternate Worlds: the Illustrated History of Science Fiction* ([New York, N.Y.?]: A & W Visual Library, 1975), 128.

Figure 8: *Electrical Experimenter*, May 1918.

and 70s New Wave) to a kind of academic respectability. But these assumptions about the genre's magazine era beginnings have never been questioned, nor have any of Gernsback's publications save for *Amazing Stories* been submitted to any kind of rigorous analysis. The editorial function many SF histories begrudgingly ascribe to Gernsback overlooks the much more interesting heritage of magazine SF within a wider tradition of thinking about new media.

3 Recent attention

This story has held sway over the reception of Gernsback until very recently. But the need for this volume is now becoming apparent as we experience technological revolutions in the fabric of the everyday similar to those that brought readers to the Gernsback publications a century ago. The ability of Gernsback's ideas to speak to us today can be seen in the ways that images from his magazines circulate online through a wide variety of social image sharing sites and blogs, like Reddit, Tumblr, and the Scientific American blog *Paleofuture*. Gernsback's life and works are now beginning to receive a more formal treatment as well, with two major museum exhibits recently held: one at Luxembourg's National Center for Literature in 2011, and another in 2013 at the ZKM (Center for Art and Media Technology) in Karlsruhe, curated by Franz Pichler and the media theorist Peter Weibel.[15] In addition, the visual artist Eric Schockmel is currently developing an animated documentary film about Gernsback.

4 Outline of Book

My introduction to this volume will situate Gernsback's writings within their technological and media historical contexts. The essays will then be organized chronologically in order to highlight the conceptual fluidity of Gernsback's writings and allow readers to experience the interdisciplinary soup out of which his thinking emerged. For instance, one essay covers the chemical properties of selenium as a substrate for electrically transmitted images, while the next seeks to recover a forgotten nineteenth century dime novel author, or comment on the latest federal legislation on wireless telegraph regulations. Though these topics seem very disparate to us today, they emerged as part of the same epistemological endeavor. Ordering the essays chronologically allows us to preserve this context.

A thematic index will provide a further entry point for readers interested in particular aspects of Gernsback's thinking. Each of these five sections (which will organize the book's introductory essay as well) are explained below.

[15] A video of this exhibit can be seen at `http://www.youtube.com/watch?v=aEq6Mlu9j8I`.

4.1 Scientifiction

> *Foundational writings on science fiction as a distinct genre, including literary historical essays on writers Gernsback understood to be predecessors: Wells, Verne, Poe, Luis Senarens, Clement Fezandié.*

Today, the phrase "science fiction" conjures up images of bug-eyed monsters, ray guns, starships, and sonic screwdrivers. But in the opening decades of the twentieth century, before a century's accretion of images, narratives, and clichés, that which was not yet called science fiction consisted of a great number of concrete practices all geared toward a reckoning with the technological revolutions in the fabric of everyday life. "Science," wrote Gernsback in the inaugural issue of *Amazing Stories*,

> through its various branches of mechanics, astronomy, etc., enters so intimately into all our lives today, and we are so much immersed in this science, that we have become rather prone to take new inventions and discoveries for granted. Our entire mode of living has been changed with the present progress, and it is little wonder, therefore, that many fantastic situations [. . .] are brought about today. It is in these situations that the new romancers find their great inspiration. ("A New Sort of Magazine)

As early as 1915, Gernsback cites nineteenth century dime novels like *Deadwood Dick* and authors like Luis Senarens ("The American Jules Verne"), revealing an awareness of the genealogy of science fiction over a decade before the launch of *Amazing Stories* in 1926, when most SF critics locate the birth of the genre. These essays make clear that a very sophisticated understanding of the genre's roots was already in place by the 1910s, and that science fiction as we understand it today was a rich and variegated series of activities, rather than merely a literary form.

4.2 Tinkering and technology

> *Reports on broadcast experiments at Gernsback's WRNY radio station, new inventions developed at the Electro Importing Company labs, and critical essays on techniques for thinking creatively through technology.*

Gernsback oversaw experiments with broadcast media and the effects of various instruments and signal processing techniques on the auditory perception of the station's listeners from his radio station WRNY. Several articles and editorials cover these experiments, including a concert broadcasting some of some of the earliest electronic instruments developed at the E.I. Company offices ("The

Pianorad") as well as one of the earliest television broadcasts on record, using a unique method of interleaving audio and visual signals across a single frequency ("Television and the Telephot"). Gernsback championed the creativity and problem-solving abilities of the tinkerer throughout his career ("Why the Radio Set Builder"; "Is Radio at a Standstill?")

While conducting these groundbreaking experiments, Gernsback kept these developments open to the contributions and participation of his readers. In one editorial for *Radio News*, ("Television to the Front") Gernsback describes the television as just a simple add-on or expansion kit to a normal domestic radio set. "I am quite certain that the final television apparatus on your radio set will take up no more room than your present cone speaker." Regardless of how advanced the devices detailed in the pages of Gernsback's magazines seemed—solar cells, automobile mounted radiotelephones, electric keyboards powered by vacuum tubes—his staff reported on them as if they only required a combination of already existing electrical principles and components. These new media appear as little more than the sum of individual building blocks that one can pick and choose from out of the pages of the *Electro Importing Catalog*.

4.3 Media history

> *Later works that read current inventions in light of their not so distant precursors, profiling forgotten (and often quirky) paths not taken in the development of radio and television.*

In Gernsback's editorials, media history is evoked not merely as a nostalgic trip back to the devices of yesteryear, as it often is today in retro-kitsch, but as an archive of possibilities ripe for future experimentation. For instance, in a 1927 editorial ("Radio Steps Out"), at a moment when national broadcast networks were flickering to life and music and variety programs were flooding the country, the medium of radio had become a fixed idea in people's minds that papered over the inherent abilities of the underlying technology. Looking back on that strange trajectory in which the technology underlying wireless telegraphy became "radio," an everyday part of household furniture, Gernsback writes, "the public at large is not aware of the fact that the art of radio is used for hundreds of different purposes aside from broadcasting and telegraphy. ... There is hardly any industry today that cannot make use of radio instruments in some phase of its work."

His examples range from a force-field like burglar alarm, to automating the recording of lightning strikes, from measuring the minute weight and touch of a fly to scanning factory workers for stolen metals. And, in a forgotten example of Gernsback's own from the 1900s (which he christened the "Dynamophone") electric motors can be started remotely by the human voice, proving that "the apparatus foreshadowed broadcasting: the human voice actually did create effects at the receiving end," both for machines and humans. Gernsback consistently

reminds us that the inherent abilities of wireless, i.e. of information transmitted through the air, has now itself been scattered by the winds of technological evolution and inflects our understanding of and interaction with a fantastic number of techniques, technologies, and media.

4.4 Broadcast regulation

> *Activism, community organization, and manifestos written in service of radio amateur rights after the US government banned all public wireless activities in the wake of World War I; includes later writings for the Technocracy movement.*

With the outbreak of World War I, the U.S. Navy outlawed all amateur wireless broadcasting activities and took sole control of the airwaves. *Modern Electrics* thus became a community forum for frustrations over this policy, as well as a drawing board for what broadcast regulation should look like once the war was over. Gernsback and his associates formed "The Wireless Association of America" in 1910, an education and outreach organization that ended up training many of the wireless operators that the Navy would need once the U.S. entered the war, one of who even developed a means of recording clandestine German U-boat commands that were being relayed through a New Jersey wireless station, unbeknownst to the U.S. Government ("Sayville"). As Gernsback liked to proudly claim later in life, language from his *Modern Electrics* editorial on broadcast regulation ("The Alexander Wireless Bill") was eventually taken up by the Congress's Wireless Act of 1912. Finally, as Tim Wu writes, *Radio News* later served as one of the first broadcast programming guides in the country's history, publishing lists of each radio station in operation, along with their frequencies and "what one might expect to hear on them – a forerunner of the once hugely profitable *TV Guide.*"[16]

Gernsback would later re-enter policy debates and the politics of technology with his short-lived *Technocracy Review,* which featured essays by the leaders of the Technocracy, Inc. movement. People like Howard Scott argued that a small elite of technologically-inclined leaders, by dint of their mathematical and engineering expertise, would be able to govern the country more rationally, economically, and fairly. Gernsback's editorials for this magazine provide an overview of the idea as it gained currency after the stock market crash ("The Machine and the Depression").

4.5 Selected fiction

> *Four short stories and the original serialized version of the famous* Ralph 124C 41+, *all of which have been out of print since their*

[16] Tim Wu, *The Master Switch: The Rise and Fall of Information Empires* (Knopf Doubleday Publishing Group, 2010), 39.

original magazine publication.

While editions of Gernsback's *Ralph 124C 41+* have been republished in 1950, 1958, and 2000, all of these use a revised version of the text Gernsback updated in 1929. The original, serial version from 1911 has not been seen since its original magazine print run. There are significant differences between these two versions of the novel that deserve to be looked at by a wider audience.

Other short stories by Gernsback that have not been reprinted include "New York A.D. 2660" (1911), "The Magnetic Storm" (1918), "The Electric Duel" (1927), and "The Killing Flash" (1929). As mentioned above, the speculative mode of these fictions is not out of step with the technical articles they were published alongside. Including them within the continuum of essays on broadcast regulation and tinkering allows them to be experienced in a context similar to their original intentions.

5 Specifications and Audience

This volume has the potential for broad-based appeal to both academic and popular audiences. A scant few works of scholarship have been devoted to this period in the history of science fiction, and it is my hope that the availability of these texts can significantly revise our understanding of the genre's origins in **science fiction studies**. Because Gernsback's writings explore many branching paths not taken in the history of media technologies, this book will be useful for **media studies** as well, a field increasingly interested in the "archaeology" of dead, hybrid, and imaginary media. In **design studies**, where "design fiction" and "speculative design" are becoming vibrant fields of inquiry, a book surveying the prehistory of thinking critically about the future of everyday objects would prove a valuable resource. These essays can find an audience outside of academia as well, as they were inherently meant to be read by a **popular audience** without sacrificing the sophistication of their ideas. The flurry of recent activity around critical making, maker spaces, 3D printing and rapid prototyping provides yet another occasion for this book's publication.

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The Dynamophone

Modern Electrics, vol. 1 no. 2

May 1908

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While conducting some experiments in wireless telephony I made the discovery of quite an interesting combination which, to my knowledge of the art, has not been tried up to this date.

To produce mechanical effects directly, man is obliged to exert his muscular forces, by bringing his muscles in contact with the object to be moved, or through an indirect way, namely, by interposing a tool between the muscle and the object.[1] This tool might be a lever or it might be a telegraph key, which latter, if desired, will move or disturb the far-off object through another medium, electricity.

To apply power to an object the hand is used more than any other part of the human body; the foot probably ranges next. The whole body, mostly applied

[1] A sentence linking human "muscular force" to "mechanical effects" in a metaphor that isn't signaled as such becomes possible thanks to the rise of the "human motor" as a dominant form of political, social, technical and scientific thought from the late nineteenth century through the interwar period. Anson Rabinback has shown how labor is transformed into "labor power" over this period, "a concept emphasizing the expenditure and deployment of energy as opposed to human will, moral purpose, or even technical skill." Predicated on a utopian ideal of a body without fatigue, discourse on the human motor sought to marry the motion of the body with that of the machine:

> European scientists devised sophisticated techniques to measure the expenditure of mental and physical energy during mechanical work—not only of the worker, but also of the student, and even of the philosopher. If the working body was a motor, some scientists reasoned, it might even be possible to eliminate the stubborn resistance to perpetual work that distinguished the human body from a machine. If fatigue, the endemic disorder of industrial society, could be analyzed and overcome ,the last obstacle to progress would be eliminated.

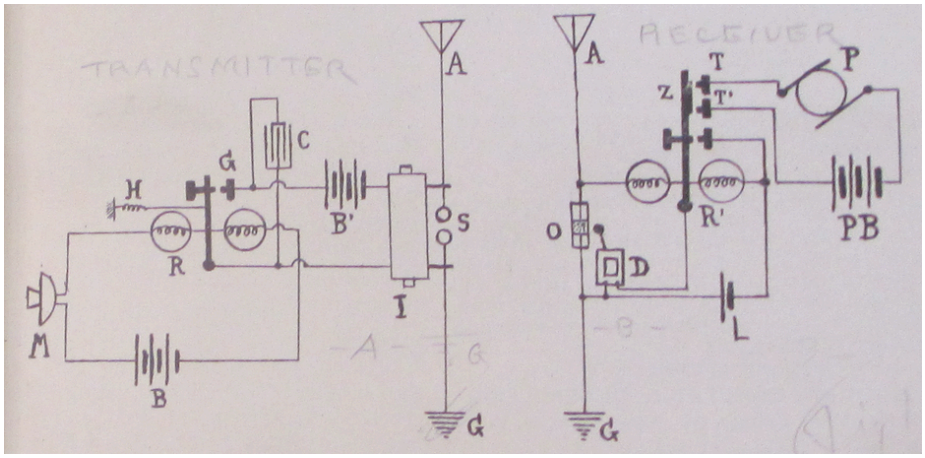
Anson Rabinbach, *The Human Motor: Energy, Fatigue, and the Origins of Modernity*, (Berkeley: University of California Press, 1992), p. 2.

as a lever, follows. The head is practically never used at all. The lungs are used very little comparatively, for instance in glass blowing, etc.

The voice has never been used, no case being on record that a motor or a dynamo was started solely by talking, to or through a medium. I am, of course, well aware that by talking in a transmitter the telephone diaphragm at the other end will vibrate, but that can hardly be called power, it being proved that in most cases the vibrations of a receiver diaphragm measure less that one-five-thousandths of an inch. To provide a contact on the diaphragm in order that the vibrations should close a certain circuit, which in turn could be relayed, to transmit or start power, has always proved a failure on account of the vibrations of the diaphragm, created by the human voice, being exceedingly weak.

My arrangement, as described below, to transmit or start power, etc., simply by talking into a transmitter, will therefore be found novel, especially if it is considered that the transmitter is not connected with the receiving station whatsoever. The transmission is made by means of wireless electric radiations.[2]

No new apparatus being needed in my arrangement, any amateur can easily perform the experiment.



Referring to plan, M represents the common transmitter as used on most telephones. R is a fairly sensitive pony relay of seventy-five ohms. C is a condenser to absorb excessive sparking; I, induction coil; S, oscillator balls.

The tension of the adjusting spring H on the relay should be just sufficient to keep the armature away from contact G. With a little experimenting the right tension will be ascertained.

By talking medium loud in the transmitter, the resistance in same will be varied accordingly and the armature will close the circuit at G, through battery B and

[2]This is a clever workaround: at a time when the voice couldn't be *transmitted* via wireless, perhaps it could at least be *translated* into a form of electrical or mechanical force.

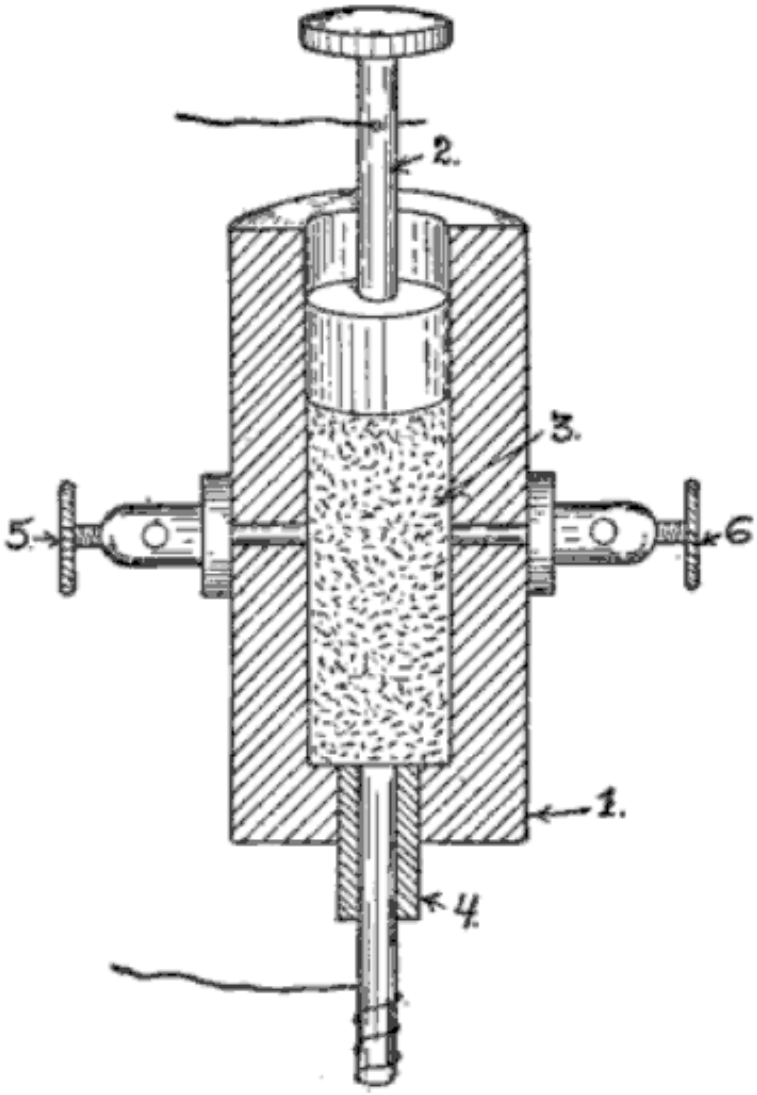
coil I, which may be a common one-inch spark-coil not deprived of its vibrator.

Every time the circuit is closed at G a series of sparks will jump across the balls at S, creating oscillations. These oscillations, traveling through the ether, arrive at the receiving station, where they impinge on the antennae A and operate the coherer O through relay R'. The decoherer D is also shown. Relay, coherer and decoherer are all operated by a single dry cell L.[3] This is the same circuit as in

[3]The coherer is one of the earliest forms of "detector," the most important component of a wireless set. The detector is responsible for demodulating radio frequency signals into an audio frequency current, ready to be piped through the listener's headphones. The idea behind the coherer is that when a radio frequency signal is applied to a glass vial filled with metal powder, the metal filings will "cohere" and an electrical current will pass through the device. Each telegraphic "dot" or "dash" causes the filings to cohere, after which some form of "decoherer" mechanically taps the vial to loosen them once again.

The coherer was initially discovered by the physicist and inventor Édouard Branly (1844 – 1940). "The form and nature of the ordinary filings-tube coherer, as applied to-day in wireless telegraphy, is fairly familiar. Branley [sic] discovered, in 1891, that the effect of electrical oscillations upon a body of metal fillings was to produce a marked increase in the conductivity of the mass, a conductivity which persisted until the particles were broken apart again by mechanical jar. Although Varley, Hughes, Onesti and others had previously noted this phenomenon, none of these investigators had fully appreciated the causes involved, or given to the world of science the benefit of their researches in thorough published reports." Lee De Forest, "Electrolytic Receivers: Wireless Telegraphy," *Telephony*, 8, no. 5, (November 1904), p. 424.

my "Telimco" wireless system.[4] Relay R' has in addition two stationary contacts



It was left for Marconi to, in the words of Thomas H. Lee, combine Hertz's spark-gap transmitter with Branly's coherer and "tinker like crazy." It is worth noting that the physical principle behind the coherer's operation is still not understood today. It remains a device with practical applications whose inner workings are nevertheless not understood. Thomas H. Lee, "A Nonlinear History of Radio," in *The Design of CMOS Radio-Frequency Integrated Circuits*, (Cambridge University Press, 2004), p. 3.

[4]The Telimco was the flagship product of The Electro Importing Company, it's name a shortened form of the company's. It was the first radio set ever sold fully assembled to the

T and T', which, when the armature Z closes, complete another circuit, as, for instance, through a small motor P, an incandescent light, etc.

As long as words are spoken in the transmitter M, oscillations will be set up in S and the receiving station will work continuously until the voice at M stops. Motor P will, of course, be kept in motion only as long as the voice talks into M.[5]

"MODERN ELECTRICS" has had an unparalleled success since its first appearance that it became necessary to give up the old offices and move to larger quarters. We are now located at 84 West Broadway, in the very heart of New York's electrical district, and our present facilities are adequate to keep pace with the rapid growth of the magazine.

We are proud to say that out of about 600 letters received, there was *not one* that did not contain congratulations, or a few nice words.

We were a little "shaky" at first, and we did not know if we had struck it right, but the avalanche of kind letters received encouraged us enormously, and we know now that we do not have to fear for the future.

We know that "MODERN ELECTRICS" has come to stay, for the simple reason that it fills a long-felt want and because "we have the goods!"

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public.

[5]Though the coherer wasn't as sensitive as later crystal and electrolytic detectors, it had the merit of being the only to work in mobile applications until the late 1910s. In a later editorial on what he refers to as "radio kinetics," Gernsback writes of the shortcomings and unique benefits of the coherer:

> as far back as 1906 this investigator fired guns, closed doors, started and stopt motors by means of distant radio control. This was in the age of the coherer, and probably due to its inherent shortcomings, the art of radio kinetics was not much advanced until very recently. The coherer is a very unsatisfactory scientific instrument insofar that even if constructed by precision mechanics, it has the great inherent fault of being susceptible to shocks as well as to most extraneous impulses. Thus, for instance, a very sensitive coherer will usually operate on strays or static as well as inductive effects and stray waves. In other words this instrument—even the most balanced one—is not reliable. It will go off when least expected. A coherer heretofore was thought to be the prime necessity for radio kinetics because it was practically the only instrument known that could close the contacts of a relay. Ordinary detectors such as the crystal type and others could not be used until about three or four years ago, at which time very sensitive galvanometer relays were introduced which actually could be used to close a contact by means of a carborundum or silicon detector." "Radio Kinetics," *Radio Amateur News*, vol. 1 no. 12, June 1920.

A strange disease is spreading rapidly over this country and threatens to infect every young man over 15 years old. No antidote has been discovered so far against its ravages, and parents are greatly alarmed, the new disease at the same time taxing pocketbooks and checkbooks heavily.

The name of the infecting germ is *Bugum Y-erlessum* and creates the so called "Wireless Craze." The disease is incurable.

Never before was the "craze" so strongly developed as this year; uncountable cases are reported from Portland, Me., to Portland, Ore., and the statistics show that one out of five young men are infected.

Since "MODERN ELECTRICS" made its appearance a month ago, the editor has been flooded with mail. From the hundreds of congratulating letters received 159 (one hundred and fifty nine) up to this writing deal with nothing but Wireless. Most readers wish the "Wireless Department" enlarged, some even went as far and asked us to publish nothing but Wireless, a great many wanted a description of an electrolytical Detector, while an equally large audience wanted to build a Silicon Detector.

We had in mind to print a good many interesting articles besides the ones the "Wireless Department," but our motto is: "To print what our readers WANT, not merely what strikes the Editor's fancy."

We remembered this in time and the present issue of "MODERN ELECTRICS" proves that our motto is no idle boast.

[The Roberts Wireless Bill]

Modern Electrics, vol. 2 no. 10

January 1910

The long threatened wireless bill has made its appearance at last.

The resolution, as introduced by Representative Roberts of Massachusetts, is reprinted in detail on the following page and should be carefully read by every one who has wireless progress at heart.[1] Personally, the Editor believes that there is no need of a wireless telegraph board.

It is of no practical value whatsoever, un-American, and will keep down the progress of a young and useful art, which in time may develop into an as yet undreamed-of asset of the nations' power.

Wireless telegraphy and telephony, in a country of such vast distances as America is a very valuable means for cheap transmission of intelligence, and it is the duty of the Government to encourage it, and not to pass a resolution to throttle it like England and Germany have done, in which two countries the art is almost unknown.

It would be deplorable indeed to see Representative Roberts' resolution passed. The farmer, who three years hence will be in a position to own his wireless telephone to call up his next neighbor fifty miles distant from him, will much rather install his private wireless 'phone, rather than be forced to subscribe to an exorbitant rent of an instrument owned and controlled by the United Wireless Company or some other wireless trust, to which trusts such a resolution would give full swing to extort high rates.[2]

[1] Congressman Ernest W. Roberts of Massachusetts's 7th District introduced House Joint Resolution 95. Though Roberts's proposals did not go far, aspects of this Resolution were incorporated into the Radio Acts of 1910 and 1912.

[2] Jonathan Sterne writes on the postwar politics of rural access to a different medium—broadcast television—which encountered significant difficulties in particular geographic loca-

At first sight Representative Roberts' resolution appears very tame and gentle, but men acquainted with modern methods at Washington know full well what the "recommendations (!) to Congress" mean, with the big wireless interests dictating the "recommendations."

Despite the present telephone interests the farmer is allowed to put up his personal telephone line from his house to that of his neighbor's. If the national wireless board comes into power, the same farmer would undoubtedly not be allowed to operate a private wireless telephone between his and his neighbor's house.

As far as wireless telegraphy is concerned, it is ridiculous to maintain now that the amateur can interfere with the business of commercial stations.

With the present efficient weeding out tuners, loose couplers, variable condensers, etc., the amateur can no more interfere with the commercial or government stations than the transatlantic liners—equipped with powerful apparatus—can interfere with the messages flashed from coast to coast.

The trouble is, that the majority of commercial and government stations have antiquated instruments, and do not care to acquire new ones. Their operators are almost entirely wire telegraph men who have not the slightest idea of wireless, nor are they interested in it. The Editor, who is personally acquainted with over twentyfive [sic] such operators was amazed to find that *not four of them could draw a diagram how* their instruments were connected up.

All their shortcomings are blamed on the innocent amateur, whose weak spark cannot be heard half a mile, as a rule, and the manager of the station of course takes the word of the operator every time.

There are to-day over sixty thousand experimental and amateur wireless stations in the United States alone.

That means that over sixty thousand young aspiring men stay at home evenings, enjoying an innocent sport, instead of dissipating outside in a questionable pastime.

We have as yet to find the father who objects to his son's "wireless." He knows it keeps the boy at home, away from mischief.

The Editor sounds a general call, and asks everyone to whom wireless is at heart, to send him at once a letter of protest against the wireless resolution. State in

tions. "Once potential audience members saw an existing system and its limits, they demanded access on the principle that television was a kind of infrastrucutre, like roads or utilities. Issues of access and entitlement to television thus grew in importance precisely at the areas where profitability was most limited." (47) Gernsback's emphatic declaration of wireless as a "utility" is thus an accurate depiction of how Americans would later identify themselves within a national network of communications relays. Jonathan Sterne, "Television Under Construction: American Television and the Problem of Distribution, 1926-1962," in *Television: Critical Concepts in Media and Cultural Studies*, ed. Toby Miller, vol. 1, (New York; London: Routledge, 2003)

your letter, before all, the UTILITY of your wireless. These letters, in mass, will be presented in Washington, to the proper officials.

All letters must be received not later than January 25th. Act at once!

National Wireless Telegraph Board Proposed

Representative Roberts, of Massachusetts, has introduced a resolution in the House at Washington providing for the creation of a wireless telegraph board. Mr. Roberts said that there is the greatest need for such control, as he has information from the Navy Department, the revenue cutter service and the commercial wireless companies that the effect of the activities of amateur operators has been such as not only to make necessary a change from "C Q D" as the distress signal, but to interfere seriously with the operations of all Governmental and private services. As a result of these reports, Mr. Roberts, who is a member of the House Committee on Naval Affairs, considers it high time to take cognizance of the situation.

The perfection of wireless apparatus has reached such a stage, he said, that if the service is to be permitted to grow unchecked it is absolutely essential that the Government take steps in the matter. The simplest solution of the matter lies in the passage of the resolution presented, or a measure of similar character, placing in the hands of a wireless board the control of wireless plants afload and ashore. It has been brought to his attention in an official way that the wireless service of the navy has been rendered practically useless at times by amateur operators, who send meaningless and oftentimes vile and unmentionable language through the air from their instruments.

Mr. Roberts' resolution authorizes the appointment of a board of seven members, "one expert each from the War, Navy and Treasury departments, three experts representing the commercial wireless-telegraph and wireless-telephone interests, and one scientist well versed in the art of electric wave telegraphy and telephony."

The duties of the board, according to the resolution, shall be "to prepare a comprehensive system of regulations to govern the operation of all wireless plants afload and ashore which come under the cognizance of the United States, with due regard alike for Government and commercial interests."

It is provided that within 30 days of the organization of the board it shall submit its report and recommendations to Congress. To defray the expenses of the board $2,000 is appropriated.[3]

[3]The following month's editorial contains a roundup of the overwhelmingly positive responses Gernsback received, including "9,000 protest letters from experimenters and amateurs all over the United States," and sympathetic editorials published in *New York Evening World, New York American, New York Sun, Boston Transcript, New York Independent,* and *New*

W. A. O. A.

The Wireless Association of America was founded solely to advance wireless. IT IS NOT A MONEY MAKING ORGANIZATION. Congress threatens to pass a law to license all wireless stations. The W. A. O. A. already has over 3,000 members—the largest wireless organization in the world. When the time for action arrives, the thousands of members will exert a powerful pressure to oppose the "wireless license" bill. This is *one* of the purposes of the W. A. O. A. There are more.

York World, who adds that "wireless communication itself is the invention of an amateur." By the April issue, which marked the third year of *Modern Electrics'* run and a readership of 30,000, Gernsback was able to endorse a new proposal for wireless registration, the Burke Bill. "Representative [James F.] Burke's bill does not impose any license fees for operating a station, as the Roberts bill. It simply calls for registration of stations by the Secretary of Commerce—a law which when passed will certainly be just and fair to all. It will also do away with the"Wireless Tramp," and mischief maker, who should be banished from the map with all possible speed." The entire text of the bill was published on the next page.

[The Born and the Mechanical Inventor]

Modern Electrics, vol. 3 no. 11

February 1911

WE have spoken several times of inventions and the present editorial is one on cultivating inventions.

Generally speaking, there are two kinds of inventing. One is achieved by the man who can't help inventing new things; he is a born inventor, just like a musician to whom music comes naturally and who never needed a teacher. The second kind of inventing is the mechanical kind. By this is meant the kind of inventing that is done by persons to whom inventing does not come natural, but those who are suddenly confronted with a certain device that to their minds seems imperfect, whereupon they will bend their energies towards improving the existing device.

The born inventor differs from the mechanical one in that to him ideas come suddenly, without the slightest suggestion. The writer, for instance, who has invented a number of devices will suddenly have a certain idea, of which he perhaps never thought before. Within less than ten seconds after the first impression of the idea, he will see the entire device, down to the smallest detail clearly before his mental eye and from that mental picture a complicated sketch of the device can be drawn immediately without reflection or real thinking; just like copying an existing drawing.[1]

[1] In his depiction of invention, Gernsback overlooks the importance of social groups and institutions in deciding the legibility of the problem an invention is designed to solve, as well as the precise means of solving it. Thanks to the legacies of science and technology studies, we now emphasize the ways technology is socially constructed, rather than celebrating the creativity of the lone genius inventor. Any invention must take place within the context of what Wiebe Bijker calls a technological frame, or

> the concepts and techniques employed by a community in its problem solving. Problem solving should be read as a broad concept, encompassing within it the recognition of what counts as a problem as well as the strategies available for

Considered all in all, the two kinds of inventors, as far as their inventions go are nearly equally matched. The born inventor will usually invent a great many things, three fourths of which are useless: he becomes guilty of over-production. The mechanical inventor invents very few things as a rule and most of them are usually useful. Thus nature tries to maintain the universal equilibrium.[2]

A few words of advice to the two kinds of inventors does not seem out of place.

The fundamental test of any invention should always be whether it is better or cheaper than existing devices and whether it will be profitable to market the invention.

Most inventors, on account of being far too enthusiastic and optimistic, fool themselves by not considering in cold blood all the defects of their devices. There was never an invention that had not its bad points and weak spots. These should be considered most critically by the inventor, because if he does not do it, the world will soon enough do it with surprising thoroughness, usually to the dismay of the misguided inventor.

Never market an invention before it is completely worked out and "fool-proof." If it has weak spots, try and improve on same, if you don't do it, your competitors will do it for you at your expense. It is fallacious to think that as long as the

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> solving the problems and the requirements a solution has to meet. (Wiebe E. Bijker, "The Social Construction of Bakelite: Toward a Theory of Invention," in *The Social Construction of Technological Systems: New Directions in the Sociology and History of Technology*, (Cambridge: MIT Press, 2012), 159–189 [1987], p. 164).

The technological frame of Bakelite plastic (Bijker's example in the above essay)—its "theories, tacit knowledge, engineering practice (such as design methods and criteria), specialized testing procedures, goals, and handling and using practice"—didn't come into existence until the 1910s, even though, conceivably, it was a *material* possibility as early as the 1870s.

Despite this, Gernsback's stated emphasis on "cultivating inventions" is very much in line with a renewed interest in creativity as an academic discipline or even a measurable learning outcome. Witness the College of Creative Studies at University of California, Santa Barbara, or the International Center for Studies in Creativity at Buffalo State College. The tension between the exceptionality of the individual inventor struck by divine inspiration and the step-by-step cultivation of that mindset in Gernsback's popularization of science is evident in books like Steven Johnson, *Where Good Ideas Come from: the Natural History of Innovation*, (New York: Riverhead Books, 2010) and Jonathan Lehrer, *Imagine: How Creativity Works*, 1st edition., (Houghton Mifflin, 2012). For a stinging critique of creativity experts, see Thomas Frank, "TED Talks Are Lying to You," *Salon*, (October 2013), http://www.salon.com/2013/10/13/ted_talks_are_lying_to_you/.

[2]This division between "born" and "mechanical" styles of invention—the whole cloth innovation of shiny new tools versus incremental acts of modification and repair—may today be seen to reflect a hemispheric divide. Steven J. Jackson argues that "a Western and productivist imagination" in studies of media and technology obscures the vast majority of technological practices around the world:

> breakdown, maintenance, and repair constitute crucial but vastly understudied sites or moments within the worlds of new media and technology today.

For more on "the distinctive repair ecologies of the develping world," see Steven J. Jackson, "Rethinking Repair," in *Media Technologies: Essays on Communication, Materiality, and Society*, (Cambridge: MIT Press, 2014), 221–239.

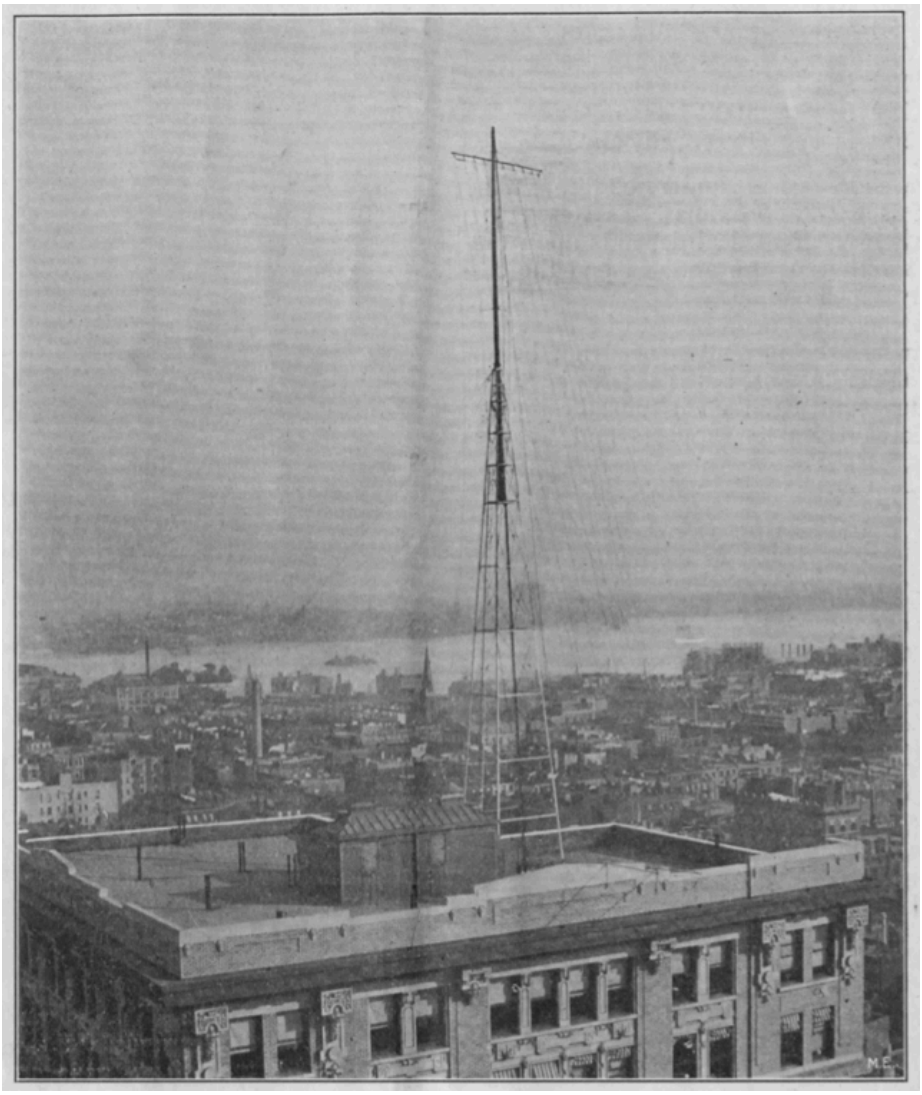
device works after a fashion it should be put on the market and the improving done afterward. Nothing is more preposterous. Witness the sad fiasco of the Wireless Telephone, exploited by several American companies, who are now defunct.[3] One of them erected costly steel towers from 100-200 feet high in dozens of cities in this country, and the great defects of the "arc" wireless telephone must have been well known to the technical staff as well as to the promoters. Nevertheless, they plunged along, trusting to good luck that the improvements were only child's play and would find themselves. However, the improvements did not materialize in time to avert the final crash and the tall steel towers today are sad monuments of inventors' folly and shout their warning to inventors who would market inventions before they are ripe.[4]

[3]Susan J. Douglas suggests that many companies were perceived to have failed in their pursuit of wireless telephone systems, despite their many technical achievements, partially because "public expectations as shaped by the press had outdistanced actual achievement." (145) In addition, several wireless companies were indicted for stock promotion and manipulation schemes. Douglas quotes a December 1907 *World's Work* article:

> Wireless stocks, at large, are to be regarded by the public as little better than racetrack gambling. Most of these wireless telegraph stocks have been put through a long period of juggling, washing, manipulation, fraud, and malfeasance that should effectively remove them, for good and all, from the field of investment.

For more on this history, see Chapter Five, "Inventors as Entrepreneurs: Success and Failure in the Wireless Business," Susan J Douglas, *Inventing American Broadcasting, 1899-1922*, Johns Hopkins Studies in the History of Technology, (Baltimore: Johns Hopkins University Press, 1987).

[4]This is perhaps a reference to Lee de Forest, who incorporated the oscillating arc transmitter designed by Valdemar Poulsen into his early system for transmitting and receiving the voice with his Audion tube. After a falling out with Abraham White (infamous founder of the fraudulent United Wireless Telegraph Company), de Forest formed the Radio Telephone Company in 1907 around this new system. De Forest would later become a frequent contributor to the Gernsback publications. Ibid., , p. 171-2. Brian Regal, *Radio: The Life Story of a Technology*, (Greenwood, 2005), p. 35.



Are We Intelligent?

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THE members of the human race, who think themselves preeminent on this planet, have long since come to the conclusion that the human animal is a superior living being, quite distinct and far above all other living creatures.[1] This conclusion, so general that it seems to be inborn, has been handed down through the ages, mainly for the reason that we imagine all of our acts and thinking are based upon intelligence. For instance, we say that a dog or a cat cannot think and reason. They are, therefore, not endowed with intelligence. Or perhaps to put it in a better way, we think that an animal or insect cannot reason the way we do. Consequently, in our arrogance, we maintain that they are inferior to us.

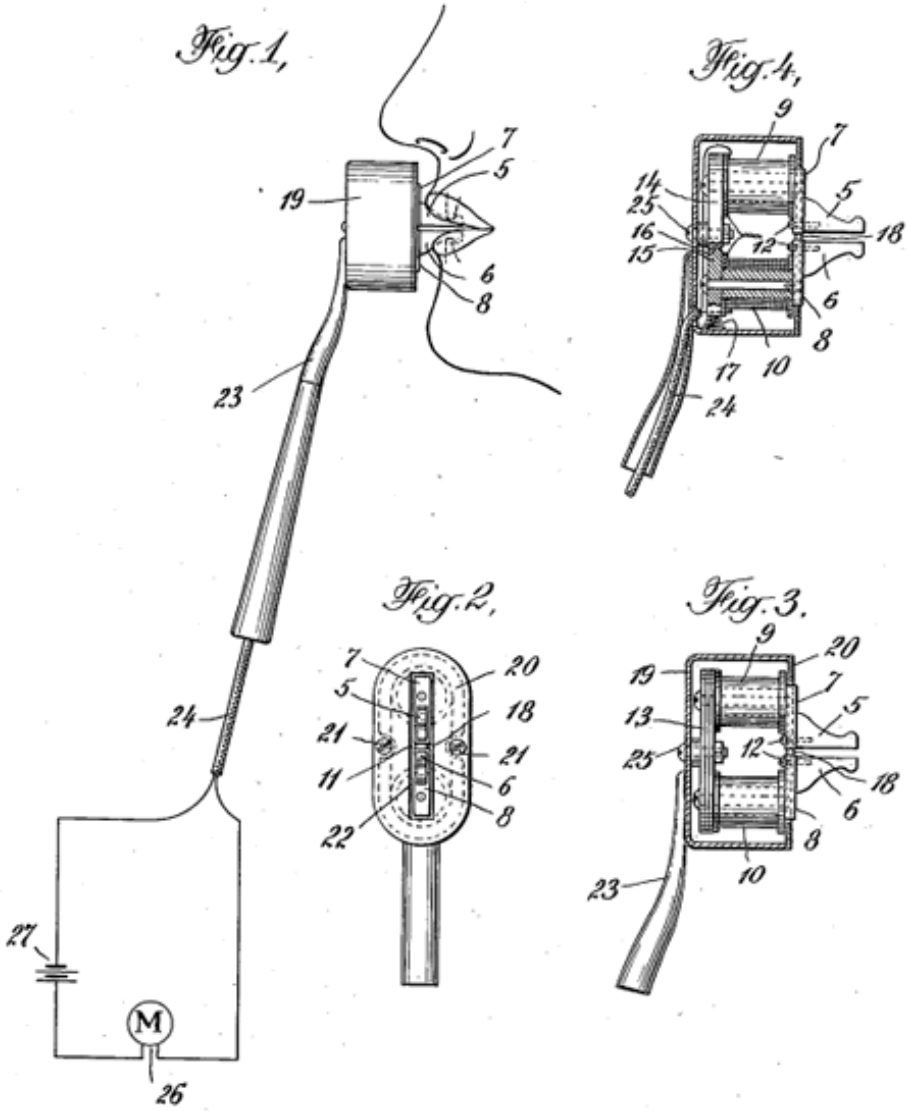
I BELIEVE THAT a patent in the shop is worth three in the patent office.

We have subdued nearly all of the larger animals to our will and have either turned them into domestic servants or else have nearly exterminated them.

But are these proofs that we are intelligent? Intelligence among other things should call for a thorough understanding of every subject. Every human being,

[1] Depicted on the cover of this issue of *Science and Invention* is Gernsback's osophone, a device for conveying audio through bone conduction. Gernsback was awarded a patent for the device's "sound vibrations transmitted directly to the osseous tissue of the body" the same year (US 1,521,187). Google Glass, the optical head-mounted display released in 2013, uses this same bone conduction technology for audio. Considering Gernsback's comparison of ant swarms to the possibility of the direct transmission of information via "thought waves," it seems that he has some sort of extra-sensory perception model of communication in mind here.

however, will admit that we comprehend practically nothing. We cannot fathom the simplest acts of the animals that we class beneath us. Our mentality is such that we cannot even interpret the simplest "thoughts" or instincts of a dog. But when we come to such creatures as insects, which have existed on this planet hundreds and thousands of years longer than we have, we are forced to admit the fact that certain species are far more intelligent than we are.



I BELIEVE

THAT invention and science are directly responsible for nearly all of our great industries today.

Take the ants for instance! With them the welfare of the nation is preeminent. Everything is subordinated to this thought; call it instinct if you wish. The ant does not require newspapers to get the news, as all news is transmitted instantaneously by a sort of "radio" system that reaches every ant in a fraction of a second.[2] Similar cases prevail with bees, as well as many other highly civilized insects.

Only because our senses are as poor as they are, do we find it necessary to use such artifices, as the printed page, railroads, the telephone, the telegraph, and nearly every other artifice that you can think of. You can imagine, perhaps, a million years hence, a central "radio" station broadcasting the news of the day, not in the spoken word, but in thought waves, so that everyone on the planet will get the news instantaneously. This does not mean intelligence only, but pictures and everything. In other words, intelligence will be transmitted by thought waves which bring into our minds the exact news or information transmitted. Naturally, if we ever reach this stage, the telephone and telegraph will be unnecessary because we will be able to transmit our thoughts direct to our friends in a less cumbersome way than we do today.[3] We need our railroads and transportation systems in the present era, simply because we have not learned to live as does the ant, for instance. We still must roam the planet in order to find the food and clothing we need. We may be sure that 100,000 years hence, such a situation will not prevail. We will be able to convert everything on the spot, for the simple reason that a piece of gold is exactly the same as a brick, and that a drop of water is the same as a piece of granite. Science knows that all kinds of matter are alike and that they appear differently only because their electrons are grouped in a different way. It will even be possible for us to make our own food without first planting the seed, which grows into the planet, which is eaten by the animal, so that we in turn may eat the animal. Synthetic food made from rocks found at our doors 100,000 years hence will be far more

[2]Jussi Parikka, writes on the long tradition of insects serving as metaphorical models for "modes of aesthetic, political, economic, and technological thought." *Insect Media: An Archaeology of Animals and Technology* (University of Minnesota Press, 2010), xiii. For more on how metaphors influence the design and reception of new media, see Georg Tholen, "Media Metaphorology: Irritations in the Epistemic Field of Media Studies," *South Atlantic Quarterly.* Summer 2002 101(3): 659-672

[3]This vision of thought transmission is not far from the one put forward today by critics and pundits who worry that mobile media's blurring of the boundaries between "online" and "real" life will lead to a literal dissolution of interpersonal space. See especially Nicholas Carr, *The Shallows: What the Internet Is Doing to Our Brains* (New York: W.W. Norton, 2010). For a refutation of the theory that mobile media entail a cognitive shift or drain, see Betsy Sparrow et al, "Google Effects on Memory: Cognitive Consequences of Having Information at Our Fingertips." *Science* 333, no. 6043 (August 5, 2011): 776–778.

palatable, far more nutritious, and less poisonous, than anything we eat today.

> **I BELIEVE**
>
> THAT the patent office in the future will be the mother of all great fortunes.

The next few centuries will bring about a great era of simplification. Everything we are doing now is too cumbersome. Everything will be freed from complexity. Our lives are entirely too crowded. Where we used to have countless wires and cables, slowly these are making way for radio, where no wires are are required. Railroads will be discontinued when aerial navigation comes into general use. Reading and studying of books is already on the wane due to the greater educational and entertaining force of the motion picture. The printed page is being supplanted by the picture everywhere.

In some quarters, it is thought that this is a sign of retrogression of the race. Nothing could be more erroneous. The scientific explanation is very simple. Our lives are crowded to such an extent, that it is impossible to read as much as our grandfathers could. We are constantly being speeded up mentally and if a picture can tell the story in two seconds why should one read a typed story which might occupy 10 or 15 minutes of one's time.[4] This, by the way, is the answer to the unprecedented popularity of the New SCIENCE AND INVENTION magazine.

[4]The material simplification Gernsback cites in the previous paragraph (from countless wires and cables to complete wirelessness) takes on a cognitive bearing here, where simplification is an evolutionary response to information overload. This passage evokes Whitehead's definition of technology: "Civilization advances by extending the number of important operations which we can perform without thinking of them," operations which today we might refer to as "high-level," after those computer languages whose simple, human-readable elements entail a high degree of complexity when compiled by the computer.