

AMERICA'S WIRELESS SPIES

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INTRODUCTION: WIRELESS IN THE SERVICE OF AMERICAN INTELLIGENCE AGENCIES

Since its earliest days, radio has had military and diplomatic significance, ranging from the tactical to the highest levels of national security. "Wireless," as it was called before broadcasting, was short for wireless telegraphy. Wireless messages were used for military as well as commercial purposes within a few years of the development of the art by Guglielmo Marconi and his 1901 transatlantic tests.

This article is about the beginnings of American radio spying and counterspying, the first U. S. SIGINT - signals intelligence. It focuses on the work of American radio amateur Charles Apgar, callsign 2MN, for the Secret Service in 1914-15 and on the U. S. Army Signal Corps on the Mexican border in 1916. Its purpose is to bring out previously unpublished materials about these episodes and to connect the technology of the time to its history, particularly Major Edwin Armstrong's regenerative circuit, early recording devices, and the first mobile wireless operations.

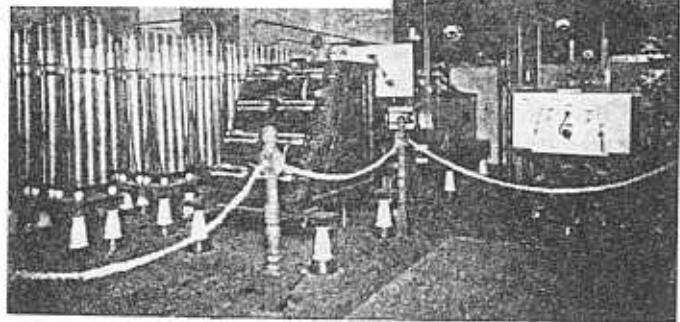
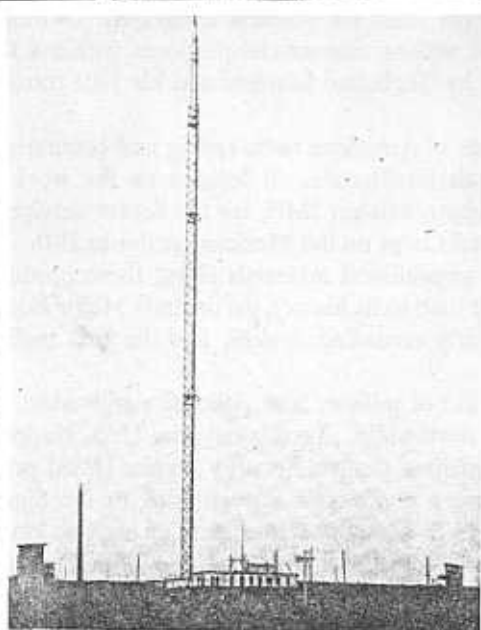
As soon as wireless carried traffic of military and political significance, its interception and decoding became worthwhile. To this day, the U. S. National Security Agency (NSA) and its companion Central Security Service (CSS) practice these black arts [1]. They have a continuous lineage back to the Signal Corps and the Secret Service of the U. S. Treasury Department as early as 1914.

Rexford M. Matlack, W3CFC, of AWA, published an article in 1976 [2] on the 1915 counterespionage adventures of Apgar, to whose success in recording spark signals much of this article is devoted. Matlack has given a slide and tape presentation to the AWA on Apgar's achievement. The latter died at his home in Westfield, NJ in 1950, at the age of 85. His obituary reports that he was an amateur astronomer [3]; Matlack has indicated that Apgar was a professional statistician. His amateur intelligence work started, however, in August 1914, on the eve of the Great War. In the several days just before the outbreak of hostilities, Apgar intercepted coded German wireless traffic of wartime significance from the Atlantic Communication Company (Telefunken) wireless station, WSL, at Sayville, Long Island, for the United States government.

Mr. Matlack's article reproduces a newspaper article datelined Westfield, August 1, 1934, indicating that Mr. Apgar had done wireless intercepts of German traffic from Sayville in the second week of August, 1914, before fighting commenced. Matlack says that a banker neighbor of Apgar's with military connections, one Colonel Parsons, put up half the money for two cylinder phonographs, to permit uninterrupted recordings off the air, and suggests that Col. Parsons may have played a role in acquainting Radio Inspector Lawrence J.



The Sayville Station



Top: operating room; center: building and tower; bottom: the transmitter.

Wireless Age, Sep. 1915



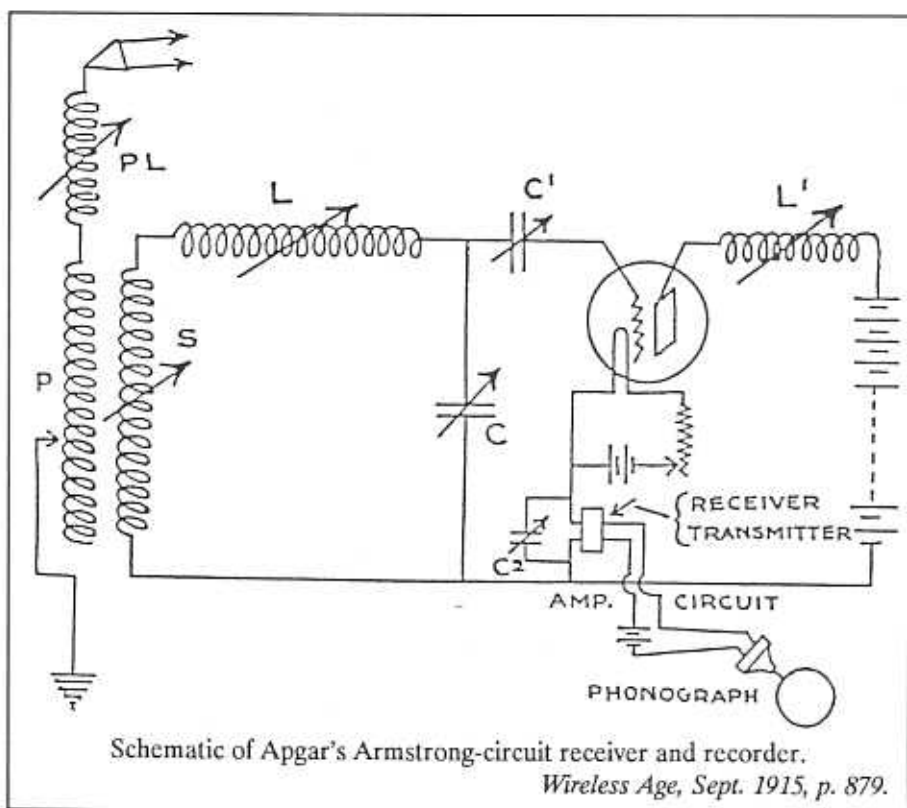
Charles Apgar at his receiver and recorder, after WW I.

Popular Radio, Nov. 1923

Krum with Apgar and thus instigating the 1915 recordings.

By 1915, both Apgar and WSL employed Armstrong's regenerative circuit with the still-new vacuum tubes in their receivers; indeed, WSL was one of the *first* commercial users. The virtues of this detector, patented October 6, 1914, led to celebrity: "overnight the feedback circuit became the sensation of the wireless world." [4]. According to Matlack, who had many discussions with Apgar's late son Lawrence, Edwin Armstrong and Charles Apgar may well have been acquainted inasmuch as active amateur radio operators of the day in the New York area tended to know one another, if only by spark QSOs.

At the start of the War, there was little precedent for the military use of wireless, or for its interception. In 1908 the Austrians monitored Italian military transmissions both on land and at sea with regard to a diplomatic crisis of the



day, Austria's annexation of Bosnia [5, p. 1]. The U. S. Navy itself had done its first testing of wireless communication at sea as early as 1903; the Japanese and Russians had used wireless in their 1905 war, listening to each other [6]. In 1911 the Austrians again intercepted military communications of the Italians, and the Turks as well, regarding their brushfire war in Libya [5, p. 1]. The French and Austrians had SIGINT agencies operating before the War; the Germans did not [5, p. 3, 7].

The first military use of wireless was as early as the Boer war in 1899-1900, but it failed for want of good antennas [8, 9]. The British Navy inherited the equipment (British Marconi and captured German Siemens gear), and used it successfully in the coastal blockade of 1900, the first successful military use [8, p. 33]. Camel-borne wireless sets went on the British Somaliland expedition of 1903 [8]. Back in England in 1903, Lodge-Muirhead gear traveled on maneuvers with one army corps, while Marconi equipment went with another [10, p. 175 n. 98]. In America in 1911, a commercial interception of a wireless press-related message in California resulted in a much publicized criminal charge and dismissal [11], sensitizing the wireless community to the issue of interception.

With the interceptions of Charles Apgar and the monitoring on the Texas border by the Signal Corps, the U. S. government entered the age of SIGINT. In a recorded 1934 NBC radio interview, Apgar tells what he did, how he did it, and how his recordings led to the U. S. seizure of WSL in July of 1915.

Americans thus matched the prewar intelligence work of English Marconi

Company engineers. In the days before the August 1914 commencement of hostilities, the Marconi staff, like Apgar, were using the vacuum tube in a receiver. They intercepted German naval traffic and provided it to the British Admiralty. This was the beginning of British SIGINT activity [12]. British amateur and Post Office stations also intercepted German naval messages for the Admiralty after the war began [8, pp. 57-58].

The infamous Zimmermann telegram of 1917, deciphered by Admiralty codebreakers, precipitated America's entry into the war against the Central Powers. Arthur Zimmermann, the German Foreign Minister, offered Mexico a return of the American Southwest if she would join the Central Powers and declare war on the United States. American outrage led to our own declaration of war in April of 1917 [7, p. 620; 13]. The year before, the U. S. had sent a "Punitive Expedition" into Mexico, under the command of General John J. "Black Jack" Pershing, to deal with Francisco "Pancho" Villa and his border raids. The extent to which Mexico was a potential German ally against the U. S., and Imperial Germany's involvement in the Mexican problems on the border, is not generally appreciated today.

What is so striking in retrospect is the continuing role that WSL played in wireless intrigue even after its seizure by the U. S. Navy in 1915 [13, pp. 97-100; 14, p. 806]. The Zimmermann telegram went through Sayville, and diplomatic messages arranging munitions for Mexican revolutionaries on the California and Texas borders in early 1917 most likely routed the same. There is however, no provenance known for these messages beyond a German report after WW II. Herr Flicke, late of the Radio Intercept Service, reports a cable of 17 March 1917 from Zimmermann to the ambassador in Mexico: "Find out what ammunition and weapons are desired and what Mexican harbor on the east or west coast a German ship would enter under a foreign flag. As far as possible, Mexico must procure arms from Japan and South America." Flicke then reports the wireless response to Germany on 24 March: "The vice-consul in Mazatlan reports that Villa, who is being supported by the Germans, is expecting three shiploads of ammunition to be landed between Mazatlan and Manzanillo. . ." [5, p. 56]. The landing of arms in Mexico by German U-boats is also reported as the subject of the conspiratorial activities of a glamorous German lady spy in the United States by the name of Maria de Victoria [15, pp. 197-198]. However, "every German wireless message was being grasped out of the ether and read in Room 40" of the British Admiralty [13, pp. 7-8], including whatever went via Nauen in Germany and WSL at Sayville.

Mexico was the prize Imperial Germany wanted to tie up American warpower at the southern border and thus to keep the U. S. out of the European war that Germany hoped to win by attrition. Wireless played an important role in the game.

AMERICA'S WIRELESS COUNTERSPY

Wireless, and wireless interception, thus necessarily played a significant part in our relationships with both Germany and Mexico. Key to both was WSL. The station was, to some extent, what would today be called a proprietary asset of an intelligence service, in this case Germany's. In 1915, WSL was suspected to

be transmitting to Germany, in coded form, information about allied shipping and other matters, in violation of the U. S. Neutrality Act [2, n. 6; 16, p. 16].

WSL transmissions were often very unusual, just a continuous sound rather than the usual Morse code dit-dah-dits. These transmissions were known to radiomen of the day as the "Nauen Buzz," after the main Telefunken station in Germany, call letters POZ. POZ operated with 100 kW on 6000 and then 12,000 meters, 50 kHz and 25 kHz respectively [17].

In normal service in 1915, WSL used a 1000-Hz quenched-gap spark transmitter operating at 35 kilowatts' power. It could radiate at wavelengths of 2000, 2500, 3000 or 4000 meters, with approximate frequencies of 150, 120, 100 or 75 kHz [17]. In 1915, WSL management claimed that it operated between 8000 and 10,000 meters, or 37 to 30 kHz, and other sources indicate that an alternator may have been the transmitter [19, 20]. The WSL quenched-gap transmitter had earlier, in 1909, been installed at POZ [17, p. 64]. The accompanying photograph of apparently the same transmitter at Sayville is from [18, p. 875].

Ed Sharpe of the California Historical Radio society (CHRS) notes that it has been suggested that the transmitter at Sayville was a Goldschmidt alternator, and therefore not the old Nauen 35-kW quenched gap, as later replaced by a Navy-installed 200-kW Federal arc [19]. Aitken reports the Sayville alternator to have been a comparable von Arco type rated at 100 kW, as of 1919 and possibly as early as 1914 [20, pp. 283, 326].

However, the photographs of the Nauen quenched gap of 1909 and the Sayville transmitter of 1915, as pictured then in connection with the seizure, closely match, as noted above. The transmitter as actually captured by Apgar on the surviving recording is clearly not an alternator; it sounds exactly like a 1000-Hz quenched gap as reproduced by the ARRL's George Grammer in his 1950s spark demonstration. Moreover, *Wireless Age* reported in 1915 [14] that the new Sayville transmitter went into service after the U. S. takeover of the station. Thorn Mayes [21] also concluded that Apgar recorded the quenched-gap transmitter.

Charles Apgar was a leading amateur radio operator of the day, with an interest in audio recording. He had recorded WSL as early as 1913, on an Edison disk recorder, and presented the disks to the station [18, p. 877]. The accompanying photograph of Apgar [22] shows him at his radio-receiving and cylinder-recording apparatus. Apgar described his apparatus and procedures in *Wireless Age* magazine at the time [23]. The schematic diagram of his receiver, which he described as an "Armstrong circuit [regenerative] valve detector," is from this article. According to a brief history in the museum of his home town, he is reported [24] to have called his receiving setup an "ampliphone" circuit. Per Matlack, Apgar used a \$5.50 regular-filament McCandless audion. The acoustic coupling of the wireless receiver to the phonograph (a microphone amplifier) may derive from a 1911 article in *Modern Electrics* [25].

The U. S. government became interested in WSL's transmissions and the Nauen Buzz partly as a result of some investigative "yellow journalism" in early 1915 [16]. The Navy put observers into the station to determine if any activity violated the Neutrality Act. A copy of a Navy report on the station's operation in April 1915 [26] is included in this article.

Developing the first "data burst" technology, the Telefunken stations used an

No.

United States Navy Yard,

NEW YORK, N.Y.

Telefunken Radio Station.

April 4, 1915

Sayville N.Y.

From; Lieut. (JG) F. Cogswell.
To; Commandant Navy Yard New York N.Y.

Subject; Operations at the Sayville N.Y. Radio Station.

I respectfully state that during the preceding twenty four hours, nothing has occurred of an unneutral nature as per Presidential proclamation, dated August 5, 1914.

National Archives, New York branch.

early wire recorder, the Telegraphone, at fast and slow speeds. The stations transmitted their traffic at too high a rate to be copied by ear, reportedly by speeding up the rate of a transmitting Telegraphone keying the transmitter, but more likely by using available high-speed paper-tape keying equipment. The receiving Telegraphone recorded at the fast rate, but played back at normal speed. Apgar's Dictograph slowed down while he was replaying a transmission, and he realized it could be copied in this fashion as readable Morse code. He provided some 175 four- and six-inch wax cylinder recordings of the WSL-POZ transmissions to the Secret Service.

There is both contemporary and recent inference that WSL used a Telegraphone to key the transmitter at high speed. The evidence for this, however, is secondary or derivative. The strongest indication is "By 1922, the government was willing to admit that there had been at least one Telegraphone on which messages had been recorded in Morse code at standard speed. The tape [sic] was played at high speed, re-recorded in Germany, and played back at the original recording speed. There was no code to be broken after all" [27, pp. 42 and 45]. "The Sayville station * * * utilized * * * automatic transmission systems which used paper tape and piano wire (the latter system, in fact, was an American Telegraphone)." [28, pp. 27-28]. Kncitel, in his thorough article on the Sayville station [16, pp. 16, 18], says: "Sayville's transmissions [after routine traffic] became a strange chatter. This was the sound made by the telegraphone."

On the other hand, some knowledgeable people (including Bruce Kelley of AWA and Paul Bourbin and Ed Sharpe of CHRS) doubt that the Telegraphone wire recorder could key a powerful spark transmitter, by modulation or interruption. Signals detected off the air could surely be recorded as audio on a Telegraphone, and replayed more slowly, but there does not seem to have been a way to use the Telegraphone to transmit speeded-up copy. Sharpe points out

that paper-tape keying was already very fast, citing Dr. Jonathan Zenneck. Zenneck was the station engineer at Sayville; his book [29] reports speeds up to 300 words per minute by paper tape keying, which must have been a buzz indeed. A speed of 100 WPM was common in Europe. In San Francisco, de Forest keyed an arc at 90 WPM with paper tape and received the result in Los Angeles with a Telegraphone recording the output of a tikker detector and audion amplifier [30]. De Forest's then-employer, Federal Telegraph, was connected with the Telegraphone's inventor, Valdemar Poulsen of Denmark, hence de Forest's access to the rare machine. Sharpe also points to an article about Sayville [31, p. 209] describing 24-contact keying relays transmitting at 150 WPM, keyed by perforated tape.

It is likely that Sayville used its Telegraphone to record the Nauen Buzz transmitted from Germany, and used paper-tape keying to transmit when it chose to send faster than monitors could copy by ear. Telefunken could well have inferred that its transmissions were monitored (as they were, by the Navy, at NAA, New York, and Fire Island, L. I.) Telefunken could also assume (until Apgar, anyway) that no such device as the Telegraphone was available, at least on the East Coast, to the monitors to slow down its transmissions to copy and decipher or decode them. The Telegraphone was an important secret communications instrument to Imperial Germany, found even on her submarines [27, p. 45]. Used in a submarine, the Telegraphone would permit large amounts of high-speed data to be acquired quickly during a short period on the surface.

So many years later, however, it is simply not known what steps were taken to disguise the true mode of operation of the Sayville station.

With Apgar's recordings on hand, the Government seized WSL on July 6, 1915, for violation of the Neutrality Act. Surprisingly enough, Telefunken had advance notice and had removed equipment, probably the Telegraphone, and presumably evidence, the night before [16]. WSL is presumed to have been sending information about Allied shipping to German naval forces for relay to submarines. This was the prosecution's charge against Dr. Zenneck at his trial. Presumably WSL had been the source of the information enabling a U-boat to sink the RMS Lusitania in May 1915 [16]. On the other hand, the Lusitania is now known (as a result of a secret cargo manifest reportedly found in President Roosevelt's desk) to have been carrying a cargo of munitions for England, also in violation of the Neutrality Act. After the Navy seized WSL, sinkings by U-boats declined substantially, and Zenneck is reported [24] to have been convicted on proof that U-boats picked up messages from WSL. Comparison of the traffic as filed at the station supervised by the Navy censors with the traffic as recorded by Apgar is reported there to have disclosed at least sufficient discrepancies to justify seizure. As mentioned before, at least some submarines carried Telegraphones and could have copied the "Buzz" quickly on the surface, then submerged for a more leisurely analysis of target data.

Apgar got considerable good press for his work as America's first Radio Counterspy, within days of the seizure of the station. His work was later hailed as "the most valuable service ever rendered by a radio operator to this country" [32]. However, doubt has occasionally been expressed that even the Secret Service could have quickly enough penetrated any code or cipher used by WSL. All the evidence nonetheless points to Apgar's work as being instrumental in dis-

closing non-neutral and violative transmissions of WSL to POZ [31, p. 210]. Matlack is definitive that Apgar's work exposed non-neutral activity.

On the other hand, intelligence agencies love cover stories, red herrings, and disinformation. What it was, exactly, in the WSL transmissions that violated the neutrality laws is not clear. It has, however, since become known that an Allied spy appearing loyal to Germany had been placed in the station itself and helped to operate it. A spymaster named Emanuel Voska (code-named "Victor"), working for the British, had placed agents throughout Germany's assets in the U. S. in 1915: "one was an operator at the Sayville wireless station on Long Island, which was used by the Germans for communications overseas." [13, p. 71]. Voska wrote a book of his own after the war; a recent history of American espionage [15, pp. 188 ff.] details his exploits, including the plant at Sayville.

At this remove, it is not known if WSL was seized *because of* violations of the neutrality laws or *to prevent* violations. Apgar reports in the 1934 interview that Radio Inspector Krum assured him that his work was instrumental to the seizure. Yet perhaps this was so because it provided a likely story for a preemptive and illegal interference with a legitimate commercial communication facility. Exactly who did what to whom, as usual, is lost in what the late James Jesus Angleton, late of the CIA as its Chief of Counterintelligence, once called the "wilderness of mirrors."

WSL continued in operation under the aegis of the Navy, soon with the call letters NDD [33]. A copy of a July 28, 1915, Navy memorandum [26] outlining the procedures is reproduced with this article. The station continued to carry supposedly commercial traffic to Germany, at least until the declaration of war intervened in April 1917 [14, pp. 807 ff.; 20, p. 285].

It is one of the ironies of history that the Navy thus oversaw the transmission of the hostile Zimmermann telegram from Germany to the German Ambassador in Mexico City via Sayville on January 16, 1917. According to the German Flicke, the best source [5, pp. 48 ff.], "This telegram was so important that * * * several routes were chosen * * * [t]he first led via radiotelegraphy from Nauen to Sayville on Long Island for forwarding to the German Ambassador * * * in Mexico." The story from the German perspective is that the Foreign Office also snookered the American Ambassador in Berlin into conveying an enciphered copy of the telegram to the German Ambassador in Washington. The British Wireless Intercept Service in MI6 and Admiralty Room 40 partially decoded the Nauen-to-Sayville radiotelegram, and fully decoded the text sent via the American Ambassador. The British were delighted to hand it over to the Americans, claiming they stole it from the telegraph office in Mexico City [8, pp. 88 ff.; 13].

Apgar's work protecting the U. S. ether in 1915 has its exact analog in protection of American computer networks (known as "cyberspace") by another gifted amateur, Clifford Stoll, in 1987. He intercepted and eventually effectuated the capture of a West German computer hacker and KGB agent who had penetrated the U. S. military and civilian networks [34].

AMERICA'S FIRST WIRELESS SPIES

At the same time in early 1917, Germany supported and encouraged Villa and Cantu, another Chicano revolutionary said to be operating in Southern Califor-

Copy to Mr. Collins

#2396-ID/MA

#161783-855W

NAVY DEPARTMENT,
BUREAU OF STEAM ENGINEERING,
WASHINGTON, D.C.

July 28, 1915.

From: Bureau of Steam Engineering,
To: Commandant, Navy Yard, New York

SUBJECT: Radio Station Sayville placed under Navy Yard, New York,
for maintenance.

1. In accordance with paragraph #103 U.S. Naval Instructions the Radio Station, Sayville, is placed under the cognizance of the Commandant, Navy Yard, New York, for supply, while the Sayville station is under the control of the U.S. Government.

2. This includes only extra supply of material necessary, due to the addition of Navy personnel at Sayville.

3. The Officer-in-Charge will, when the station is eventually turned over to its owners, return all Navy material to New York.

4. The owners are maintaining the station in operating condition.
Griffin

#560-5 Commandant's office July 29/15. To: GSK For inf & return.
Upham By direction GEB

1401-20 2nd Indorsement Mc D/CFD-AS Aug.3/15.

From: Eng.Off, To: Comdt Via: A.O. GSK.

1. Returned; contents noted.

2. Job order 3 S 312/15 has been issued.

R.B.Dungan, Acting

B-150 (7-5-F) 4th Indorsement Aug.5/15. From:AO To:Comdt via GSK

1. Returned; contents noted.

#2596 ID/MA

5th endorsement,

Navy Yard, New York,
August 6, 1915.

From: General Storekeeper.

To: Commandant.

1. Returned; contents noted.

G.C.TOBEX

National Archives, New York branch.

nia. British MI6 and Room 40 intercepted and decoded German diplomatic radio traffic arranging shipments of munitions for the revolutionaries, who also continued to threaten the U. S. border. As noted previously, a reliable German wireless history reports a wireless telegram on March 24, 1917 to Germany dealing with provision of arms to the revolutionaries.

In the American military operations into Mexico of the prior year, wireless and wireless spying played crucial roles. The Signal Corps and the Military Intelligence Division became America's first Wireless Spies. They operated out of horse-drawn wagons and motor trucks. "Radio Tractors" of two types were commissioned in 1914 [35]. Their spark transmitters were of either one or two kilowatts in power, for ranges up to 300 miles. Wireless was used extensively to supplement Army single-wire telegraph circuits, and to report back to the

United States. (A romantic fascination with border intrigue persisted for some time; see, for example, The Radio Boys on the Mexican Border [36].)

As early as the winter of 1914-15, Germany had aggravated U. S. - Mexican friction by planting rumors of a hostile Japanese army in Mexico, using the wireless of the imperial cruiser Geier while in port in Pearl Harbor [13, p. 55]. There was some physical evidence of an armed Japanese reconnaissance into Arizona [15, p. 181]. German wireless operators were running Mexico's main receiving station [13, p. 66]. Germany had a secret wireless station in Mexico as late as 1918, ferreted out by an American spy in April [37, p. 123]. The press frequently reported German spy stations as well, and noted the capture of spy Max Wax with his well engineered receiver in 1917. A picture of Herr Wax and his radio [38] accompanies this article. Robert Johnson of CHRS has researched press reports from 1917 of German wireless activity in Mexico at the San Jose (CA) Mercury-News, finding such stories as "German Officers, Many in Tijuana; Three Wireless Plants Operated by Teutonic Army Men in Lower California" (dateline San Diego, March 2); "Mexican Wireless Reaches Germany" (Washington, March 8); "Secret Wireless on German Vessel" (Norfolk, VA, March 9); and "German Spies Are Rounded Up By U. S." (New York, April 7). The latter reports: "Until a few weeks ago a wireless receiving plant of the most expensive type was operated on the roof of [a] Fifth Avenue home." This set was operated by the butler, of course.

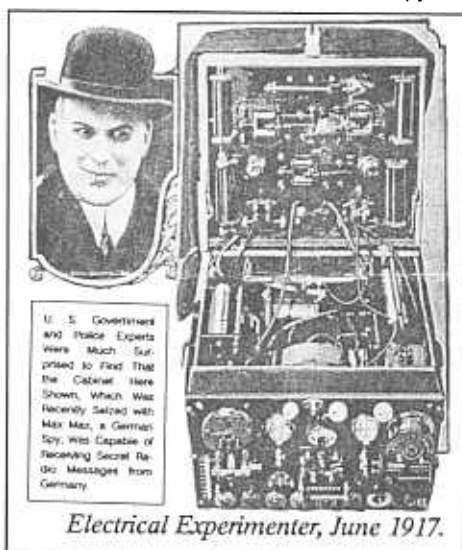
One can detect a certain amount of war hysteria in these reports. On the other hand, Telefunken engineers did escape Sayville and set up a wireless station at Chapultepec to communicate with Nauen [20, p. 286, n. 50]. Haraden Pratt, working for the Navy in 1917, triangulated this station from San Diego, Phoenix, and El Paso as being located in Mexico City. He reports it [39] as a 100-kW spark-gap set smuggled in from Nauen.

With whatever German support or connivance [37, p. 93], "Pancho" Villa raided Columbus, New Mexico, killing 17 Americans, on March 9, 1916. General "Black Jack" Pershing, already at the Texas border, invaded Mexico on March 18. Two days after the incursion by Pershing "there arrived the first direct news by wireless from our Army in Mexico, telling the whereabouts of the bandits who had perpetrated the massacre" [35, p. 751].

The report of Wireless Age that "Villa was located by radio" could have meant that his approximate location was reported out of Mexico, or that the Signal Corps located him by wireless interception. Villa, however, did not have wireless equipment. His hostile fellow revolutionary, Venustiano "Don Venus" Carranza, was the most recent government, and his forces did use wireless. Looking for Villa, the Signal Corps radio tractors monitored the Carranzistas, in America's first military use of technical intelligence [40, p. 13]. (Carranza retains sufficient respect in present-day Mexico to appear on the obverse of the 1984 100-peso coin, looking like a woolly-bearded Teddy Roosevelt.)

The Signal Corps and the Military Intelligence Division also set up monitoring stations along the border as early as 1916. They wanted to listen to German activity as much as to Mexican. The accompanying photo of the receivers in one such station is from 1918 [40, p. 23]. The program of interception was very successful, although the product has been declassified only recently, 70 years later. The early Mexican intercepts were declassified as a result of New Mexico State

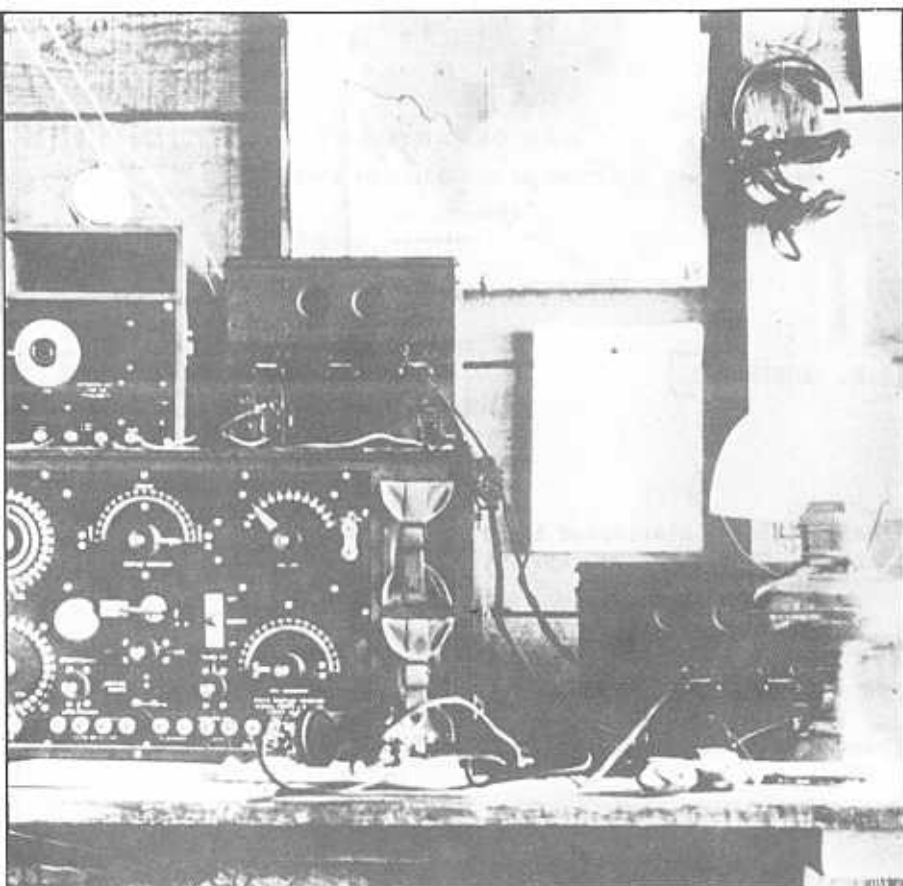
Wireless Set of Max Wax, a German Spy



University professor Ray Sadler's request under the Freedom of Information Act in researching his book on border history [37].

The Signal Corps receiver at the monitoring station is in the style of National Electric Supply Company (NESCO) equipment, using a horizontal, external cat-whisker galena or silicon detector. Will Jensby of CHRS identified it as a "Cohen Type A" Signal Corps Static Coupled Receiver. A similar set is pictured in [Vintage Radio](#) [41]. The white circle to the left of the detector arm that looks like tube glow through a porthole is actually a buzzer. The receiver also appears to be accompanied by possibly two, two-tube audio amplifiers (the boxes with dark portholes). The receiver's nomenclature is STATIC COUPLED RECEIVER/SIGNAL CORPS U. S. ARMY/ . . . APRIL 26, 1916. It has a rotary switch for SHORT WAVES, MEDIUM WAVES and LONG WAVES just beneath the detector arm, a vertical white on-off switch for BUZZER, and a half-circle face for COUPLING CONDENSER just above the detector arm, along with the rotary inductance taps for LARGE PRI. COIL and SMALL PRI. COIL.

The Signal Corps equipment was certainly as good as or better than the Mexicans' receivers, which had a night range of half a continent. So reported *Wireless Age* magazine in 1915. A Carranza opponent had two portable wireless sets in Merida, and established a fixed station. His transmitting power was 1.5 kW. He noted "I was able to receive 800 miles during the daytime and 1500 miles at night" [42]. Pershing's forces used the mobile Radio Tractors to listen for word of Villa from the Carranzistas [40, p. 13]. Accompanying this article are reproductions of two Mexican intercepts [43] from the Signal Corps Radio Tractors still in use at Pecos and McAllen, Texas, in May 1919. A brief moving picture, circa 1918, of such a Radio Tractor in operation, probably in France, with about a seven-foot square multiwire loop antenna on top, appears in the PBS television series on U. S. intelligence aired recently. (The Army's new Bradley Fighting Vehicle reportedly will also be fitted out as a modern-day Radio Tractor.) As identified by Matlack, the upper Radio Tractor pictured is a Jeffrey four-wheel-drive vehicle in the style of a Dodge truck. The second vehicle, shown in a field



Army photo of Mexican Border intercept station, 1918.

Courtesy of Cloak and Dagger Publications, reproduced by permission.

in Texas, is a solid-tire White truck manufactured in Cleveland.

For its own communications as well as intercepts, the Punitive Expedition in 1916 also used horse-drawn Radio Wagons, each with two carriages, on the model of the caisson and limber of the field artillery. Such radio wagons are depicted under construction, in photos from the collection of CHRS founder Norm Berge. The contemporary legend on the photos is "Radio Wagon Set 2 KW 500 [Hz] Instrument cart under construction 2-1-18." One carriage held the generator unit and the other the radio equipment. A *Wireless Age* cover photo [35] shows a Signal Corps radioman operating just such a receiver and transmitter at the rear of an Instrument Cart.

The U. S. Army bought its first radio wagons from Telefunken in 1910, two-kilowatt, 500-Hz quenched-gap transmitters operating between 500 and 2000 meters [44]. In 1913, the Army had purchased British Marconi wireless-telegraphy cart stations of the "F" type with a power of 1.5 kW and a 200-mile range. (See the "New Wireless Pioneers" reprint of a 1913 item and photo from *The Weekly Marconigram* produced for a recent Army exhibit, described in [45].) Marconi had had a steam-powered wireless truck operating as early as 1900, with

WAR DEPARTMENT
OFFICE OF THE CHIEF OF STAFF
WASHINGTON

[C.B. 10898 W.D.]

[65-33D 2242]

May 21st, 1919.

[Radio message intercepted by Tractor Unit No. 33,
McAllan, Texas, May 2d, 1919.]

From Unknown

To Unknown

[Message with cipher numerals 28 21 32 31 24 13 etc.]

[DECIPHERMENT:]

-----vinieron mas cuatrocientos hombres-----ayer partido
llamado socialismo Yucatan recorieron calles lanzando
injurias y gritos susersivos contra este gobierno. Poli-
cia mantuvose prudente sin interrumpir manifestasion.
A continuacion reunieronse meeting en balcones hotel
frente plaza principal. Hable coronel---orden luego
Santiago Hernandez injuriando personalidades partido
contrario invitando publico derrocar bandidos ocupan
gobierno etc.

TRANSLATION:

-----more than 400 men arrived----yesterday of the so-called
Socialist party. They paraded thru the streets shouting
insults and indecent things against this government. The police
were prudent and did not interfere with the manifestations.
The party afterwards held a meeting and from the balcony of the
hotel opposite the main square colonel spoke---Immediately there-
after Santiago Hernandez insulted the chief members of the oppo-
sition parties, inviting thepublic to oust the bandits who at
present hold the government etc.

National Archives, #RG457.

WAR DEPARTMENT
OFFICE OF THE CHIEF OF STAFF
WASHINGTON

[C.B. 10900 W.D.]

[6543D 2470]

May 21st, 1919.

[Radio message intercepted by Tractor Unit No. 43,
Pecos, Texas, May 2d, 1919.]

From J. Mucel

To Unknown

[Message with Cipher Numerals 10 31 24 33 20 etc.]

Memo, pl.

[DECIPHERMENT:]

---que conducto debe observarse con elementos Yucatecos algunas armadas que en mas vengan a verificar hechos como el presente policia recogio distintivos y tarjetas identificacion son da listas Yucatecos agradecerle tambien de sirva ordenar se recuerde a la guarnicion el contenido de los articulos quinientos cuarenta y cinco, un mil trece, un mil diecisiete y un mil dieciocho de la ordenanza general del ejercito y ciento quince y ciento veintinueve constitucion general republica.

[On May 2, J. Mucel, location unknown, sent following to unknown address.] TRANSLATION:

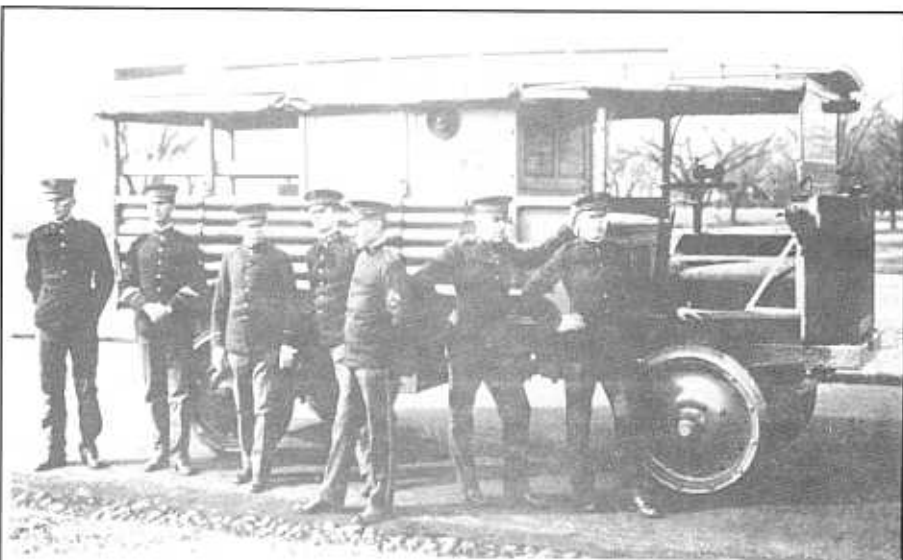
---[that action should I take with Yucatanians] Some of them are armed and might gather in large crowds and commit acts like the one described. Police has taken up the badges and identification cards with lists of Yucatanians. I will be obliged if you will issue orders to have the attention of the garrison called to the contents of articles 540, 1013, 1017 and 1018 of the general army code and 115 and 129 of the constitution of the republic.]

J. Mucel.

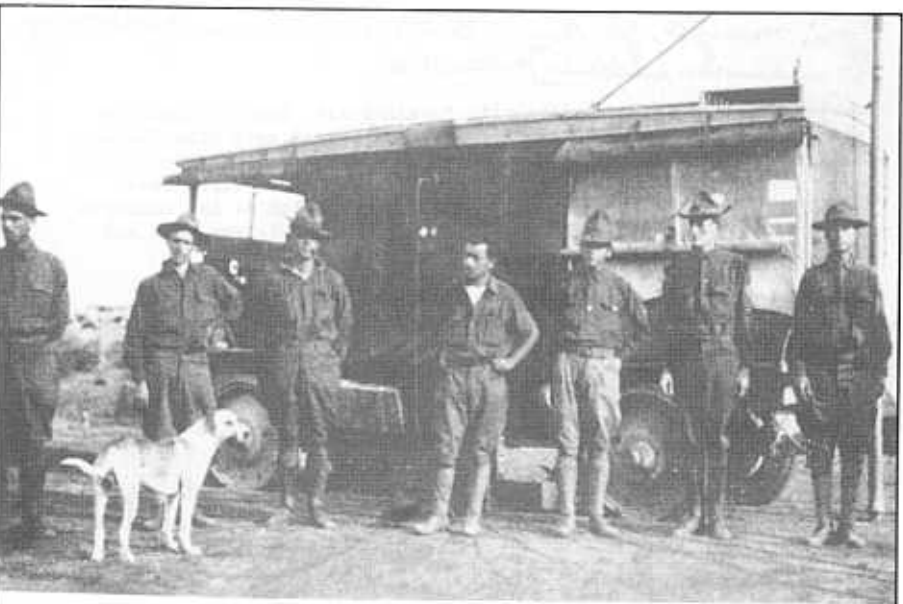
National Archives, #RG457.

a 20-mile range. (This truck is illustrated and described on a 1901 color English cigarette card, Lambert & Butler Wireless Telegraphy set, Card No. 9, in the author's collection.)

The receiver in the Signal Corps radio wagon is a crystal detector with a catswhisker on a horizontal arm. The labels on the rotary inductance taps across the top of the set read (left to right): LARGE PR COIL, SMALL PR COIL and SEC COIL. The two half-circle dials on the far left and far right read COUPLING CONDENSER and SECONDARY CONDENSER respectively. The catswhisker arm is horizontal between two white vertical lever switches, the left one reading BUZZER. There are two rotary switches beneath the white vertical switches.

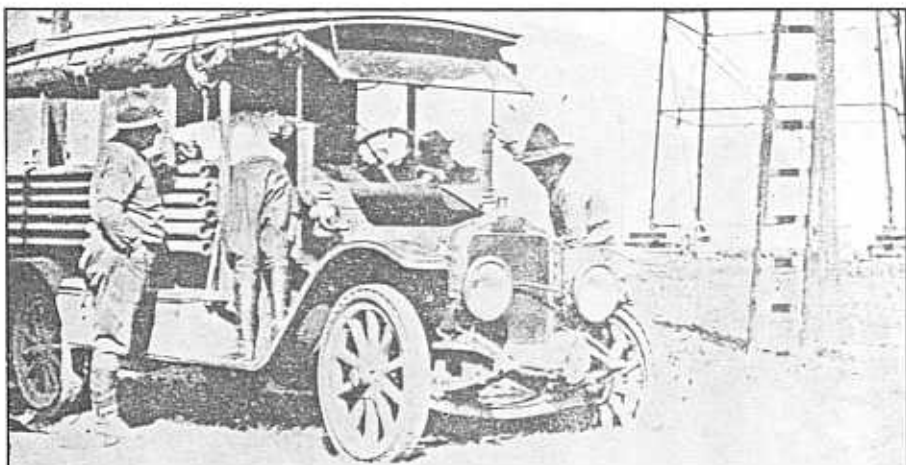


"Radio Tractor" at Ft. Myer, Virginia, 1914 Army photo.



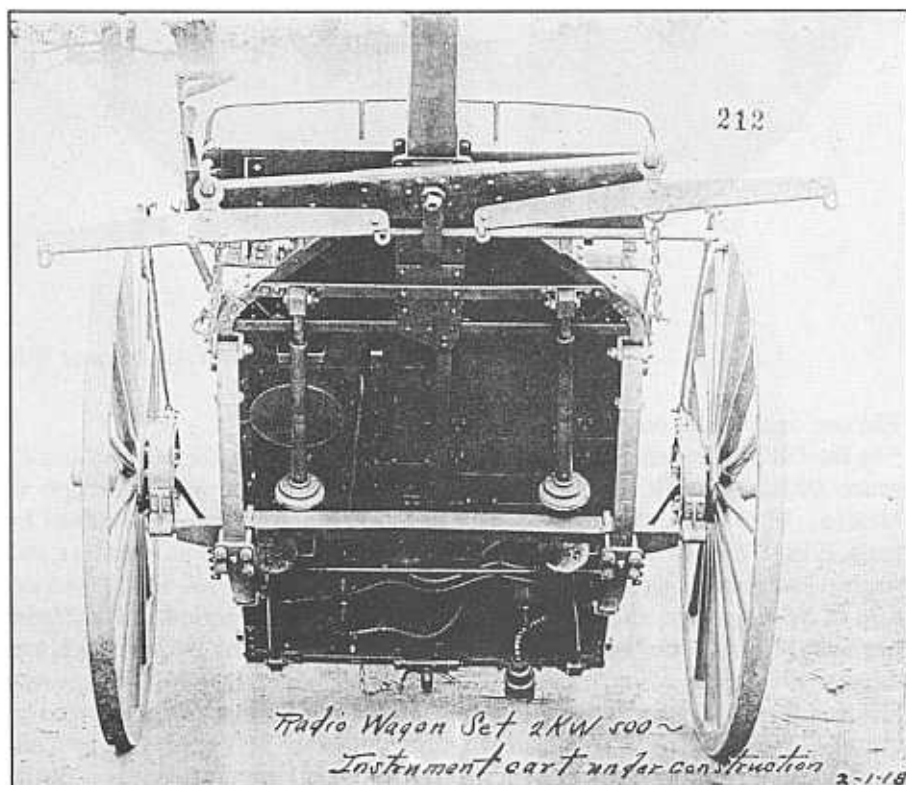
"Radio Tractor" in Mexico, 1916 Army photo.

Courtesy Cloak and Dagger Publications, used by permission.



Another radio truck being equipped for use in Mexico.

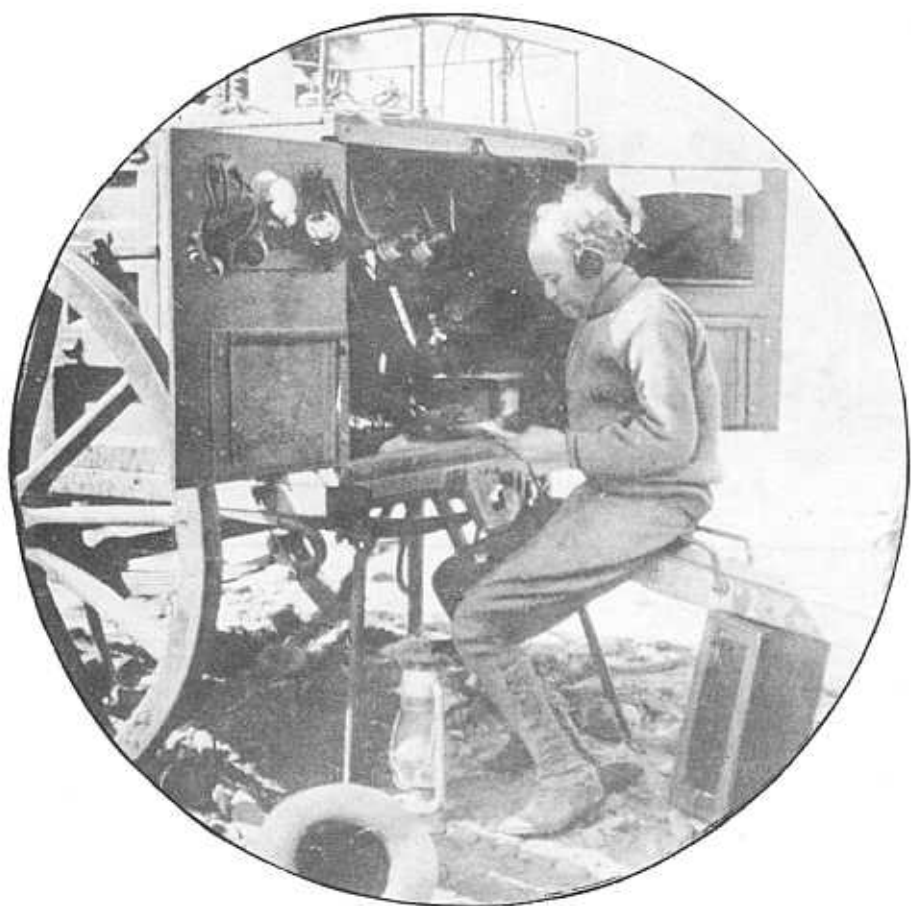
Wireless Age, Aug. 1916, p. 756



*Radio Wagon Set 2KW 500~
Instrument cart under construction 2-1-18*

Trailer set being built.

Photo: Collection of Norm Berge.

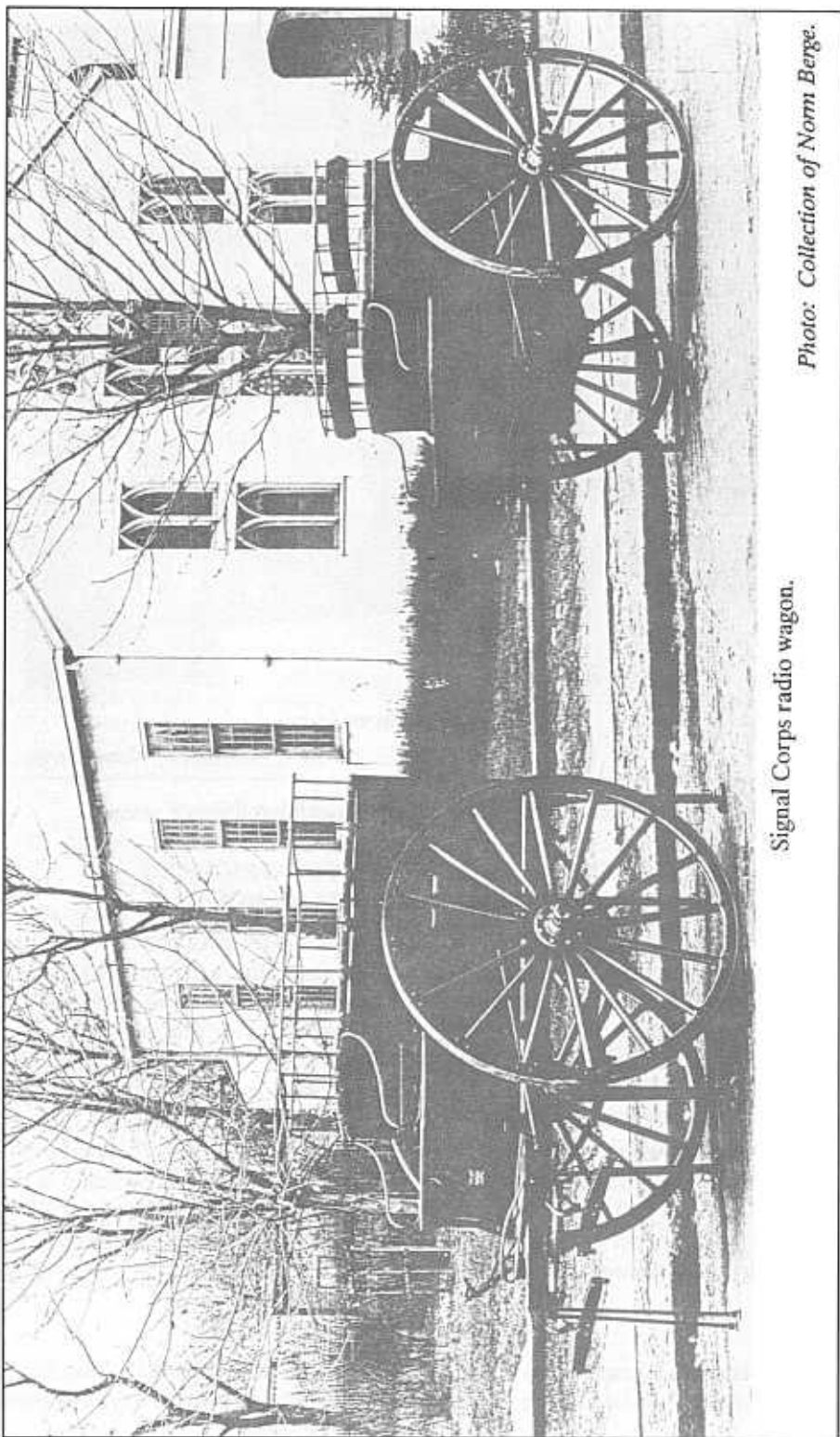


Trailer set in use in Mexico.

Wireless Age, August 1916

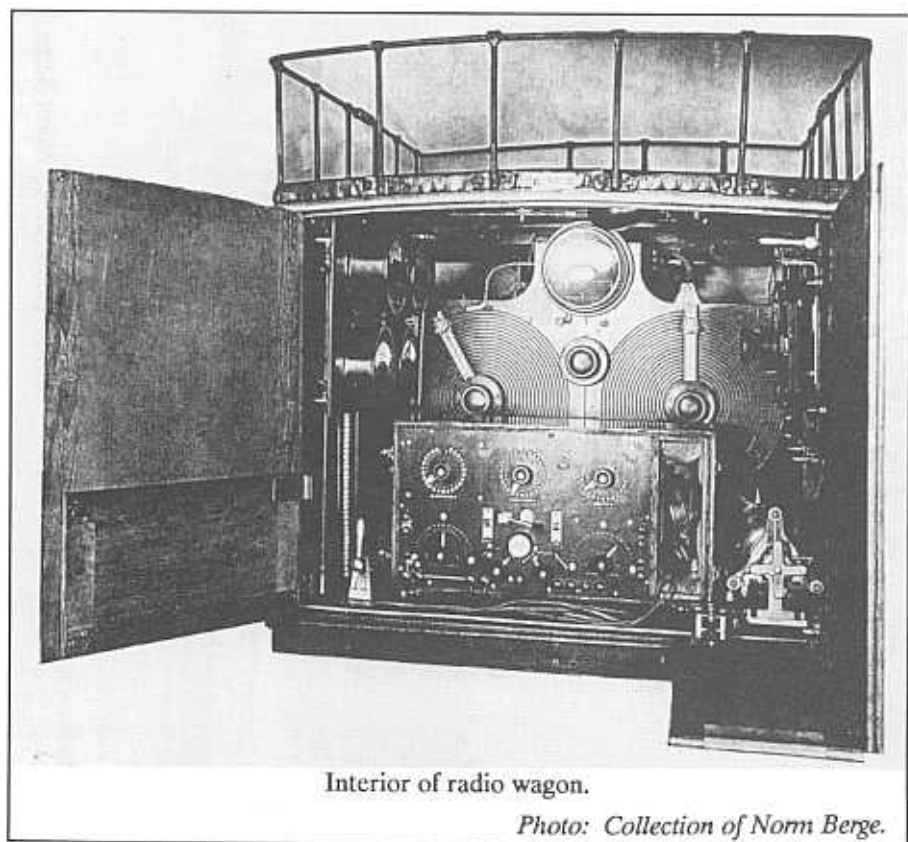
The one on the right reads SECONDARY TUNED/UNTUNED.

In the fall of 1916, after Villa's raid and the U. S. response, the Military Intelligence Division and the Signal Corps were routinely doing radio intercepts in Mexico. They had established a chain of about a dozen intercept stations by early 1918. Stations were located at Fort Bliss and both Radio Tractors and wagons had gone along with Pershing's forces, according to Prof. Sadler. An article in *Wireless Age* also notes, with regard to the 1916 period: "The Signal Corps at Marfa [Texas] had a small unofficial radio receiving station which was capable of receiving from Juarez, in Mexico" [46]. George Sterling has reported [47] that these intercept stations also appeared at Las Cruces, NM (operated by Clarence Pfeifer, later W2FG) and at Ft. Sam Houston, TX (operated by Conrad Sedlack). Mr. Sedlack intercepted part of the Germany-to-Mexico traffic relating to Mexican participation in WW I, and also Japanese Kana code traffic. By October 1918, the U. S. had a transatlantic intercept station operating in Maine listening to Europe [1, p. 5], with Mr. Pfeifer as one of the operators.



Signal Corps radio wagon.

Photo: Collection of Norm Berge.



Interior of radio wagon.

Photo: Collection of Norm Berge.

Radio intercept capability had entered the American intelligence arsenal.

CONCLUSION: FROM WIRELESS INTRIGUE TO MODERN SIGNALS INTELLIGENCE

Before and during the First World War, wireless intercepts played an important role in informing America about the intentions and activities of Imperial Germany as a European belligerent with hostile intent, and about Mexican factions as potential German allies. Every art advances other arts and, of course, every weapon leads to a defense against it. Wireless was no different in its early days. As soon as wireless was put to use against American interests as a tool of espionage in 1915, Charles Apgar exposed it: America's first Wireless Counter-spy. As soon as wireless appeared useful to American forces in gathering intelligence, the Signal Corps and the Military Intelligence Division employed it, in 1916: America's first Wireless Spies. The resources and procedures of the NSA, and the intercept services of the CSS and the armed services, all derive from these early and effective American efforts.

NOTES AND SOURCES

This article in an early form was a companion paper to the CHRS Radio News Audio Journal Special Edition of November 1988, "The 1915 WSL Sayville Spark

Transmissions and George Grammer W1DF Spark Demonstration" and of March, 1989, "NBC Broadcast Interview with Charles Apgar, 1934, About Recording the Sayville Station in 1915." Copies of both these tapes, containing the only known recordings of pre-WW I spark transmitters in service (WSL and WHD) are available from CHRS through the author (327 Filbert Steps, San Francisco, CA 94133). ["WHD" sic; WHT]

The text of the recorded 1915 WSL transmission is "R84 TEMP 54 NORTHWEST CLEAR 34 MILES ?? BAR 29R84 TEMP 54 NORTHWEST CLEA" (per Dick Dillman, N6NV). The text of the 1915 WHD transmission is "MNY K BT INVESTIGATION SHOWS MISSING BANK CLERK HENRY BRADLEY MERCHANTS NATL BANK SHORT HUNDRED FIFTY THOUSAND PLAYED RACES PLUNGED STOX" (per James Maxwell, W6CF). Radio station WHD is said in the interview to have been owned by the New York Herald newspaper. As early as 1910 the Herald operated a 2-kW Fessenden-system transmitter on 945 meters with a 1000-mile range, using the call OHX [48]. (The call letters WHD are, however, listed to the New York City Fire Department in the 1913 U. S. Government Callbook, Supp. #2, OOTC Ed., and much later to the New York Times.) ["WHD" sic; WHT]

The recordings reproduced by CHRS were located in the AWA Museum archives by curator Bruce Kelley, who took the Apgar WSL recording off a 1934 transcription of the broadcast interview. The spark signals had been acoustically transferred from Apgar's original Edison Dictagraph wax cylinders to the recording of the interview. The 1934 interview, including the WSL-WHD recordings from 1915, comes to CHRS most directly from a tape courtesy of Robert Angus. Part of it appeared as a tipped-in phonograph-record "sound sheet" accompanying [28, p. 32].

The original interview by NBC announcer George Hicks was broadcast on December 27, 1934, on NBC's station WJZ in New York, on the occasion of the opening of its museum of radio (since dispersed). It was recorded on four sides of two vertically cut aluminum disks. Lawrence Apgar gave the disks to Rexford Matlack, who presented the recordings of the interview to the AWA Museum in 1976 [49] along with a master tape he had made of them. CHRS continues its quest for off-the-air recordings of spark transmitters. Inquiries continue as to the whereabouts of Apgar's 1915 cylinders, if indeed they survive. Information leading to these or other off-the-air recordings of spark transmitters will be greatly appreciated.

ACKNOWLEDGMENTS

My errors are my own, but only with the help and encouragement of the following people has this Note come together in its present form. Grateful and alphabetical thanks to: Robert Angus for the tape of the 1934 Apgar interview; Norm Berge, CHRS, for the Radio Wagon photo; Paul Bourbin, CHRS president, for his encouragement and for authorizing publication by CHRS of the first version of this material and issuance of the Special Edition of CHRS Radio News with the 1915 Apgar recordings of WSL and WHD, and his interview; David Dintenfass, Puget Sound Antique Radio Association and Northwestern Vintage Radio Society, for his note "Sound Recording on Magnetic Wire; A

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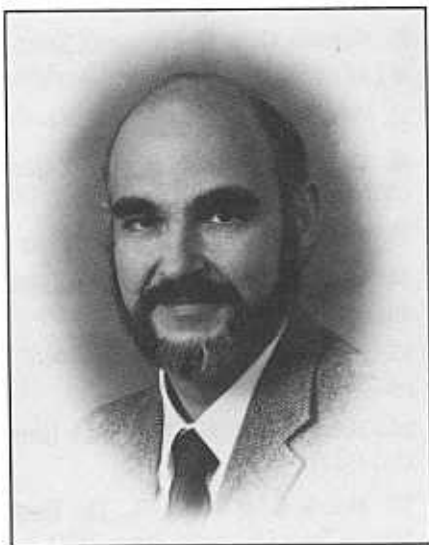
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America's Wireless Spies
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