

**American Guide Series**

**Portland Fire Alarm System**

\*\*\*\*\*

**Written By**

**Workers of the Federal Writers' Project**

**of the**

**Works Progress Administration**

**State of Oregon**

\*\*\*\*\*

**Sponsored by**

**R. E. Riley, City Commissioner  
Bureau of Fire**

**Edward Grenfell, Fire Chief**

**Edward L Boatright, Executive Director**

**Portland Fire College**

**March 28, 1941**

WORKS PROGRESS ADMINISTRATION

Harry L. Hopkins, Administrator

Ellen S. Woodward, Assistant Administrator

Henry G. Alsberg, Director of the Federal Writers' Project

E. J. Griffith, Oregon State Administrator

Gradys Everett, State Director Women's and  
Professional Projects

T.J. Edmonds, Acting State Director,  
Federal Writers' Project

## History of the Portland Fire Alarm System

Among fire fighters, it is axiomatic that the first five minutes of a fire is the critical period. On this fact rests the justification for the considerable amounts spent on up-to-date alarm systems. The National Fire Underwriters stress the necessity of efficient alarm equipment by assigning to it thirty percent, when rating a city for fire hazard. In this connection, Portland may be justly proud. The city's present alarm system is one of the most modern in the United States. Under the able leadership of such men as Chief Engineer A. J. Coffee, Battalion Chiefs, Jay Stevens and Harry Johnson and the present Superintendent of Fire Alarm Telegraph, Charles Ralph, Portland Has developed a system that has achieved a rating of standard Class A, by the committee on Signaling Systems of the National Fire Protection Association (1).

In marked contrast to Portland's efficient system was the Roman method of two thousand years ago. In those days men were stationed along the streets at regular intervals within hailing distance of each other. These human fire alarms were called "nocturnes." They shouted the alarm from one to the other, until it eventually reached the "castra," or fire station. It was then their duty to proceed to the fire themselves, and act as police establishing fire lines and preventing vandalism. The general public apparently hindered the fire fighting forces in those early days just as they do today.

On receiving the alarm at the "castra," the chief, or "centurion" led his "aquarri," or firemen, to the scene of the blaze. The first group to arrive was armed with the "siphones," or wooden hand pumps that worked like syringes. Others carried axes, hammers, and wrecking bars. Still others carried short scaling ladders that could be lashed together to make longer ones when necessary. These men wore metal helmets, leather jackets and trousers as their uniforms.

The main force, as often numbering a hundred or more, arrived next, each carrying light-weight earthenware jar. These men quickly formed themselves into a bucket brigade extending from the nearest cistern to the scene of the fire. In this manner, water was provided for the "siphones." The cisterns were supplied with water from nearby open aqueducts. A third force of men carried life nets. These nets were known as "pillows," and their carriers were "pillow-bearers." The pillows were about four feet square and were stuffed with feathers. Since Rome's buildings were quite successful (2).

Portland's fire alarm system developed from a very small beginning. The city was founded in 1845. At first fires were fought by volunteers forming bucket brigades. In 1850 Pioneer Fire Company No. 1 was organized. The alarm system was much the same as that used by the Romans – a lusty pair of lungs. On April 6, Portland became an incorporated city. One month later the Pioneer Fire Company tendered its services to the newly formed corporation (3).

In 1853, two more volunteer companies were formed, the Vigilance Hook and Ladder Company No. 1 and the Willamette Engine Company No. 1. The burning of the old steam mill at the foot of Jefferson Street called attention to the need of an official fire department. A city ordinance was passed 1854 providing for the formation of such an organization composed of volunteers serving without pay. By 1862 five companies had been recruited. In 1859, the efficiency of the department was improved by the purchase of a large cast steel bell, weighing 1,030 pounds and costing \$515.15. It was mounted in a tower at the foot of Alder Street, but later was moved to the station house of Willamette Engine Co. No. 1. Today it is stored in the fire department warehouse and used for Fire Prevention activities along with other relics of early fire fighting days (4).

The city council on October 1, 1873, passed an ordinance authorizing the purchase of a larger alarm bell. It was to weigh 4,200 pounds and to contain 600 pounds of pure silver. After a long trip around the Horn, it arrived in 1874, and was installed in the bell tower of the fire station at 4<sup>th</sup> and Taylor Streets. The following year the bell was made practically useless when the city adopted the Gamewell system of fire alarm telegraph. While not automatic, the goals of present day system, it was a big improvement over the old (5).

It is interesting to note that the first fire alarm telegraph was installed in Boston in the year 1852. Based on the Morse Telegraph, it had been invented by Dr. William F. Channing. John N Gamewell, in 1855, purchased Channing's rights to the system, and formed a company to manufacture the necessary apparatus. The new company made its first installation in St. Louis, in 1858. Gamewell being a Southerner, the Federal Government during the Civil War, confiscated his patents, and offered them for sale. John F Kennard, of Boston, brought the patents for the ridiculously low price of \$80. After the war, Kennard returned to Gamewell a part of the patents, took him into the new company, and made him president. From then on the system has retained the name of Gamewell for all its devices (6).

The same year that the city adopted the fire alarm telegraph, the chief engineer of the fire department was made superintendent of the alarm system. He was authorized to purchase and install 10 signal boxes, four engine house

gongs, one bell-ringing apparatus for the large alarm bell, all at a cost not to exceed \$7,500. This was the beginning of the present elaborate and efficient system. Curiously, it antedated the use of horses by eight years (7).

The first alarm boxes were opened with keys which were distributed around the neighborhood to responsible persons. In case of fire, it was necessary to find this "responsible person," obtain the key from him, returned to the box, open it, and send in the alarm. If one was fortunate, the house was not completely destroyed by that time. In 1886, it was found necessary to place little tins signs over all boxes showing where box keys could be found (8).

The United States District Court, in 1885, issued an injunction against the city for using an automatic electric horse unhitcher patented by one Robert Bragg. Proving that necessity is the mother of invention, A. J. Coffee, Jr., superintendent of the alarm system, devised a new unhitcher that proved even better than the Bragg patent. His device was used until the automobile replaced horse-drawn vehicles (9).

In 1887 the alarm system was completely revised. Thirty-three boxes of the newly developed non-interfering type were placed on three non-interfering circuits in such a way that every third box was placed on a differing circuit. When one box is operating, signals from other boxes are held back by relay switches until the first is through. The circuits were controlled by a three-circuit Gamewell repeater. Some of the circuit wires had been placed on the roofs of houses. These were now placed on iron brackets to prevent them from becoming short circuited. One new line was strung from the poles of the Electric Light and Telephone Company. They were placed on V-irons, three feet above all other wires. The department was attempting to provide an adequate system without an adequate budget (10).

When the city changed the routing of its streets in 1889, it forced the fire department to change several of its circuits. At the same time a new type of Gamewell alarm box was installed, and 35 electric box protectors attached to them. These protectors prevented damage to the boxes due to overheating when the current supply became too strong (11).

Several important changes were effected in 1890. The house of Truck Co. No. 1, on Fourth, between Morrison and Yamhill, was designated the central station for the alarm system. The big alarm bell was placed in the station house tower. The system now consisted of 53 boxes and 25 miles of line, 18 miles of which were on the poles of the Electric Light and Telegraph Company (12).

In 1892, the alarm network was divided into two sections, by establishing a central station on the east side of the river. Station house No. 7 was chosen as east side headquarters, and duplicate equipment installed there. High water in the Willamette that year prevented the placing of cables across the river to connect the two central stations. Superintendent Coffee, in his annual report to the chief of the department, complained of the inability of keeping the alarm expanding as rapidly as the city was growing (13).

In 1893, the old Gamewell repeaters were replaced with apparatus manufactured by the Municipal Fire and Police Telegraph Company. On the west side, a 6-circuit repeater was installed, and on the east side, a 3-circuit repeater. The same company also supplied 42 alarm boxes of a newly devised non-interfering type. Two of these boxes, purchased on trial, were of succession type, containing character, or code, wheels that turned on their shaft four times, sending a like number of signals to the central station, which enabled the operators to check the signals more readily (14).

On April 5, 1895, a serious mix-up of signals occurred. The Portland Iron Works caught fire, and two boxes were pulled at the same time. Because the boxes were not completely non-interfering, the signals received at the central station were badly mixed up. This caused considerable delay before the call could be interpreted and equipment sent to the scene of the fire. The following year, severe storms during the winter, caused several short circuits. This resulted in many false alarms and kept the department busy making the useless runs. To add to the difficulties, the cable, placed across the river in 1893, broke, and disrupted service between the east and west sides. The repair crew discovered that the cable had not been placed on the bottom of the river. Its own weight, plus the hammering of a driftwood caused it to give way (15).

Still further trouble beset the alarm system the next year, when the Oregon Telephone and Telegraph Company demanded that the city remove its wires from the company poles. The city Council replied with a resolution stating that "Whereas the City of Portland, has, without compensation, liberally granted the aforesaid Corporation valuable franchises, and privileges of erecting poles and putting wires promiscuously throughout the city, and by Ordinance has protected its property; Therefore, Be it resolved; By the Common Council, that the aforesaid action of the O. T. & T. Co. is considered by this body as showing a reprehensible spirit of base ingratitude for this retaliating against the City for not being able to monopolize the telephone service of the Police and Fire Departments, and that this Body take this method of expressing its disapproval of the action of the said Corporation." The city was saved the expense of setting up the poles of its own, however, when the Portland General Electric, the

Columbia Telephone, and the City & Suburban Railway companies generously offered their poles for the Fire and Police department wires (16).

In 1898, the central station on the west side was moved to the city hall. The new marble switchboard was the pride of the fire department. The east side station headquarters was moved, also, to the house of Chemical Co. No. 3. All the old gravity batteries were replaced with the newly devised storage batteries. The circuits were relocated and improved during the changes made necessary by the shifting of the central stations (17).

George J. Walker was superintendent of the fire alarm system in 1901. He complained that Portland was trying to make two independent "village" alarm system do the work of a "metro-politan" system. He wished to unite the east and west central stations, thus eliminating duplications. He wished, also to lessen, or do away completely with dependence upon telephone company operators in receiving fire alarms as they were not under the control of the fire department and not trained to receive alarms. In many cases they had proved unsatisfactory by not getting information correctly, which caused delay in getting fire apparatus to the scene promptly. Frequent failures in the non-interference alarm boxes prompted him to advocate their elimination. If the first alarm coming in over the repeater was not correct, firemen would not bother to check on it, he said. Nor did he blame the firemen for this – false alarms due to short circuits and box failures were so frequent. In 1905, he recommended that the system be completely overhauled. Two years later he saw most of his ideas put into effect (18).

In 1906, the first of the keyless boxes, similar to those in use today, were installed, and a start was made toward placing some of the wires underground. The following year, the east side station was discontinued and all circuits terminated at the city hall central station. The latter was not equipped with a new 12-circuit switchboard, a private telephone systems for city offices, with three operators in attendance at all times, and a manual (hand operated) transmitter for sending signals to the various station houses. The installation of pedestal type boxes followed a year later 1907 (19).

The work of placing alarm circuit wires underground was a temporarily halted in 1910, when the city enjoined from removing its lines from the telephone and light companies' poles. For some time the city had been paying a small rental for use of the poles and the companies did not wish to lose this revenue. The city, however, won its case, and the work continued (20).

The assignment card system was devised in 19174 by Jay Stevens, well-known in Portland for his fire prevention work. Battalion Chief Harry Johnson,

eleven years later, introduced the Kardex system for filing the cards. Under the directions of Charles C. Ralph, who became superintendent in 1932, the system was further improved by the installation of a new ready reference cabinet and a card transmitter. The transmitter was so designed that it would send signals to one or more stations in accordance with the way the assignment cards had been punched. When these cards are placed in the machine and a lever pulled, metal fingers penetrate the holes in the card and a signal is sent to the proper station houses. The device selects the apparatus that is to respond to any given alarm box call, and sends the number of that box. This is the most completely automatic device being used at the present time for the transmission of signals (21).

The present modern and efficient system dates from 1930. By that year 752 boxes were in use, 16 station houses operating, and 48 circuits connecting the boxes and station houses with the central station. The central station is located at 21<sup>st</sup> Avenue and Pacific Street, in a building constructed especially for that purpose. Here are the brains and heart of the signal system. The equipment includes the card index, an electric wall map, a combination control panel, the card transmitter, a circuit panel board, and power supply (22).

The wall map was designed in 1931, by Charles C. Ralph, then a battalion chief. It is a map painted on a large pane of glass, with red, green, and white lights so placed behind it that the various station houses and sites of fires can be quickly located. A red light behind the number of a station house, on the map, signifies that the apparatus is out to a fire. A green light so placed, shows that the station house is occupied by a move-up company. A white light shows the position of the district chief. Red lights also show the location of fires, and are so arranged as to be within an average of 500 feet of the actual site. These lights, operated by plug-in switches on the control panel, give the central station operators a visual picture of the situation at all times (23).

The combination control panel contains, besides the map switches, a two-position telephone exchange board controlling eight incoming, four out-going, and 60 local lines, a wooden plug-out board, a microphone and transmitter for sending signals vocally to the station houses, a dictaphone to record telephone conversations, and an automatic card transmitter. The circuit panel board controls 56 box circuits with 20 boxes on each, eight primary, and eight secondary circuits to fire stations with five stations each. The primary circuits actuate the station punch registers and the secondary circuits, the station house gongs. Mounted on the panels there are a light, a bell, a buzzer, and a punch register for each box circuit. When a box has been pulled, these devices will operate, giving its location (24).

Box numbers are quite significant. Of the four numbers on each, the first one refers to the district in which the box is located, the second to the zone in that district, the third to the group in the zone, and the fourth to the number of the box. In this way, anyone familiar with the system can tell the exact location of the box without referring to a chart, or other aid. Each box contains a bell that strikes off its number when it is operated. By listening to the bell the sender can verify the number being sent to the central station. Error, due to a short circuit or other failure, can thus be detected and the alarm sent by telephone. This precaution may mean the difference between a fire promptly put out and a complete loss (24).

Signals sent vocally from the central station to station houses are spoke into a microphone on the operators' desk. A 60-watt audio-speaker transmitter, utilizing the wires of the box and station house circuits, sends the signals to one or any number of station houses. This is what is known as "wired wireless." Both the vocal system and the card transmitter were designed originally to do away with the old night watch idea. With these two devices, a silent period at night can be utilized. This means that instead of sending all signals to all stations, as is done during the day, only the station or stations desired will be tapped out to a fire. The men at other stations may continue to sleep. If a dangerous situation should develop, all stations are called and a watchman instantly placed on duty. After the danger period has been passed, the rest of the men are allowed to return to their beds and temporary watch is notified. The nervous tension and loss of sleep due to answering calls during the night is now done away with. The efficiency of the men is increased thereby.

The power supply consists of a 220-volt, three-phase, alternating current from the lines of the Northwestern Electric Company and the Portland Electric Power Company. This power is stepped down to 120-volt direct current by means of a combination motor and generator set. An exact duplicate is held in reserve for emergencies. This device supplies the current for a 120-volt storage battery, composed of 56 cells, 2 ½ volts to each. It also supplies the power to operate 24 smaller motor-generator sets. These consist of a motor placed between two generators. Each generator furnishes current for two circuits. Emergency devices include the battery which is floating on the line continuously and is capable of carrying the load for 36 hours, and a Buda automobile engine so arranged as to operate the large motor-generator set. To date it has not been necessary to call upon those devices, as no emergency has developed.

Since 1932, several improvements have been installed. These include street semaphores, operated over department telephone lines, by means of a switch at the central station; warning sirens, placed in front of fire stations on busy thoroughfares; telephone jacks in all boxes, enabling firemen to call the

central station from the scene of a fire; and automatic flash-back signaling devices, enabling the central station operators to know when, a station has been vacated and occupied. Such devices are responsible in part for the high rating of the department's alarm system and the city's low fire loss (26).

To aid the fire department in the discharge of its duties, a tape register has been placed in the Police Station. The police are thus able to cover large fires where it may be necessary to establish fire lines for the prevention of over-eager citizens. Tape registers are also in the offices of the newspapers. Reporters may cover a fire without having to bother the central station operators with inquiries as to the location of the fires. Telephone lines are maintained to the power companies' linemen, the municipal water works, the city's shops, the A. D. T., and to others who might be needed in cases of large or dangerous fires (27).

The American District Telegraph Company, better known as the A. D. T., maintains a burglar and fire alarm service of its own. All fire alarms are immediately referred to the Portland fire department, and signals sent over the city alarm system call out the apparatus as for box or telephone alarms. The city also maintains a tape register at the office of the A. D. T. so that their service men can cover the fire and aid in locating the exact spot where the fire may be raging, and in other ways assist the fighters. They also have keys to the buildings protected by the company and are valuable in gaining quick access to a burning structure. The A. D. T. also controls the Sprinkler Supervisory Service and the Aero Automatic Fire Alarm System. Alarms from these sources are handled the same as for the regular system. The first A. D. T. central station in Portland was opened Oct. 20, 1886 with five boxes. Since that time its network has grown to 115 burglar and fire alarm circuits with several boxes on each, and 25 night watch and five alarm circuits on the Sprinkler Supervisory System.

Portland's fire losses have dropped from a high of \$915,575 in 1930 to \$367,316 in 1937 and bid fair to be reduced to \$200,000 in 1938. Per capita losses have fallen from \$4.51 in 1923 to \$1.12 in 1937. The fire loss per alarm received has decreased from \$1,081.94 in 1922 to \$94.00 in 1937. These figures are of importance because fire insurance rates are based in the main on the fire losses of a city. An efficient, and well-equipped department that keeps fire losses to a minimum. Portland's fire alarm system has played a large part in bringing about these savings. The elapsed time, between the turning in of a box alarm, to the dispatching of apparatus, has been cut to thirty-three seconds, so that the firemen arrive at a fire before it has gained much headway. The first few moments of a blaze are the most critical, and firemen must reach the scene as quickly as possible.

The alarm system has been made almost completely automatic. The alarm boxes, the card transmitter, the punch recorders, the Gamewell transmitter and the station house gongs and tappers all operate automatically.

By eliminating the human factor as much as possible, the accuracy of the system is increased. The giving and receiving of telephone alarms and the transmission of them to station houses by operators, permits of mistakes and errors that are avoidable. The constant goal of the department is for greater speed and accuracy.

Plans for the future include three innovations:

1. Two-way radios on all moving apparatus.
2. A loudspeaker wagon with equipment that will allow the chief to talk to the men while they are fighting a fire. The loudspeaker will be one that can be heard for two miles.
3. A system whereby an audio wave will be impressed upon all wires of the alarm system and which can be received by all moving apparatus, within 1,000 feet of one of these wires. It will be impossible to be on a Portland city street without being in direct communication with the Fire Alarm office when this is completed. Portland will then have the most modern Fire Alarm Communication System in the world.

The men on duty put out the fires. The alarm system merely gets to them to the right place as quickly as possible and with as much information as is available. Beyond that it cannot go.

## CHRONOLOGY

### The Alarm System of the Portland Fire Department

1845. Portland founded.
1850. Portland is incorporated by an act of the Territorial Legislature.
- Portland's first fire company - the Pioneer Fire Company #1, a volunteer organization, offers its services to the city and is accepted, May 6, 1851.
1853. The burning of an old mill at the foot of Jefferson Street demonstrates the need of better fire protection.
1853. A city ordinance authorizes a municipal department, which takes in the Pioneer, Vigilance, and Willamette companies.
1856. The Multnomah Engine Co. organizes and becomes a city company.
1859. The city buys and installs a 1,030 pound cast steel alarm bell.
1860. The State Legislature passes an act regulating the Portland Fire Department.
1865. All station houses now equipped with alarm bells.
1873. The city orders a new alarm bell. IT is to weigh 4200 pounds, 600 pounds of pure silver.
1875. The city installs the Gamewell system of fire alarm telegraph. The chief engineer of the department is made superintendent of the fire alarm system.
- The first anti-false alarm ordinance is passed.
1879. The new alarm bell is installed, after its trip around the Horn, in the bell tower of the station at Fourth and Yamhill Streets.

1880. The city has twelve alarm boxes in use. All have to be opened by a key, left in the hands of "responsible" persons in the neighborhood.

1883. Julius Dilg, Supt.

First annual report of the Fire Department to the Mayor.

The Department now on a part paid basis; no more volunteers. Some men placed on a call basis and paid only for time spent on call.

Horses used for the first time.

Seventeen boxes and 8 miles of line in use.

1884. Twenty-one boxes and 9 miles of line.

The city is divided into two districts; all south of Alder Street is district #1, all north of Alder Street is district # 2.

1885. Twenty-two boxes and 9 ¼ miles of line.

Robert Bragg sues the city, claiming infringement on his patents for electric horse unhitchers. The U. S. District Court issues an injunction against further use of said unhitchers. Battalion Chief A. J. Coffee, Jr. invests an unhitcher of his own, that proves better than Bragg's.

1886. Little tin signs are placed over the boxes to show where the key to open it can be found. Two new punch recorders, invented by Coffee, are installed. Some of the circuit wires placed on the roofs of houses are causing short circuits. Some of the poles are rotten, some are too far apart, and shade trees are giving trouble.

1887. A. J. Coffee, Jr., Supt.

House-top wires are placed on iron brackets. Some wires are placed on the poles of the Oregon Light and Telephone Co. These wires are placed on V-irons, three feet above the company's wires.

A non-interfering system is devised by installing three circuits, with boxes alternating, and all controlled by a three-circuit Gamewell repeater.

Thirty-three boxes now in use. A privately owned box, tied into the city system is installed at the Weinhard Brewery.

1889. The city installs 10 of the newly devised Gamewell non-interference, easily tested, boxes.

Some of the circuits are rearranged when the city changes some of the streets.

1890. The alarm headquarters and large tower-bell are located in the house of Truck #1, on Fourth, between Morrison and Yamhill Streets.

The system has 5 circuits, controlled by a 6-circuit Gamewell repeater.

Fifty-three boxes and 25 miles of line in use.

1891. Eighteen miles of line on the Oregon Light and Telephone Company's poles.

1892. A central alarm station is set up on the east side, in the house of Engine Co. #7.

High Water in the Willamette prevents cables from being placed across the river to connect the two central stations.

1983. Cables are laid across river.

Municipal Fire and Police Telegraph Company equipment is substituted, in part, for Gamewell devices. A 6-circuit repeater is set up on the west side, and a 3-circuit repeater on the east side.

Forty-two of the M.F.&P.T.Co. boxes are installed. Two of these boxes, bought on trial, are of the succession type.

Five A.D.T. boxes are installed.

One box is installed in the office of the National Automatic Fire Alarm Co.

1894. Forty-nine Municipal Fire and Police Telegraph Co. boxes.

Fifty-two Gamewell boxes.

Five A.D.T. boxes.

One Interstate box.

1895. On April 5, a fire starts in the Portland Iron Works. Two boxes are pulled at the same time, mixing the signals and delaying the arrival of apparatus.

1896. R. G. Paddock, Supt.

Severe storms play havoc with the system.

Cables across the Willamette break.

1897. George J. Walker, Supt.

The Oregon Light and Telephone Co. forces the city to remove its wires from the Company's poles.

The Portland General Electric, the Columbia Telephone, and the City and Suburban Railway Companies offer their poles to the city, and the offers are accepted.

An automatic alarm whistle is moved from the foot of the Stark Street and set up on the Burnside Bridge.

1898. The Central Office is moved from Fourth and Yamhill Streets to the City Hall. The East Side Station is moved from Station House #7 to House #13.

Storage batteries are substituted for Gravity batteries.

1901. Supt. Walker complains that Portland is trying to make two independent "village" alarm systems do the work of a "metropolitan" system. He wants the east and west side stations combined.

1902. Walker still complains about the "automatic" devices.

Succession boxes send in four signals when pulled. If the first signal is mixed, firemen ignore the following ones, which may be correct, according to Walker.

1904. The city shops are building much of the alarm apparatus.

The practice of having some of the men on a "call" basis is discontinued.

1906. Charles Savariau, Supt.

Keyless boxes in use.

A start is made toward placing wires underground.

1907. The East Side Station is discontinued. All circuits terminate at the City Hall Station.

A private telephone system, with a new 12-circuit switchboard operated by 3 operators on 8-hour shifts is installed.

A manually operated Gamewell transmitter for sending signals to fire houses is installed.

1908. The first of the pedestal type boxes are installed.

1910. Red "location" lights are placed over alarm boxes. The city is enjoined from removing its wires from electric companies' poles.

1912. The city wins in case against the electric company.

The entire alarm hook-up is revised. Two operators are placed in charge of the switchboard at all times.

1914. Jay Stevens, a battalion chief, devises the assignment card system.

1916. The alarm system is damaged by severe silver thaw.

1917. Vacuum high-potential arresters are placed in fire houses, to protect the punch registers and tappers from too great a fluctuation of current supply.
1925. Battalion Chief Johnson installs the Kardex filing system for the assignment cards.
1930. The new Central Station at 21st and Pacific Streets is put into use.
1931. The wall map, first of its kind in the U. S. is set up.
- Nine hundred thirty-seven boxes, 56 circuits in use.
1932. Charles C. Ralph, Supt.
1935. Eleven hundred twenty-five boxes, 56 circuits, 767 miles of line underground and 484 overhead. Six street intersection on warning lights and sirens installed. Forty automatic signal flash-back devices installed.
1936. Telephone jacks placed in alarm boxes.
1937. Installation of the public address system, for giving alarms to stations houses by voice.

For the future:

Two-way radios on all moving apparatus.

A loudspeaker wagon with equipment that will allow the chief to talk to the men while they are fighting a fire. The loudspeaker will be one that can be heard for two miles.

A system whereby an audio wave will be impressed upon all wires of the alarm system and which can be received by all moving apparatus, within 1000 feet of one of these wires.

## BIBLIOGRAPHY

1. National Board of Fire Underwriters: Reports on City of Portland for 1930 and 1937. American City. January 1938, p. 7.
  2. Oregon Journal, May 2, 1916, p. 13, section 1.
  3. Fire Engineering, July 27, 1927, pp. 761 f. Fred Lockley, History of the Columbia River Valley From The Dalles to the Sea. S. J. Clarke Publishing Co., Chicago 1928, Vol. 1, p. 494.
  4. Portland Directory for 1863. S. J. McCormick, Publisher, 1863, pp. 89-101. Fred Lockley, Op. Cit. City Ordinances, May 1953. Also. Acts of State legislature, Oct. 17, 1860.
  5. City Ordinances, Oct. 1873.  
Fire Department Scrap Book at Station House No. 4. No reference available.
  6. Fire Engineering, Jan. 1938, p. 13, (Vol. 91, No. 1)
  7. City Ordinances. Vol. 4, No. 1610, p. 638.
  8. Annual Report of Portland Fire Department, 1885.
  9. " " " " " " , 1886.
  10. " " " " " " , 1887.
  11. " " " " " " , 1889.
  12. " " " " " " , 1890.
  13. " " " " " " , 1892, 1893.
  14. " " " " " " , 1894.
  15. " " " " " " , 1895.
  16. " " " " " " , 1896, 1897.
- City Ordinances, July 7, 1897 (unbound records).
17. Annual Report of Portland Fire Department, 1898.

18. Annual Report of Portland Fire Department, 1901, 1902,  
1903, 1904, 1905.
19. Annual Report of Portland Fire Department, 1906, 1907.
20. " " " " " " , 1910.
21. " " " " " " , 1931.
22. " " " " " " , 1931.
23. " " " " " " , 1931.
24. " " " " " " , 1931.
25. Report of J. Cunningham to Supt. Ralph, May 31, 1938.  
Interview with Supt. Ralph, June 27, 1938.
26. National Board of Fire Underwriters: Report on City of Portland, 1937.  
Quarterly of National Fire Protection Association, July, 1937.
27. J. Cunningham Report (see above).
28. See American District Telegraph Co. bulletin 1938. Quarterly of National Fire  
Protection Association, July, 1937.