TABLE No. 13.—FIRE COMPANIES—LOCATION AND EQUIPMENT.

Engine Companies.

Company.	Location.	Members.	Engine. Size.	Engine. Horses.	Wagon. Type.	Wagon. Horses.	2½" Hose Carried, Feet.	2½" Spare Hose, Feet.	Ladders Carried.	Chemical Extinguishers and Tanks.
1..	Dorchester and 4th Sts. (S. Boston)..	12	Second....	3	Plain.....	2	1,000	950	None.	2–3 gal.
2..	4th and O Sts. (S. Boston).....	10	Second....	3	Plain.....	2	1,000	1,000	None.	2–3 gal.
3..	Harrison Ave. and Bristol St.....	12	First.....	3	Plain.....	2	1,000*	900*	None.	2–3 gal.
4..	Bulfinch St., opp. Howard St.....	14	First.....	3	Plain.....	2	1,150*	1,100	None.	2–3 gal.
5..	Marion St., near Trenton St. (E. Boston)	10	Second....	3	Plain.....	2	1,000	850	None.	2–3 gal.
6..	Leverett St., opp. Lyman St.....	13	Second....	3	Plain.....	2	1,200	1,250	None.	2–3 gal.
7..	East St., near South St.....	13	First.....	3	Plain.....	2	1,200*	1,300	None.	2–3 gal.
8..	Salem St., near Prince St.....	13	First.....	3	Plain.....	2	1,100	1,300	None.	2–3 gal.
9..	Paris St., near Meridean St. (E. Boston).	12	First.....	3	Plain.....	2	1,100	1,100	None.	2–3 gal.
10..	Mt. Vernon St., at River St.....	13	Second....	3	Plain.....	2	1,000	1,000	None.	2–3 gal.
11..	Saratoga and Byron Sts. (E. Boston)..	10	Third.....	3	Plain.....	2	1,000	750	None.	2–3 gal.
12..	Dudley St., near Blue Hill Ave.....	11	Third.....	3	Plain.....	2	1,200	1,000	None.	2–3 gal.
13..	Cabot and Whittier Sts. (Roxbury)....	11	Second....	3	Plain.....	2	1,000	1,100	None.	2–3 gal.
14..	Centre St., opp. Highland Ave. (Roxbury).....	12	Second....	3	Plain.....	2	1,000	1,000	None.	2–3 gal.
15..	Dorchester Ave, and Broadway (S. Boston).....	13	First.....	3	Plain.....	2	1,200*	1,150	None.	2–3 gal.
16..	River and Temple Sts. (Dorchester)...	10	Second....	3	Plain.....	2	1,000	700	None.	2–3 gal.
17..	Parish St., near Winter St. (Dorchester)	11	Third.....	3	Plain.....	2	1,000	1,150	None.	2–3 gal.
18..	Harvard St., near Washington St. (Dorchester).....	12	Fourth.....	3	Plain.....	2	1,000	1,000	None.	2–3 gal.
19..	Norfolk St., near Fremont St. (Dorchester).....	10	Third.....	3	Plain.....	2	1,000	850	None.	2–3 gal.
20..	Walnut St., near Neponset Ave. (Dorchester).....	11	Second....	3	Plain.....	2	1,000	1,000	None.	2–3 gal.
21..	Columbia Road and Annabel St. (Dorchester).....	12	Second....	3	Plain.....	2	1,200	250	None.	2–3 gal.
22..	Warren Ave., near Clarendon St.....	13	Second....	3	Plain.....	2	1,000 2,000	900	None.	2–3 gal.
23..	Northampton St., near Reed St.....	12	Second....	3	Plain.....	2	1,200	1,400	None.	2–3 gal.
24..	Warren and Quincy Sts.....	11	Second....	3	Plain.....	2	1,000	750	None.	2–3 gal.
25..	Fort Hill Sq. and High St.....	14	First.....	3	Plain.....	2	1,100*	1,100	None,	2–3 gal.
26..	Mason St., near West St.....	14	First.....	3	Plain.....	2	1,000*	1,900	None.	2–3 gal.
27..	Elm St., near High St. (Charlestown)..	12	Second....	3	Plain.....	2	1,200	1,200	None.	2–3 gal.
28..	Centre St., near Myrtle St. (W. Roxbury)	11	Third.....	3	Plain.....	2	1,200	200	None.	2–3 gal.
29..	Chestnut Hill Ave., near Washington St. (Brighton).....	11	Second....	3	Plain.....	2	800	1,250	None.	2–3 gal.
30..	Centre St., near Bellevue St. (W. Roxbury).....	9	Fourth.....	3	Plain.....	2	1,000	800	None.	2–3 gal.
32..	Bunker Hill St., near Main St, (Charlestown).....	11	Second....	3	Plain.....	2	1,200	1,000	None.	2–3 gal.
33..	Boylston and Hereford Sts.....	12	Second....	3	Combination.	2	1,000	750	None.	1–35 gal.
34..	Western Ave., near Waverly St. (Brighton).....	10	Second....	3	Plain.....	2	1,000	850	None.	2–3 gal.
35..	With Engine No. 26.....	13	Extra First, self propelling		Plain.....	2	800*	1,000	None.	2–3 gal.
36..	Monument St., near Bunker Hill (Charlestown).....	12	Second....	3	Plain.....	2	1,000	1,100	None.	2–3 gal.
37..	Longwood and Brookline Aves.....	12	Third....	3	Plain.....	2	1,000	950	None.	2–3 gal.
38..	Congress and Farnsworth Sts.....	10	Extra First, self propelling		Plain.....	2	1,000*	1,400	None.	2–3 gal.
39..	With Engine No. 38.....	12	First.....	3	Plain.....	2	1,100	1,100	None.	2–3 gal.
40..	Summer and Orleans Sts. (E. Boston).	11	First.....	3	Plain.....	2	1,100	900	None.	2–3 gal.
41..	Harvard Ave., near Cambridge St. (Brighton).....	12	First.....	3	Plain.....	2	1,000	950	None.	2–3 gal.
42..	Washington St., near Atherton St. (Roxbury).....	12	Third.....	3	Plain.....	2	900	800	None.	2–3 gal.
43..	Boston St., at Andrews Sq. (S. Boston).	12	Second....	3	Plain.....	2	1,000	.....	None.	2–3 gal.
44..	Central Wharf.....	16	Fire Boat.				4,800†	.....	.....	.....
45..	Washington St., near Poplar St. (W. Roxbury).....	11	Third.....	3	Plain.....	2	1,200	600	None.	2–3 gal.
46..	Dorchester Ave., near Ashmont St. (Dorchester).....	10	Fourth.....	3	Plain.....	2	1,200	800	None,	2–3 gal.
47..	Foot of Lewis St. (E. Boston).....	15	Fire Boat.				4,800†	.....	.....	.....

* Includes 3-inch hose. † Includes 3½-inch hose.

TABLE 13.—(*Continued.*)

LADDER COMPANIES.

Company.	Location.	Members.	Ladder Truck. Type.	Horses.	Put in Service.	Ladders Carried. Number.	Total Length, Feet.	Chemical Extinguishers and Tanks.
1	Friend and Merrimac Sts.	13	Ordinary	3	1901	17	499	2-3 gal.
2	Paris St., near Meridian St. (E. Boston)	11	Combination	3	1899	17	464	2-35 gal. 1-6 gal.
3	Harrison Ave. and Bristol St	13	Ordinary	3	1886	16	470	2-3 gal.
4	Dudley St., near Winslow St. (Roxbury)	12	Ordinary	3	1884	15	429	2-3 gal.
5	4th and Dorchester Sts. (S. Boston)	12	Ordinary	3	1902	15	428	2-3 gal.
6	River and Temple Sts. (Dorchester)	8	Combination	3	1904	8	205	2-35 gal. 2-3 gal.
7	Parish St., near Winter St. (Dorchester)	10	Combination	3	1898	10	263	2-35 gal. 2-3 gal.
8	Fort Hill Square	14	Ordinary	3	1907	15	454	2-3 gal.
9	Main St., at Hancock Sq. (Charlestown)	11	Ordinary	3	1908	13	386	2-3 gal.
10	Centre St., near Myrtle St. (W. Roxbury)	8	Combination	3	1909	14	331	2-35 gal. 2-3 gal.
11	Chestnut Hill Ave., near Washington St. (Brighton)	10	Combination	3	1907	14	381	2-3 gal. 2-35 gal.
12	Tremont St., near Cunard St	13	Ordinary	3	1906	13	382	2-3 gal.
13	Warren Ave., near Clarendon St	11	Hayes 82′ Aerial*	3	Rebuilt 1907	7	276	2-3 gal.
14	With Ladder 8	5	American La France 85′ Aerial	3	1910	10	316	2-3 gal.
15	Boylston and Hereford Sts	13	American La France 85′ Aerial	3	1906	11	368	2-3 gal.
16	Washington St., near Poplar St. (W. Roxbury)	8	Combination	3	1888	10	265	2-3 gal. 2-35 gal.
17	Harrison Ave., near Harvard St.	13	American La France 85′ Aerial	3	1906	9	318	2-3 gal.
18	Pittsburg St., near Congress St. (S. Boston)	14	Seagrave 85′ Aerial	3	1910	12	373	2-3 gal.
19	E. 4th St., near K St. (S. Boston)	7	Combination	3	1898	6	141	2-3 gal. 2-35 gal.
20	Boston St. and Andrews Sq. (S. Boston)	7	Combination	3	1902	10	247	2-3 gal. 2-35 gal.
21	Saratoga and Byron Sts. (E. Boston)	7	Combination	3	1898	9	207	2-3 gal. 2-35 gal.
22	Monument St., near Bunker Hill (Charlestown)	9	Combination	3	1898	8	210	2-3 gal. 2-35 gal.
23	Washington St., near Blue Hill Ave. (Dorchester)	8	Combination	3	1910	9	195	2-3 gal: 2-35 gal.
24	North Grove St., near Cambridge St	8	Combination	3	1899	9	224	2-3 gal. 2-35 gal.
25	Centre St., near Bellevue St. (W. Roxbury)	7	Combination	3	1900	7	156	2-3 gal. 2-35 gal.
26	Longwood and Brookline Aves.	7	Combination	3	1908	9	268	2-3 gal. 2-35 gal.
27	Walnut St., near Neponset St. (Dorchester)	6	Combination	3	1901	9	222	2-3 gal. 2-35 gal.

* With Dahill compressed air hoist.

TABLE 13.—(*Continued.*)

CHEMICAL COMPANIES.

Company.	Location.	Members.	Type.	Horses.	Put in Service.	Chemical Tanks and Extinguishers.	¾" Hose Carried, Feet.	Ladders Carried.
1	Bulfinch St., opp. Howard St.	4	Babcock	2	1911	2-50 gal,	450	1-18 ft.
2	Church St., near Fayette St.	4	Babcock	2	1890	2-50 gal.	500	1-15 ft.
3	Winthrop St., near Warren St. (Charlestown)	6	Holloway Combination Hose Wagon	2	1898	2-35 gal.	800'-2½" 300'-¾"	none
4	Shawmut Ave., near Canton St.	4	Babcock	2	1896	2-80 gal.	500	none
5	Washington St., near Atherton St.	3	Babcock	2	1876	1-100 gal.	350	1-25 ft.
6	Harvard Ave., near Cambridge St. (Brighton)	3	Babcock	2	1876	2-80 gal.	350	1-18 ft.
7	Saratoga St., near Prescott St. (E. Boston)	4	Babcock	2	1886	2-3 gal. 1-100 gal.	500	none
8	B St., near Athens St. (S. Boston)	4	Babcock	2	1887	2-80 gal. 2-3 gal.	500	none
9	Main St., at Hancock Sq. (Charlestown)	3	Babcock	2	1889	1-100 gal.	350	none
10	Eustis St., near Washington St. (Roxbury)	4	Babcock	2	1889	1-100 gal.	450	none
11	Callender and Lyons Sts.	4	Holloway Combination Hose Wagon	2	1892	2-35 gal.	450'-2½" 300'-¾"	none
12	Tremont St., near Cunard St.	4	Babcock	2	189	2-50 gal.	500	none
13	Wenham and Walk Hill Sts.	6	Knox, Automobile	..	1910	1-35 gal. 1-3 gal.	600-2½" 250-¾"	none

WATER TOWERS.

Company.	Location.	Members.	Type.	Horses.	Height Extended.	Put in Service.	Turret Nozzles.	Number of Inlets.
1	Bulfinch St., opp. Howard St.	3	Hale	3	55	1890	2	4-2½" 2-3"
2	Bristol St., near Albany St.	5	Hale	3	55	1893	....	6-2½"
3	Pittsburg St., near Congress St.	4	Hale	3	65	1903	1	9-3"

Maintenance.—Members are allowed two meal periods of 2 hours or three of 1¼ hours daily, one day off in five and fourteen days' annual vacation. These, with the details, sick leaves, etc., reduce the fire force during 11½ hours each day to about one-half, and in many instances less than one-half, of the total membership.

The following figures, taken from the chief's morning reports, show the fire force on the days when a maximum and a minimum number of men were on duty during two periods of one month each.

Date.	Total Enrollment of Department.	Employees Present.	Detailed to Shop, Etc., from Fire Force.	Detailed to Light House Duty.	Absent on Days Off, Vacation and Leave.	Fire Force for the day.
1910.						
July 29th	990	78	13	6	267	626
Aug. 15th	992	83	13	7	302	587
Nov. 18th	995	94	16	9	233	643
Dec. 17th	994	91	16	8	215	664

The average fire force available during these two months was 636 or less than two-thirds of the department roll. During the meal periods, the fire force on duty at fire stations averaged about 424. These conditions are representative for the past year. In the vacation months, May to November, the number of men in quarters during meal periods sometimes reached the following:

In 13- and 14-man engine and ladder companies. 5
In 9- and 12-man engine and ladder companies. . 4
In 7- and 8-man ladder companies. 3
In chemical companies. 3

An engineer or an assistant is always with each engine, but when the company is reduced to 4 men, there is only 1 man available for hose duty; in a ladder company with 4 men present, 3 are available for ladder work. This means, unless the ladder truck is of aerial type, that ladders over 35 feet long can be raised only with the assistance of members of other companies, and that engine companies must also have assistance in getting lines on the fire.

The extent to which the fire force is reduced during meal periods in the summer was illustrated at the general alarm fire on August 9th, 1910. The first alarm for this fire was received at 6:17 P. M. and the 6th or general alarm at 6:30 P. M. Figures compiled from the department's records show that at the time these alarms were received, less than 43 per cent. of the members of the fire force were in the quarters of their companies. Many men on days off, detailed and on leave, responded as soon as they knew of the fire, although not required to do so.

Distribution.—In the congested value district are stationed 5 engine companies, each with an engine of the first size or larger, 3 ladder companies, one water tower and a chemical engine; 4 more engine companies, 3 ladder trucks, a fire boat, a water tower and a chemical engine are close about its limits. At least 2 engine companies, and frequently 4, are within ½ mile of any point in this district, but in the center of the area, in the vicinity of the Old State House, are many valuable buildings more than ¼ of a mile from any company. Elsewhere in the city proper an engine company is usually within ½ mile of any point, although this distance is exceeded in some parts of the Back Bay district.

In outlying districts there is usually a company within three-quarters of a mile of closely built sections, but parts of Brighton, Dorchester and East Boston are more remote from fire companies.

The distribution has been improved since the report of 1906 by a new fire boat on the East Boston water front, an automobile combination hose wagon in the Forest Hills district and an engine in Ashmont.

EQUIPMENT.—Summary of Apparatus.—In Table No. 14, following, the amount of apparatus in the department in 1905 and January, 1911, is given, showing the increase since the former date.

Steam Fire Engines.—In service, 44; in reserve, 10. See Tables Nos. 13 and 15. The engines are of double piston pump types and with three exceptions have been purchased or rebuilt within 11 years. Boilers are usually replaced after about 12 years' service; as a whole, the engines are in good condition. Each engine is provided with a hand relief and, in most cases, with a compound suction gage and rubber tires. They are uniformly equipped, each carrying two lengths of 4- or 4½-inch hard suction with 4½-inch couplings, one length of 3- or 3½-inch soft suction, a reducer connection, hydrant heads, gates and fresh water connections and hose. Three-horse teams are provided except for the two largest engines, which are self-propelling and seldom respond except to second alarm fires.

Engine Tests.—Eleven of the engines in service were tested during February and March, 1911, by engineers of the National Board to ascertain their condition and capacity, and the ability of the crews. In general, they were in good working condition and delivered, on an average, 95 per cent. of their total rating, only one delivering less than 90 per cent. The engineers were mainly skillful, although several did not regulate feed water closely enough for operating to capacity. Stokers in several cases were not sufficiently familiar with the requirements of firing at capacity, and required instruction by the supervisor of engines. The need of a third man, trained in stoking, for duty when regular engineer or assistant engineers are off, was apparent.

Fire Boats.—See Table No. 16. Engine 44 is equipped with electric lights and steam steering gear. Total rated capacity is 6,000 gallons per minute at 175 pounds water pressure.

The boat is fitted with three monitor pipes with 2- and 2½-inch tips and twelve 3½-inch hose connections; it carries 2,400 feet of 3½-inch cotton rubber-lined hose, 2,500 feet of 2½-inch rubber hose, 300 feet of 1-inch rubber hose, a very complete assortment of play pipes with 1¼- to 2¼-inch tips, shut off nozzles, rail pipes, nozzle holders, reducers, siamese connections, gated "Y" connections and other minor equipment.

Engine 47 is equipped with steam steering gear and electric lights. The total rated capacity of fire pumps is 6,000 gallons per minute at 175 pounds water pressure. There are 4 deck monitor pipes, with 2- to 3-inch tips, one elevated monitor with 2-inch tips forward of the smoke stack and twelve 3½-inch hose connections. The boat carries 2,400 feet of 3½-inch cotton rubber-lined hose, 2,500 feet of 2½-inch rubber hose, 200 feet of 1-inch rubber hose, and other equipment similar to that on Engine 44.

A new fire boat will soon be put in service as Engine 31. It is a light draft twin screw boat with wooden hull, steel deck house, electric lighting-equipment and steam steering gear. The capacity is expected to be 2,400 gallons at 175 pounds water pressure.

The fire pump and engines were in the old Engine 31 and have been rebuilt. The boat is equipped with 3 monitor pipes with 2- and 2½-inch tips and one elevated monitor with 2-inch tip forward of the smoke stack. The boat will carry 1,000 feet of 3½-inch hose, 2,500 feet of 2½-inch hose, 300 feet of 1-inch deck hose, and an assortment of pipes and tools. It will be stationed near the North End Park and will respond to points where water is too shallow for the larger boats.

Tests.—Both fire boats in service were tested in February, 1911, to ascertain their pumping capacity, the condition of the machinery and the ability of the crews.

Engine 44 could deliver only 77 per cent. of its rated capacity, due mostly to the inability of the boilers to supply sufficient steam, but partly to the manner in which the boilers were stoked. One of the fire pumps showed excessive slip and connecting rods were rather free for full speed operating.

TABLE No. 14.—EQUIPMENT.—SUMMARY OF APPARATUS.

	1911.		1905.	
	In Service.	In Reserve.	In Service.	In Reserve.
Engines, rated capacity:				
1,000 gallons	2	0	2	0
800–900 "	6	2	3	3
700–750 "	12	4	12	1
600–650 "	14	3	16	4
500–550 "	10	1	10	2
Total steam fire engines	44	10	43	10
Fire boats	2	1	1	1
Hose wagons, combination type (1 automobile)	4	1	2	1
" " plain	44	5	46	8
Total hose wagons	48	6	48	9
Ladder trucks, combination aerial	0	0	2	0
" " plain aerial	5	2	3	1
" " combination	15	3	16	1
" " ordinary	7	3	6	4
Total ladder trucks	27	8	27	6
Chemical engines	10	3	10	4
Water towers	3	0	3	0
Wagons, Chief's Automobiles and wagons	22	2	14	4
" fuel	40	0	39	0
" supply and miscellaneous	16	0	7	2
" wrecking	1	0	1	0
Horses	368	45	363	24
Hose, 2½-inch	87,750 feet.	3,900 feet.	82,950 feet.	7,150 feet.
" 3-inch	10,700 feet.	50 feet.	11,850 feet.	1,350 feet.
" 3½-inch	5,700 feet.	60 feet.	2,400 feet.	1,350 feet.
" ¾-inch for chemicals	10,900 feet.	300 feet.	10,450 feet.	1,000 feet.
Ladders, total length	8,750 feet.	1,500 feet.	8,583 feet.	1,580 feet.
" short, on chemical engines	15	None.	4	None.
Portable extinguishers	150	14	130	12
Deluge sets	49	None.	51	None.
Revolving nozzles	60	None.	None.	None.
Turret nozzles	13	None.	1	None.
Ladder pipes	None.	None.	3	None.
Cellar pipes	35	None.	None.	None.
Special and universal couplings (for engines from other cities)	16	None.	16	None.

Engine 47 delivered 90 per cent. of its rated capacity, the limiting feature being the speed at which it was proper to run the pumps; the boilers supplied steam freely without the use of forced draft and the condenser plant maintained a suitable vacuum. Crew showed ability.

Ladder Trucks.—In service 27, in reserve 8. See Table No. 13. Four of the aerial trucks are of the spring raising type and one has a compressed air hoist; in addition to an aerial ladder 75 to 85 feet long, each carries eight to eleven other ladders, including two extensions 40 to 60 feet long, one short extension, two pompiers and at least one ladder with roof hooks.

The ordinary trucks are of local make, with a double ladder rack, box or skeleton frame and no tiller. They carry an unusually large amount of ladders, a total of 386 to 499 feet, and are especially adapted for getting around in narrow streets. Each is equipped with a 65-foot ground extension and at least two other extension ladders 40 feet or longer, five to eight 25 to 35 feet long, a short extension, two pompiers and two roof ladders.

Each combination truck is equipped with two 35-gallon chemical tanks, 300 feet of chemical hose and from six to fourteen ladders, according to the character of the district in which it is located. The ladders include at least one extension, 40 feet or more in length, a short extension and five to twelve plain ladders, two of which have roof hooks.

Each truck has a nearly uniform equipment of tools and appliances and has rubber tires. They are

generally in excellent condition. In reserve are two manual-raising aerials, three ordinary and three combination trucks. They are of old patterns and are not all in good condition.

Water Towers.—See Table No. 13. In service three; two can be raised by either chemicals or water pressure and on these the tower nozzle can be elevated 55 feet; the other is raised by water pressure only and tower extends 65 feet above the ground. Towers 1 and 3 have turret deck pipes.

Two-inch tips are generally used on the tower nozzles and guy ropes are attached to steady the masts when fully extended. One of the towers is in only fair condition.

TABLE NO. 15.—STEAM FIRE ENGINES.

Engine No.	Make.	Size.	Put in Service.	Renewals.	Diam., Inches. Cylinder.	Diam., Inches. Pump.	Stroke, Inches.	Rated Capacity, Gallons per Minute.	Results of Engine Tests. Gallons Obtained at Test.	Per Cent. of Rated Capacity Obtained.	Steam Pressure, Pounds.	Net Water Pressure, Pounds.	Speed, Revolutions per Minute.	* Slip of Pumps, per Cent.
1	Clapp & Jones	Second	1890	1899 and 1909, boiler rebuilt.	8½	5	7	750	606	81	79	103	280	6
2	American	Second	1890	1904, boiler rebuilt.	8	4¾	8	700	...	...	...	...	...	...
3	American	First	1904	...	9	5½	8	900	...	...	...	...	...	...
4	Amoskeag	First	1907	...	8½	5	8	750	...	...	...	...	...	...
5	American	Second	1907	...	8	4¾	8	700	...	...	...	...	...	...
6	Amoskeag	Second	1870	1900, boiler rebuilt.	7⅝	4⅝	8	650	...	...	...	...	...	...
7	Clapp & Jones	First	1893	1907, boiler rebuilt.	9	5½	8	900	823	91	85	103	252	3
8	Metropolitan	First	1907	...	9	5½	8	900	...	...	...	...	...	...
9	Amoskeag	Second	1910	...	7⅝	4⅝	8	650	...	...	...	...	...	...
10	American	Second	1886	1903, boiler rebuilt.	8	4¾	8	700	...	...	...	...	...	...
11	Amoskeag	Third	1879	1905, boiler rebuilt.	6⅞	4¼	8	550	...	...	...	...	...	...
12	Amoskeag	Third	1882	1904, boiler rebuilt.	6⅞	4¼	8	550	526	96	97	100	294	4
13	Clapp & Jones	Second	1890	1899, boiler rebuilt.	8½	5	7	750	...	...	...	...	...	...
14	Amoskeag	Second	1872	1907, boiler rebuilt.	7⅝	4⅝	8	650	651	100	91	103	306	3
15	Amoskeag	First	1904	...	8½	5	8	750	719	96	70	111	287	3
16	Amoskeag	Second	1872	1893 and 1910, boiler rebuilt.	7⅝	4½	8	600	...	...	...	...	...	...
17	Amoskeag	Third	1886	1906, boiler rebuilt.	6⅞	4¼	8	550	...	...	...	...	...	...
18	Amoskeag	Fourth	1890	1905, boiler rebuilt.	6⅛	4	8	500	...	...	...	...	...	...
19	Amoskeag	Third	1896	1909, boiler rebuilt.	6⅞	4¼	8	550	...	...	...	...	...	...
20	American	Second	1882	1900, boiler rebuilt.	8	4¾	8	700	...	...	...	...	...	...
21	Amoskeag	Second	1870	1907, boiler rebuilt.	7⅝	4⅝	8	650	...	...	...	...	...	...
22	Amoskeag	Second	1896	...	7⅝	4⅝	8	650	...	...	...	...	...	...
23	American	Second	1890	1901, boiler rebuilt.	8	4¾	8	700	656	94	64	90	293	5
24	Amoskeag	Second	1867	1904, boiler rebuilt.	7⅝	4⅝	8	650	...	...	...	...	...	...
25	Metropolitan	First	1910	...	9	5½	8	900	843	94	89	91	260	3
26	Amoskeag	First	1909	...	8½	5⅛	8	800	...	...	...	...	...	...
27	American	Second	1902	...	8	4¾	8	700	...	...	...	...	...	...
28	Amoskeag	Third	1882	1904, boiler rebuilt.	6⅞	4¼	8	550	...	...	...	...	...	...
29	Amoskeag	Second	1910	...	7⅝	4⅝	8	650	632	97	83	105	285	3
30	Amoskeag	Fourth	1890	1910, boiler rebuilt.	6⅛	4	8	500	...	...	...	...	...	...
32	Amoskeag	Second	1907	...	7⅝	4⅝	8	650	...	...	...	...	...	...
33	Amoskeag	Second	1909	...	7⅝	4⅝	8	650	...	...	...	...	...	...
34	Amoskeag	Second	1869	1904, boiler rebuilt.	7⅝	4⅝	8	650	...	...	...	...	...	...
35	Amoskeag	Extra first	1898	...	9¼	5¾	8	1,000	...	...	...	...	...	...
36	Amoskeag	Second	1867	1904, boiler rebuilt.	7⅝	4⅝	8	650	...	...	...	...	...	...
37	Amoskeag	Third	1896	1907, boiler rebuilt.	6⅞	4¼	8	550	...	...	...	...	...	...
38	Amoskeag	Extra first	1897	...	9½	5¾	8	1,000	1,028	103	126	127	308	4
39	Amoskeag	First	1901	...	8½	5	8	750	730	97	102	114	288	3
40	Amoskeag	First	1906	...	8½	5	8	750	...	...	...	...	...	...
41	Amoskeag	Second	1909	...	7⅝	4⅝	8	650	...	...	...	...	...	...
42	Amoskeag	Third	1884	1907, boiler rebuilt.	6⅞	4¼	8	550	534	97	88	88	299	3
43	Amoskeag	Second	1867	1904, boiler rebuilt.	7⅝	4⅝	8	650	...	...	...	...	...	...
45	Clapp & Jones	Third	1895	...	7	4⅜	7	600	...	...	...	...	...	...
46	Amoskeag	Fourth	1890	1902, boiler rebuilt.	6⅛	4	8	500	...	...	...	...	...	...

* Reasonable slip of pumps in good condition, less than 7 per cent.

TABLE No. 16.—FIRE BOATS.—EQUIPMENT AND TESTS.

Number.	Put in Service.	Hull.	Boilers.	Propelling Engine.	Speed, Knots per Hour.	Turret Nozzles.	$3\frac{1}{2}''$ Hose Connections.	Fire Pumps.					Results of Tests.					
								Type, Make.	Size, Inches. Cylinders.	Pump.	Stroke.	Rated Capacity, Gallons per Minute.	Gallons Obtained.	Per Cent. of Rated Capacity Obtained.	Steam Pressure, Pounds.	Net Water Pressure, Pounds.	Revolutions per Minute.	Slip of Pumps, per Cent.
Engine 44.	1895	Wood.	2. Vertical, with horse-shoe furnaces 12′6″ × 86″ diameter	Compound condensing 18″ × 36″ × 24″	12	3	12	Compound, Double Acting Duplex. American Fire Engine Company.	$12\frac{3}{4}$ & 18 $12\frac{3}{4}$ & 18	10 10	11 11	3,000 3,000	4,603	77	86	133	165 173	12 7
Engine 47.	1909	Wood.	2. Scotch Marine, 10′9″ × 132″ diameter	Compound condensing 17″ × 36″ × 24″	12	4	12	Compound, Double Acting Duplex. Blake & Knowles	12 & 22 12 & 22	10 10	11 11	3,000 3,000	5,390	90	124	176	196 190	5 6
Engine 31*	*	Wood.	1. Babcock and Wilcox Marine	2 Compound condensing $10\frac{1}{2}''$ × 22″ × 16″	12	4	8	Duplex Double Acting. American Fire Engine Company.	16	9	10	2,400	Not in service.					

* Not completed.

Chemical Engines.—In service 10, in reserve 3. See Table No. 13. The chemical engines have vertical tanks; 4 are single 100-gallon tank machines and the others have double tanks of 50 or 80 gallons capacity each. Each carries from 350 to 500 feet of ¾-inch chemical hose, usually in two lines. Engines appear in fairly good condition, but the tanks are in some cases over 20 years old and need frequent inspection and testing.

Hose Wagons.—In service, 4 combination and 44 plain hose wagons; in reserve, one combination and 5 plain hose wagons. See Table No. 13. The plain hose wagons, in service with engine companies, are well built and mostly in good condition. The few light wagons now in service will be replaced by the department's standard type, which has a centrally divided body so that two sizes of hose may be carried or two lines can be laid at the same time. Each carries at least 1,000 feet of hose, two shut-off nozzles, two portable extinguishers, a deluge set and a good supply of minor equipment.

One of the combination wagons is in service with Engine 33; the other three, including one Knox automobile, operate as chemical engines. They are in generally good condition.

A large hose wagon loaded with 1,200 feet of 3-inch hose and equipped with deluge sets and large nozzles for use in connection with the salt water main is kept at Station 4.

Hose.—The 2½-, 3- and 3½-inch hose is nearly all double, or equivalent interwoven, jacket cotton, rubber-lined and is purchased under guarantees of 3 years' service and 320 pounds pressure. Each section is tested with 320 pounds water pressure when delivered. All of the hose is tested annually with 200 pounds pressure. Hose is well cared for, and dried in towers or on racks; it is shifted on wagons after using and at least once in 10 days. Most companies are provided with complete extra shifts. The 2½-inch hose used on the fire boats is rubber; it is kept in the holds, and spare shifts are not provided. The 3½-inch hose is carried only on the fire boats; it is kept in lockers in the deck houses.

About 4,000 feet of new hose is usually kept on hand, although this is not the case at the present time. Of the total of 104,150 feet of 2½-, 3- and 3½-inch hose now in service, about 59 per cent. has been purchased within 4 years, and less than 15 per cent. has been used more than eight years. Little trouble from burst hose is experienced at fires; out of a total of 945 sections in use at 2 fires on August 9th, 1910, 29 sections were reported burst; in all but two cases it was not necessary to replace these sections in the lines as burst hose jackets were used. A good grade of 4-ply rubber hose is used for chemical service.

Couplings.—Hose couplings are of the usual screw type. Three-inch hose, except that provided especially for use in connection with the salt water fire main, has 2½-inch couplings.

Connection.	Nominal Size, Inches.	Outside Diam. Male Thread, Inches	Threads per Inch.
Hose and hydrants	2½	3 1/16	7
Hose for use with salt water mains	3	3⅝	7
Hydrants in salt water mains	3	3⅝	7
Hose and fire boat connections	3½	4¼	8
Hydrant and suction connections	4½	5¾	4
Hose (adjoining towns and cities)	2½	3 1/16	7
Hydrants (adjoining towns and cities)	4½	5¾	4
Worcester hose	2½	3 1/16	7½
Providence hose	2½	3 1/16	7½
Fall River hose	2½	3	8
National Standard hose	2½	3 1/16	7½
	4½	5¾	4

Engines carry reducers for connecting 4½-inch suctions to 2½-inch hydrant outlets, and those apt to be called to Cambridge carry special couplings for Cambridge hydrants. The fire boats carry an assortment of reducer couplings for making up 3½-inch and either 3- or 2½-inch hose. The salt water hose wagon carries 3-inch by 2½-inch reducer couplings.

Reducer couplings, for attaching chemical hose to 2½-inch hose, are carried on all apparatus provided with chemical tanks.

Minor Equipment.—Minor equipment is largely standardized and apparatus is well supplied. Each hose wagon and truck carries portable extinguishers, and extra chemical charges are carried for all large chemical tanks. Each hose wagon carries an axe, a door opener, burst-hose jacket, deluge set, hose hoist, two or more play pipes, Eastman nozzle holders, two shut-off nozzles with 1- to 1¼-inch tips, an open nozzle, plaster hooks, a life line and a revolving nozzle, and in most cases, life belts, a life net and a siamese connection. The ladder trucks, in addition to the usual appliances, carry, in most cases, marine torches and emergency surgical kits, and those in the downtown districts carry rope guns.

The special appliances for throwing streams, in addition to the deluge sets and revolving nozzles on each wagon, include cellar pipes on each ladder truck and nine monitor turret pipes with 1½- to 2½-inch tips on hose wagon, 3 on the water towers and those on the fire boats. The fire boats, the wagon for use with the salt water main and the wrecking wagon carry large deluge sets throwing up to 3-inch streams, and pipes with 1⅜- to 1¾-inch tips for use with the large hose. Single outlet hydrant chucks are kept at most of the fire stations. Emergency connections are provided so that engines from other stations may be attached to the heater. Universal hose couplings are kept in the downtown stations.

Engine Fuel.—Cannel coal from Warwick, Va., is used for the fire engines and Pocahontas coal on the fire boats. One or two tons are kept at each

company's quarters, and 34 fuel depots are maintained, at each of which from 6 to 30 tons is kept. Each fire boat carries from 12 to 30 tons of coal. At each depot a fuel wagon is kept loaded with 1½ to 2 tons of coal in sacks, and an equal amount in sacks is usually stored on an elevated platform for convenience in quick loading; at some of the fuel depots near the down-town district two fuel wagons stand loaded. These wagons are substantially built and mainly in good condition.

Chiefs' Automobiles and Buggies.—The commissioner, chief and deputy chiefs are provided with automobiles, and each district chief makes use of a horse-drawn, rubber-tired buggy. The veterinary, superintendent of fire alarm and supervisor of engines have light rigs.

Miscellaneous Wagons.—A wrecking wagon is in service at headquarters; it carries screw jacks, rope, tackle blocks, heavy bars, machinists' and blacksmith tools, vise, hydrant chucks, deluge sets, and a reserve supply of engine oil. One or more wagons are kept in each district for hauling supplies, salting hydrants, etc. Hose pungs are kept in outlying districts.

Repair Shop.—The department repair shop was burned on August 9th, 1910, and a contract has recently been made to replace it with a 4-story reinforced concrete building. This will be equipped with modern tools and facilities for making all repairs to apparatus and equipment. A temporary shop was established after the fire and the apparatus has been kept in good condition, despite the handicaps under which the work has been done.

The repair shop branch of the department is under the direction of Superintendent E. M. Byington, who is especially well qualified for this position. A force of 40 mechanics, foremen and laborers is employed, and 10 to 12 regular members of the fire force are detailed to this branch. A captain is acting as assistant superintendent, and a lieutenant as foreman of the hose and harness shop.

Horses.—In service, 368; in reserve, 45. The veterinary surgeon has general supervision over all horses and is in charge of the veterinary hospital. A horse ambulance, operating table and other modern facilities are provided. One or more spare horses are stationed in each district and, whenever a heavy fall of snow occurs, additional horses are procured for each piece of apparatus. Arrangements are made by the district chiefs with large stables to supply these horses on short notice, so that engines, ladder trucks and water towers then have five horses, and hose wagons and chemical engines 3 horses each; harness for this emergency use is kept at each station. Harness is made and kept in repair at the department repair shop.

Horses are in most cases shod at the nearest shop doing good work and preference must be given to the department work. Spare horses are used while others are being shod. Horses are purchased and sold on the recommendation of the veterinary surgeon, are well cared for and regularly exercised.

Fire Stations.—Brick, 58; frame, 3. The fire stations are mostly fairly well arranged and in fair condition, although many of them are old and were not originally intended for a paid department. Stall trips and lighting switches are operated from the patrol desks. Engine heaters and hose towers or racks are provided where needed; the last are, in many cases, not well arranged. The quarters most notably in need of alterations or repairs are those of Engine 44, the fire boat, Engine 25, Ladders 7, 8 and 14, and Chemical 3. The basements of Engines 4 and 37 are in poor condition. Engines 26 and 35 are located practically in an alley. The stable and sanitary arrangements in most of the stations are excellent.

One frame and two brick stations have been built since the previous inspection.

OPERATION.—Discipline.—Regulations governing the department are made by the commissioner. The ordinary rules are embodied in a printed manual and special cases are covered by general orders. The regulations appear to be well enforced and discipline is generally good. Charges are made by or through the superior officers to the commissioner, who investigates, grants a hearing when necessary and gives a decision, which is final. Penalties of fines, suspension, curtailment of days off, reduction in rank and dismissal are imposed.

Drills and Training.—New members attend the drill school during the probationary period; each is required to devote two hours a day for 30 days and to qualify to the satisfaction of the instructor. There is a well appointed tower and yard at headquarters, and a lieutenant is in charge of the instruction. The men are trained in the use of all appliances carried on the apparatus, and in addition are given a course of pompier ladder drills and in rescue work with ropes, belts and life nets.

Company drills are held weekly, usually under the direction of the district chiefs. During suitable weather, ladder trucks are taken out, ladders raised, and all appliances are inspected; in engine companies, the equipment is inspected and lines of hose are run from the engines, which are coupled to hydrants.

Candidates for promotion to assistant engineer are detailed for 30 days or more to the engineers school at the repair shop. Here they are thoroughly trained in running and caring for engines and are instructed in the details of the construction of the different makes of engines and boilers in use in the department.

Response to Alarms.—The usual response to box alarms is as follows; the amount of apparatus given for second and subsequent alarms includes that which has already responded:

USUAL RESPONSE TO ALARMS.

District.	Alarm.	Engine Companies.	Ladder Trucks.	Chemical Apparatus.*	Chief Officers.
Congested Value, Wholesale and Storage Warehouse, Water Front. City Proper and Charlestown.....	1	4	3	1 or 2	3
	2	8	4 or 5	2 or 3	6
	3	12	6 or 7	3 or 4	8
	4	16	7 or 8	3 to 5	10
	5	20	7 or 8	3 to 6	11
Other Closely Built in Charlestown, East Boston and South Boston, and Back Bay Garage...	1	3	2	2 or 3	1 or 2
	2	6 or 7	3 or 4	3 or 4	4 or 5
	3	10 or 11	4 to 6	3 to 5	6 to 8
	4	13 to 15	4 to 7	3 to 6	8 to 10
East Boston, Roxbury and Dorchester.....	1	3	2	1 or 2	1 or 2
	2	6	3	2 or 3	4
	3	9 or 10	3 or 4	3 or 4	5
	4	12 to 14	3 to 5	3 to 5	6
Outlying, Brighton and West Roxbury.....	1	2 or 3	1 or 2	1 or 2	1
	2	4 or 5	2 or 3	2 to 4	2 or 3
	3	6 or 7	3 or 4	3 to 5	3 or 4

* Including tanks on ladder trucks.

A water tower answers either first or second alarms from localities where its services may be needed, and a second tower is assigned on a subsequent alarm; the third tower follows in some cases. One fire boat is assigned to first alarms on or close to the water front as far east as L street, and a second boat responds on second or third alarms. The new light draft fire boat will be assigned to cover points along the Mystic and Charles rivers and Chelsea creek which cannot be reached by the larger boats at all times. One of the boats responds to fires on the islands in the harbor. The self-propelling engines respond only on second alarms, except when the other engines in the same stations are out.

The chief goes to first alarms from the more important congested districts and attends such other fires as he thinks necessary, usually all second alarms. The senior deputy responds to box alarms in the downtown business districts and the South Boston warehouse section, and one of the deputies responds to second alarms. Two district chiefs respond on each alarm in the central part of the city, and at least one in the outlying districts.

The running card was revised in 1910 and is now arranged on a card system. It provides for moving companies to cover districts left unprotected on second and subsequent alarms, up to the fifth. A sixth alarm is general and calls out the entire department, except 7 engine, 11 ladder and 7 chemical companies. The city is divided for this purpose into three sections, and the locations of the companies remaining in service is designated according to the section in which the fire occurs. These locations are selected with a view of giving the best protection for the city possible with the small amount of apparatus left in service. It is expected that additional protection under these conditions will be afforded from adjoining towns and cities under the mutual aid plan outlined in the Fire Department Auxiliaries.

One ladder and one engine company, and a chemical engine if the location is near its quarters, respond to an automatic or A. D. T. alarm. The nearest company responds to a telephone alarm; a box is pulled if assistance is needed. District chiefs are notified of still or A. D. T. alarms within their districts, but do not respond in all cases. The men on watch at each station are held responsible for the correct receipt of alarms and, during the night, teams are not hitched nor men awakened unless the company is to respond, move to another station or is assigned on the next alarm from the box. Companies due to respond on second alarms hitch and remain for fifteen minutes. Many stations are provided with only one sliding pole and companies are slow in getting out of quarters.

Streets, except in outlying districts, are generally in fair condition for fast running, and grades into the more important districts are mainly slight. There are steep grades in Charlestown on Bunker Hill, in South Boston on Telegraph Hill, in the city proper on Beacon Hill, and in several outlying localities.

Apparatus moving between the city proper and East Boston is dependent on ferry service, which necessarily causes some delay, even though alarms are sounded at the ferry houses and boats are frequently held at the slips for the apparatus.

Serious delays at drawbridges are infrequent. Apparatus has often been delayed at a grade railroad crossing on Main street, Charlestown; in other parts of the city, grade crossings have been mostly abolished. Some points on the water front are inaccessible at low tide for the two larger fire boats, or they may have to wait for the tide before returning to quarters. To reach points along Albany street on Fort Point channel and South bay, the boats have to go through six drawbridges and are necessarily slow.

Fire Methods.—The records show that during the past three years, water from large hose was used on only 25 per cent. of the fires handled by the department; 49 per cent. were extinguished by chemicals, and the remaining 26 per cent. by other small appliances. Lines of 2½-inch hose are always laid, when signs of fire are seen, and are carried into the building to back up chemical streams. Two chemical lines are often used from one piece of apparatus. Single hose lines with 1- to 1¼-inch shut-off nozzles are used at ordinary fires, and the water pressure is often sufficient to supply these streams without the engines working. Engines are coupled to hydrants on arriving and fires are lighted under boilers on leaving quarters. The regulations call for all engine companies responding on second alarms to make use of the deluge set unless otherwise specifically directed, but monitor pipes have been placed on a number of hose wagons and are used, whenever possible, instead of deluge sets to supply the heavy streams. The water towers are also used in such cases, and two

are often effectively operated at one fire; thus a large number of 1½- to 2¼-inch streams are sometimes concentrated. Three-inch hose is used to some extent in the downtown districts, the wagons with the self-propelling engines are provided with it exclusively and others carry it in one side for use when lines are made up into the water towers or monitor pipes. Hose is carried up stairways and ladders to upper stories; roof lines are hoisted by means of ropes and the hose hoist provided for the purpose. Wagons are arranged to lay two lines at the same time, and this is done when deluge sets and monitor nozzles are to be used immediately. Outside connections for the department's use on standpipes, cellar pipes and automatic sprinkler equipments are seldom provided, except on the more recent installations; it is doubtful if any have ever been used. The ladder companies are expected to properly ventilate a building on fire, and this is usually accomplished promptly. Watch lines from hydrants are left at ruins so that companies may return to quarters more promptly. Hose is properly stowed in wagons before returning and wet hose is shifted immediately on reaching quarters. Drivers are not expected to assist at fires otherwise than by supplying engine fuel; one or more engine drivers are assigned, on each alarm, for this purpose. The fire alarm force and public service corporation employees attend to removing wires and cutting off current, when necessary.

Communication is established with the fire alarm office by the first chief's driver arriving at the box from which the alarm was sent. The drivers are telegraphers and use the Morse set provided in each box. Salvage work is done by the underwriters' protective department.

Use of Separate Salt Water Fire Mains.—The fire boat connection of this system is at Central Wharf, and Engine 44 does not have to move from its present berth to make connections; it can furnish water in ten minutes, provided it is at the dock, although it does not connect to the system except on orders. A special hose wagon carrying 1,200 feet of 3-inch hose with 3-inch couplings is kept in reserve. Reducers have to be used if other hose is attached to the hydrants. The system was used on a fire, for the first time, during the past year, as the fire department officials have considered it only an auxiliary to be used to prevent a fire from spreading. The pipe is kept filled with fresh water; tests have been made and the pipes flushed once a year.

Building Inspections.—District chiefs and company officers inspect all important buildings in their respective districts; most of the buildings are thoroughly inspected four times a year. Card catalog records of the larger buildings are kept by the district chiefs and reports of inspections are made weekly to the commissioner. Besides noting the individual features of buildings, the officers request occupants to remove rubbish and correct other hazardous conditions; such cases are specially reported to the district chief, who follows them up, and if owner or occupants do not comply with requests, a report is made to the commissioner, who, after notifying the owners, turns the matter over to the building department and the local underwriters, as the fire department is without authority to enforce its requests. The fire appliances in all school houses are inspected once a month, and the present commissioner has asked for special inspections of the means of egress from factories, hotels, lodging-houses, assembly halls, etc. At the present time a special inspection of premises where gasolene is stored is being made.

Hydrant Inspection.—Each company inspects all hydrants in its district monthly to see that they are accessible. During freezing weather, the covers of all flush hydrants in each district are salted three times a week, or oftener, by two members of the company, and snow is removed as soon as possible after it falls.

Theatre Inspection.—All theatres, moving picture theatres and assembly halls are inspected weekly by a lieutenant or a captain and frequently by the district chief. The fire appliances are inspected, and violations of laws are promptly reported and followed up. Before licenses are issued to theatres and other places of amusement the fire appliances must be approved by the chief in whose district the building is located. Two employees of each theatre are appointed special watchmen by the commissioner and instructed in fire duties by the district chief.

Reports and Records.—Records are kept at each fire station of all events, and include fire duty of the company, roster of members, supplies received and buildings inspected. Captains make daily reports of the members off duty, on leave, etc., and monthly reports of the hose, coal and feed on hand and the condition of equipment. District chiefs make detail reports of every fire attended; engineers report monthly to the suprevisor as to the condition of their engines. Suitable forms are provided for all the routine reports. The headquarters records include a very complete fire record, covering alarms, causes and mode of extinguishing fires, companies responding, and insurance statistics; department accounts, card records of each member, files of orders, contracts, transactions, and reports, are also kept in good form. The commissioner makes an annual report to the mayor covering in summarized and tabulated form the organization and work performed by the department, the location and valuation of fire stations, descriptions of apparatus, statement of expenditures, fire statistics, alarms and causes of fires and method of extinguishing them, and, usually, recommendations for bettering the service.

In the report of the commissioner for 1910, recommendations were made for improving the condition of some of the fire stations and for a high pressure system.

RECENT IMPROVEMENTS.—Since the report made in 1906 by the National Board of Fire Underwriters, the following improvements have been made: All of the call men have been replaced by permanent members; a total of 81 men has been added to the force; two new districts have been established and two additional district chiefs appointed, and the department has been organized into two divisions; one new fire boat has been put into service and a new smaller fire boat is almost completed; an automobile combination hose wagon has been put in service at Forest Hills, and the former combination hose company at Ashmont has been made an engine company, as recommended. Ten new engines and 4 new aerial trucks have been purchased, and one aerial truck has been equipped with a quick raising hoist.

These and minor improvements made comply with recommendations of the previous report, Nos. 20, 24, 27, 28 in part, 31, 32, 34 and 37.

The department repair shop, burned in August, 1910, is being replaced by a larger building, which will be completed in a few months.

CONCLUSIONS.—The fire department is a well organized, efficient force and is under good supervision. The financial support has been fairly liberal, but fire protection has not been strengthened in proportion to the growth of the city. The gross loss per fire continues to be very large, but this reflects on the general structural conditions rather than deficiencies of the fire department. The method of making appointments tends to eliminate politics; discipline is good and the force is directed by experienced and capable officers. The training of new members is such as to quickly develop individual efficiency, but the number of superannuated members in active service is noticeably large.

The high values and conflagration possibilities, not only in the congested value district but in other important districts, are such as to require an excessive response of apparatus to serious fires, thus leaving other parts of the city practically unprotected; this condition, together with other important features given in greater detail in a recent special report of the National Board of Fire Underwriters, makes the early installation of a special high pressure system, covering the congested value district, very urgent and the most effective method of strengthening the department.

The fire force, while nominally strong, is seriously weakened by the allowances of time off under the present arrangements; even companies in the most important districts are often reduced to 4 or 5 men in quarters during 11 out of 24 hours. At such times, companies responding to fires must assist one another, with a loss of valuable time at the most critical stage. This is the most serious deficiency of any pertaining to the department and demands immediate attention. The number of men in each company should be increased, or at least provisions made for relief men to take the places of all members on vacations, sick and special leave or details, and in some cases, for those on days off.

The distribution of apparatus is mainly good throughout the city, but a few localities in outlying districts will eventually require better protection, and there is need of more apparatus for large fires in several more important sections. The chemical and ladder service is excellent and much improvement in the aerial ladder equipment has been made in the past few years.

Engines are of modern types and of sizes suited to the districts where located. They are kept in good repair and those tested indicate a generally excellent condition of this equipment. The engineers proved themselves mainly skillful and accustomed to operating engines to capacity. The two fire boats now in service are well built and equipped, and a new smaller boat will soon be completed, which, owing to its light draft, will reach districts not at present covered. At the tests, the oldest boat delivered less than 77 per cent. of its capacity, due in part to the size and condition of its boiler equipment. Other apparatus is of excellent type, substantially built and generally in good condition; some of the chemical apparatus, however, cannot be expected to do service much longer on account of its age. Hose is of fairly good quality and the supply is ample; it appears to be in fair condition, and is properly cared for and tested. A considerable amount of 3-inch hose, with 2½-inch couplings, is in use, and shows that the department realizes the advantages of its greater water carrying capacity. Minor equipment for hose wagons and ladder trucks is standardized, and they are well supplied. The special appliances for large streams are numerous. An ample supply of good engine fuel is distributed so as to be quickly available in any part of the city.

Repairs to apparatus and equipment are promptly made at the repair shop; a new building now in course of construction will provide increased facilities for this important branch of the department. A modern veterinary hospital is maintained and horses receive good care. The fire stations are mainly well located, although many are old and in need of remodeling.

The several features of the usual response to alarms for ordinary fires, including the amount of apparatus assigned and companies moving to cover vacant stations, are good, except that the number of men responding with apparatus is sometimes seriously deficient. The regular assignments for fifth and general alarms seriously weaken the protection of the rest of the city. It would appear that some intermediate assignments would be an improvement, as they would leave more companies in service for the contingency of a second serious fire, result in less confusion and disorder, would not require companies to make such long runs, and would be used more frequently. The city is divided by waterways, which make the concentration of apparatus in the detached districts more than

ordinarily difficult, especially after a second alarm. Streets are generally in good condition for fast running, but are narrow and congested with traffic during the day in the downtown business districts.

Fire methods employed are modern and effective in most particulars. The separate salt water main has been used only once for a fire, although installed 13 years. This may be attributed to delay formerly necessary in connecting a fire boat to it, and to the disposition of the department to consider it only as an auxiliary. Its scope is limited, as it is a single main dependent on a fire boat for supply.

The inspections made by the officers are thorough and tend to reduce hazardous conditions as well as to inform the officers of local conditions useful in fire fighting. Reports and records are well kept and cover essential features.

The improvements since the previous report by the National Board have strengthened the organization and the protection of the water front.

FIRE ALARM SYSTEM.

ORGANIZATION.—The system is in charge of a superintendent, who is responsible directly to the fire commissioner. All appointments to the force are made in the same manner as to the fire force. Mr. Geo. L. Fickett was made superintendent in November, 1910, previous to which time he had been an electrical inspector for the New England Insurance Exchange and city electrician of Portland, Me.

The chief operator, Richard Donahue, has recently been appointed acting assistant superintendent and is in charge in the absence of the superintendent. He is 53 years of age and has been in the fire alarm service 21 years.

The fire alarm force is as follows, compared with that at the time of the former inspection.

	Oct., 1905.	Jan., 1911.
Superintendent	1	1
Assistant Superintendent and Chief Operator	1	1
Operators	6	4
Assistant Operators	3	6
Foreman of Construction	1	1
Assistant Foreman	1	1
Machinists	2	2
Repairmen, Wiremen and Linemen	14	18
Cablemen	0	2
Hostler	0	1
Clerk	0	1
	29	38

The operators are telegraphers and have been in the fire alarm service 15 to 32 years; long terms of service have been the rule. The former assistant superintendent, who is 71 years of age, and an operator, 64 years of age, have recently been granted 3 months' leave and will probably be retired. Two other employees are 65 years of age.

HEADQUARTERS.—The fire alarm headquarters are on the top floor of a 4-story fireproof building erected in 1894, and occupied entirely by the fire department as headquarters and a fire station. The ordinary hazards of gas and electric lighting and steam heating from an outside plant exist. There is considerable unnecessary woodwork in and about the operating room, but the building is in good condition and free from rubbish. Outside sprinklers are provided on two sides of the building, where it is exposed across a 40-foot street by a wood-working plant of large size; an outside standpipe and portable extinguishers on each floor are also provided; fire shutters have been placed on the windows of the operating room. The fire alarm repair shop, storage rooms and stable occupy an adjoining 4-story mill constructed building.

EQUIPMENT.—Apparatus at Headquarters.—Of manual type, mostly furnished by the Gamewell Fire Alarm Company in 1894-95. On each box circuit, in addition to a solenoid which releases a revolving cylinder showing a list of boxes on the circuit, is a relay connecting through a local open circuit to the receiving instruments; each local circuit connects 10 box-circuit relays in multiple and operates an individual pen on a Pearce inking register, an annunciator showing circuit number and either a small tapper and buzzer or a telegraph sounder. A switch is provided so that the tapper, buzzer and sounder can be cut out. A spare set of receiving instruments is provided to which any box circuit can be switched in case of trouble with its regular set.

Two 4-dial manual transmitters of the Pearce type are regularly used in sending out tapper and gong signals. Each has a capacity of four 4-figure signals. A 10-pen Pearce inking register records all outgoing tapper signals and small individual tappers denote the operation of these circuits. A time stamp records the start of each box and tapper signal. Two multiple contact keys on the tapper circuits and a crank actuated, multiple contact, current reverser on the gong circuits, both operated manually, provide a second method of transmitting alarms.

Provision was made in the original installation for connecting box and tapper circuits through a controlling relay and a local circuit, so that by throwing a switch incoming box signals would be automatically transmitted to the tapper circuits. This has never been in regular use and is not considered reliable as it permits alarms received at the same time to interfere. Gang switches, controlling all of the gong circuits, allow gong signals to be sent to the northern or southern division of the city, or both, as desired. Gong circuits have relay, sounder and key sets similar to those of the box circuits and are sometimes used for telegraphing.

On the protector and testing boards are mounted mechanical circuit breakers, ½-ampere fuses, grounded lightning arresters and line rheostats. A

voltmeter, an ammeter and individual galvanometers are provided on the testing board, but are not conveniently arranged for tests. There are many superfluous switches and connections. A Gamewell automatic circuit tester tests all circuits once an hour.

Apparatus at Fire Stations.—A small tapper bell on a tapper circuit and a large gong on one of the gong circuits are installed in each fire station. Switches allow gong signals to be cut out if the company does not respond on incoming or following alarms. Punch registers on the tapper circuits have recently been installed in two fire stations.

Gongs and Tappers Elsewhere.—A gong and tapper are installed in each of the protective department stations, the repair shop, veterinary hospital, headquarters offices, fire alarm shop and residence of the foreman of construction and of the retired superintendent. A tapper is installed at the quarters of each deputy and district chief, the office and residence of the commissioner and superintendent of fire alarm, the city hall, police headquarters and reporters room, and in fire stations in Brookline, Cambridge, Milton and Somerville. Gongs are installed in each police station, 3 water works pumping stations, 2 water works offices, 9 stations of the Boston Elevated Railway, substations of the Edison Electric Company, 2 gas company's works, 2 ferry houses, the City Hospital and the wire department, and in Chelsea and Newton fire stations.

Boxes.—*Description.*—Total number, 745. All are of plain, interfering type, with sector pull and of the Crane, Municipal and Gamewell makes.

Public boxes	567
School boxes, outside of buildings	37
" " inside of buildings	87
Private boxes, outside of buildings	11
" " inside of buildings	43
	745
Boxes with keyless doors:	
Public	566
School	37
Private	4
	607
Boxes with key doors:	
Public	1
School	87
Private	50
	138

Each box is provided with a shunt, Morse key, signal relay and lightning arrester and most of them have platinum point key breaks and metal character wheels. Boxes in the city proper are mostly mounted on special posts with red lights above and provided with room for cable terminals; twenty-nine are placed on the outside of fire stations and also have red lights indicating location. The private and school boxes are accessible to the public in some cases as indicated above; the others are in most cases located prominently on street corners and, with one exception, have keyless doors which are not self-acting.

An inspection of 57 boxes was made by an engineer of the National Board in February, 1911, to ascertain their condition; this was found to be generally excellent. Some were dingy and needed painting; this has not been done in several years.

Distribution.—In the congested value district, a box is generally within 500 feet of any building; the few locations where the distance exceeds 600 feet are noted below; private boxes inaccessible to the public are not considered. Boxes are well distributed in most of the city proper, South Boston, Charlestown, East Boston and Roxbury; elsewhere the distribution is much below a proper standard. In several cases localities were noted where 2 and sometimes 3 boxes are within 800 feet of each other. School boxes are mostly inside the buildings and add little to the general protection of the districts in which they are located. The more important localities in the city proper which are too remote from boxes are:

Locality.	Distance to Nearest Box, feet.
Fruit and Garden streets	750
Clinton street, near Mercantile street	700
Doane street, between Kilby and Broad streets	700
Commercial Wharf	800
Congress street and Gilbert place	800
Snow Hill and Hull streets	750
South Margin and Hale streets	650
Beverly and Traverse streets	700
Beacon street, near Fairfield street	1,000
Falmouth and Belvidere streets	1,000

Circuits.—There are 68 outside circuits, all nominally closed and not grounded; these include 44 for boxes, 13 for gongs, 10 for tappers and one for the signalling system in connection with the salt water main.

Six of the box circuits are overloaded. All circuits are underground in the city proper and in a large part of the rest of the city; cables extend well out into Dorchester, Forest Hill, Brighton and Charlestown. The total length of circuits is about 914.3 miles, of which 65 per cent. is underground. The underground work is being extended annually. Cables are of No. 14 rubber-covered copper wire in lead sheathing and are in duct systems with telephone cables only. Terminal posts, set at the street curb, are placed at junction of overhead and underground and where cables are connected. These are mostly wooden boxes and contain terminal binding posts mounted on wooden backs. Similar terminal plates are provided in fire alarm box posts, and 3 or 4 circuits are looped into each box. Cables are not provided with terminal heads nor are they sealed even where close to the bottom of a cellar or to the ground in a terminal post. All circuits to Charlestown cross one bridge and are in a braid-covered cable in iron conduit to the draw with a submarine cable under the channel; a similar crossing is made to South Boston, where there are three cables. The East Boston circuits

cross by way of the tunnel in ducts with telephone cables.

Box circuits are generally interlaced and as far as possible only one side of a circuit is along one duct route. Sufficient spare wires are available in most of the main cables. Overhead wires are mostly No. 9 bare iron and are on the top cross-arms of poles; in some cases poles carrying from 2,000 to 4,500 volts are used in outlying districts. Some overhead wires are in aerial cables, placed below other lines on the same pole. Leads down poles to boxes are of No. 14, double-braided, rubber-covered copper wire mostly in braid-covered cable secured to poles by metal straps, and enter pipes about 6 feet above boxes.

Wiring in fire stations is in most cases poor, cotton-covered office wire under staples being largely used. At headquarters, underground cable enters a brick duct from manhole and extends to a terminal room where ends are opened out and connected to a slate terminal board. The back of this board is a mass of loose wires, supported on wood work.

Braid-covered cables of No. 14 rubber-covered copper wire extend in iron conduits to the protector boards in the operating room. The connections between the various parts of the headquarters equipment are mostly of No. 14 single-braided rubber-covered copper beneath a raised wooden platform, and are loose or are bunched and secured to wooden joists by metal straps; loose, cotton-covered office wire and twisted pairs of office wire are also used; the outside circuits pass among these connections before reaching the protectors. Circuits are protected at headquarters by electro-mechanical circuit breakers, ½-ampere fuses and grounded lightning arresters, and at junction of overhead and underground work by 2-ampere enclosed fuses; lightning arresters in boxes are not grounded.

Batteries.—No batteries are used on the fire alarm circuits, current being supplied by motor-generators. There are 41 machines, of which 17 are ordinarily used for outside and 2 for local circuits. During stormy weather, about twice the number ordinarily used are put on the box circuits so that at such times not over 4 circuits are on one machine; at other times 4 or more circuits are supplied by each machine, leaving one-half in reserve for emergency use. Current is taken from the machines at from 90 to 105 volts, and, by means of a plug switchboard, any circuit or group of circuits may be connected to any of the generators; the voltage required on different circuits is obtained by the use of individual rheostats. The machines are driven either from an Edison 110-volt circuit or by current from the department's power plant, where engines, boilers and dynamos are in duplicate. The generators may be switched from one source of power to the other without breaking the current and are well mounted, in a room used exclusively for the purpose. This method of supplying energy has thus far given reliable service but is not economical. Measurements taken of the power used by the motor-generators and of that on the circuits show that only about 9 per cent. of the current taken from the power circuit is actually used.

FIRE DEPARTMENT TELEPHONE SYSTEM.—A telephone system connects all fire stations and residences and quarters of superior officers. The switchboard is of the local battery type and is connected with the Tremont exchange of the local telephone company by 2 trunk lines. There are individual circuits to most of chiefs' telephones, but from 3 to 8 fire stations are on one circuit. Circuits are owned by the department and all equipment is maintained by it. A second switchboard of the same type, so placed that one operator may attend to both, is used as a branch exchange for the headquarters building. There are five trunk lines from the Tremont exchange, one from Oxford and one from police headquarters connected to this board. Most of the telephones in the headquarters building are connected to both switchboards and there are several telephones for special use not connected through these switchboards. The equipment, except circuits, is leased from the New England Telephone & Telegraph Company and the second system is maintained by it.

OPERATION.—Routine and Maintenance.—The operating force is on duty in 3 shifts of 8 hours each; at least 3 men are always present in the operating room and during the day the assistant superintendent is usually at the office. The superintendent and assistant superintendent usually report at headquarters on a third alarm and in case of serious line trouble. The construction force is at the shop adjoining when not engaged on outside work; two trouble men are always on duty here; others may be called in by telephone if needed at night.

Circuits are tested by each operator in charge when coming on watch, the galvonometers and Morse keys being used. The automatic tester is set to operate hourly and the motor-generators are inspected hourly. At 12 o'clock a test blow is sent over the gong circuits daily by means of the hand transmitter. Boxes have been tested 7 to 10 times during the past year. Two men are now assigned to this work and in the future all boxes will be tested about once in three weeks. A journal is kept by the chief operator showing all alarms, trouble and tests; record of the voltage of each generator is made by each watch. The galvanometer readings of grounds are recorded daily and the voltage and current on circuits tri-weekly. A daily report is made of box inspections showing by whom tested and received, time, etc. Records in card form are kept of the boxes, showing location, date of installation, repairs, circuit, type of mounting and dates when pulled for test and for fire.

Similar records of each circuit show the boxes, instruments and test points on each, and dates when serious trouble occurred. General and detail plans of all underground construction are on file and plans of the overhead construction are being made. The trouble records are not sufficiently in detail. Most of the trouble appears to consist of grounded circuits, and of gongs and tappers out of order. Storms sometimes open a number of circuits. A severe wind and snow storm beginning December 26th, 1909, opened 24 box, all of the gong, 2 of the tapper and several of the telephone circuits; many of these were not in proper working condition for 4 days and several for a much longer time, during which a large number of boxes were out of service.

Alarm Transmission.—*Box Alarms.*—The receipt of a box alarm at the central office is by a buzzer and tapper and on the register. One operator sets the number on the tapper transmitter, verifying the count with the second operator after one complete round and then sends three rounds at fast time over the tapper circuits. While these are going out the second operator sets the number on the gong transmitter and sends out 2 rounds at slow time over the gong circuits, after the tappers have finished striking. When alarms are received simultaneously on 2 circuits connected to the same set of receiving instruments, one of the local circuits has to be opened, cutting the alarm on that circuit off of all receiving instruments; the signal must then be read from the box circuit relay.

Automatic Alarms.—Automatic alarms are transmitted from the office of the alarm company to the fire stations nearest the location of the fire and are not sounded at fire headquarters; immediate notice of them is given by telephone.

Telephone and Watch Service Alarms.—Alarms received by telephone are usually forwarded to the company nearest the fire and to the district chief; if call indicates a serious fire the nearest box may be sent out. Watch service alarms are received on a stamp register and by telephone; they are handled as telephone alarms.

During the year 1910, there were 4,003 alarms received, of which 2,055 were box, 173 automatic, 45 A. D. T., and 1,730 telephone; of these, 974 were false or needless.

RECENT IMPROVEMENTS.—Since the report made by National Board engineers in 1906, the following improvements have been made: 74 boxes, and 8 box circuits have been added to the system and underground work has been extended by 253 miles of conductors; the use of tower bells has been discontinued, 4 of the oldest members of the force have been retired, and the operating force increased by one and the construction force by 8 men. Plans of the overhead lines are being made, new testing instruments and a new telephone switchboard are to be installed, the central office is to be rewired and the underground work will be extended during the present year.

These and other changes made comply wholly or in part with the following recommendations embodied in the previous report, Nos. 39, 40, 41, 43, 47 and 48. No. 50 is not necessary as call members have been dispensed with.

CONCLUSIONS.—The fire alarm system is of a suitable type for the city, and is properly a branch of the fire department. The direct management of the system and of the fire alarm force is now thoroughly competent and progressive; the recent retirement of the older members of the operating force will benefit the service; additional retirements or changes would improve the construction force, which is now larger than has been found necessary for other cities which have as large fire alarm systems.

The headquarters apparatus, although in a building of fireproof construction, is not properly protected and the room contains much unnecessary woodwork. The building is in a hazardous district, as was well illustrated during the past year when a lumber yard and several nearby buildings were burned. A fire alarm headquarters should preferably be out of the zone of possible conflagration, in a fireproof building containing no woodwork and be provided with every possible safeguard against any contingency even remotely liable to interrupt the service.

The headquarters apparatus provides some of the essential features for a manually operated system; but there is a large amount of cabinet work. obsolete equipment is occupying valuable space which might be used for the necessary improvements, and open local circuits are used.

The arrangement intended to automatically transmit alarms from a box circuit over the tapper circuits has never been used for this purpose, as it allows simultaneous alarms to interfere and transmit mixed or incorrect signals to the fire stations. Testing instruments are not conveniently installed and galvanometers are still in use for ground tests.

The present arrangement of the local receiving instruments is unsatisfactory as they are connected in multiple to the box circuits so that simultaneous alarms cannot be properly received if coming in on circuits connected to the same set of receiving instruments.

The tapper and gong transmitters are of good type, and suitable reserve instruments are provided for sending alarms by hand. The tappers and gongs at fire stations are satisfactory but registers are not a part of the regular installation. The fire alarm boxes are not of improved type, and many are dingy, but they are kept in good condition, and locations are indicated by red lights in all business districts. The distribution is generally good in business districts and the older closely built-up sections; elsewhere more boxes are needed. Box circuits are interlaced, a desirable feature with the type of box in use, but unnecessary with an approved non-interfering type. Gong and tapper

circuits are both of the closed type and are not overloaded.

The outside construction work is fair and a large portion of the circuits is underground, but cables are not properly protected at their ends and the terminals provided are on wooden bases, insecurely housed. Leads down poles to boxes from overhead lines are too frequently on poles with high-potential circuits and are not properly installed.

Circuits in fire stations are not, in general, well installed, and at headquarters the wiring is seriously at fault, as the outside circuits pass among office connections before reaching protectors and much loose wire with unapproved insulation is used. The masses of loose wire on the back of the terminal board and beneath the platform in the operating room invite serious trouble which could readily cripple the whole system.

The protectors against abnormal and foreign currents at headquarters are not arranged in the proper order and the lightning arresters are of an inferior type; fuses are placed at junction of overhead and underground circuits, but lightning arresters are lacking at such points and those in fire alarm boxes are not grounded.

The motor-generators used instead of storage batteries for supplying current for the system have so far proved reliable, but they are more subject to injury and breakdown, are less economical than storage batteries and must be supplied with a driving current continually, while the latter could operate the system for several days without charging in case of emergency.

The present fire department telephone facilities are fairly good; a new switchboard in place of the two now used will be a distinct improvement. The system is not of the common battery type but generally gives satisfactory service; direct lines to each public telephone exchange and to each fire station should be provided. Boxes are properly tested but circuit tests could be improved and changes are being made to do this. Records, except of troubles, are quite complete.

The method of receiving alarms is not satisfactory under some conditions, owing to the arrangement of the receiving instruments; the general method of transmitting alarms is good.

FIRE DEPARTMENT AUXILIARIES.

SALVAGE CORPS OR PROTECTIVE DEPARTMENT.—General.—The Boston Protective Department is maintained by the insurance companies doing business in Boston, under the supervision of a board of 9 directors, 3 of whom are chosen annually. Mr. A. S. Lovett is president of the present board.

The department is under the direct management of a superintendent appointed by the directors for an indefinite term. Mr. Samuel Abbott has been superintendent since 1890. At the time of appointment he was a district chief of the Boston Fire Department.

Total membership, 66, an increase of 5 since the previous report; the former call members have been made permanent, making an increase of 9 in permanent members.

Companies.—The force is divided into 3 double companies, supplemented by 3 members stationed with ladder companies of the city fire department. Each company is divided into two sections. The two central companies have 13 and 14 permanent members, respectively, and each also has 9, so-called, auxiliary members. The Roxbury company has 12 permanent members. The auxiliary men are on duty from 7 P. M. to 6 A. M.; the permanent men have the same time off as in the fire department.

Equipment.—There are 3 horse-drawn and 3 motor-propelled wagons in service, and 2 horse-drawn wagons in reserve. The equipment on each wagon consists of 25 covers, two 18-foot extension ladders, a life net, two life lines, door openers, ram, and other minor appliances, except that the smaller automobile at Station 3 carries only 15 covers.

Three horses are used on each horse-drawn wagon in the winter and 2 in the summer. The superintendent is provided with a horse and buggy.

Operation.—Two wagons, one from each of the downtown stations, respond to first alarms in the city proper north of Kneeland street, followed by 2 others on second alarms. One of the motor-propelled wagons goes to all fires in other parts of the city; when available they are also used to cover any vacant station. The superintendent responds to second alarms in mercantile and high-value residential districts and to all third alarms, and the men assigned to ladder companies respond with the apparatus. A wagon responds to water flow alarms from sprinklered buildings, and automatic and still alarms in the congested value district.

The department's stations are well adapted for their purpose and are in good condition. The officers inspect all sprinkler equipments monthly and make written reports. Reports and records are complete and well kept, and are summarized in the superintendent's annual report.

The corps is well organized and, through the use of automobiles, covers the entire city. The fire and protective departments co-operate effectively to their mutual benefit.

FIRE MARSHAL.—Duties performed by Deputy-Chief George C. Neal of the State Police. Three assistants cover the Metropolitan District and investigate fires of suspicious origin; all fires are reported by the fire department within 24 hours of their occurrence. Records of fires are kept, including the cause, value, insurance and loss involved in each; these show the number of incendiary fires per year during the past 6 years to range from 45 to 12, representing a percentage of 3.27 to .85 of the total number of fires; the proportion of fires of incendiary and unknown origin is steadily decreasing.