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SALEM CONFLAGRATION
AND
DESTRUCTION OF THE MILLS OF
NAUMKEAG STEAM COTTON CO.
JUNE 25, 1914.

INSPECTION DEPARTMENT
Associated Factory
Mutual Fire Insurance Companies,
31 Milk Street, Boston, Mass.

INSPECTION DEPARTMENT
OF THE
Associated Factory
Mutual Fire Insurance Companies,
31 MILK STREET, BOSTON.

THE CONFLAGRATION AT SALEM, MASS.,
AND THE DESTRUCTION OF THE
MILLS OF THE NAUMKEAG
STEAM COTTON CO.
JUNE 25, 1914.

This pamphlet is substantially a reprint of the Department Fire Report, prepared by Mr. C. H. Smith, and is circulated that all Members may have the full advantage of this experience.

The conflagration destroyed about one-third of the city, and the total property loss was estimated at from \$14,000,000 to \$16,000,000. The loss to the Mutual Companies was confined with one small exception to the Naumkeag Steam Cotton Company amounting to about \$3,000,000.

The city water supply and the public fire department were of no service in protecting the Naumkeag Mill property, and the mill equipment and forces alone could not withstand the conflagration conditions.

The Naumkeag property stood on a point of land bounded on three sides by Salem Harbor. During the early years of its development the land on the fourth side was vacant, or sparsely settled. Gradually this territory became covered with wooden buildings; and this fact had been appreciated but it was felt that the protective equipment available could safeguard the mill.

The chief lesson is that to defend a property successfully against a conflagration all buildings must be fire resistant toward the point of attack. There should also be a liberal water supply at good pressure, and ample equipment to bring the water to any point. It should be remembered that when a conflagration is raging the public fire department will probably be unable to give assistance, so that the protected property is likely to be thrown on its own resources.

The tremendous power of an advancing conflagration with the fire-brands, flame, smoke, and heat carried before it will overcome anything except the best construction protected with reliable apparatus and defended by courageous men, disciplined to do good team work.

SALEM CONFLAGRATION.

This fire, which burned over two hundred and fifty-three acres, started at Proctor and Boston streets, over a mile west from the property of the Naumkeag Steam Cotton Company. The fire started about 1.37 P. M. in a group of four-story frame buildings with attached sheds, occupied by tenants for the manufacture of shoe stock, heels, counters, etc. It is said that the tenant in whose premises the fire started manufactured a "tip filler," used to repair patent leather shoes, which involved the use of celluloid scrap and inflam-

mable solvents to cut it. There was an explosion, cause not definitely known, that spread the fire throughout the building in an incredibly short time, so that almost immediately the whole structure was a mass of flames.

The fire spread to a large three-story tenement house and restaurant on one side and to a frame leather factory on the other, and the conflagration had started. The fire department was powerless from the first. While the apparatus soon arrived at the fire, it was short-handed at the start, and it is said that some difficulty was experienced with a chuck hydrant, so that there was delay about getting the first stream on to the fire. There should have been plenty of water, as there was a 20-inch main in this street. There was a moderate west wind blowing that carried the flames through this district, which contained many tanneries, shoe shops, etc., some of considerable size and largely of frame construction. The fire reached Jefferson Avenue at about 3 P. M., was carried by flying brands over the railroad yards and a block of dwellings into the best residential section of the city, continuing to the water front. The fire early gained conflagration proportions on the west side of the Boston & Maine tracks, and spread itself on the east side of the tracks by the sparks and embers carried by the wind.

At about 6 P. M. the wind shifted to west-southwest, blowing directly toward the Naumkeag Steam Cotton Company and the intervening district of three and four story wooden flat dwellings, closely built up and of cheap construction. The conflagration progressed with great rapidity in this flimsy tenement district, and bore down upon the mill property, taking it broadside. The progress of the fire in the mill buildings will be given in detail below.

The fire was carried across South River, burning the lumber yards and coal pockets in this section, and was stopped on Derby Street, where a fighting chance was given by a re-

inforced concrete laundry, a hospital of good construction, and the open spaces of the cemetery and public square, assisted by a slight shifting of the wind to the north. A group of firemen concentrated their efforts to stop the fire in the frame buildings in the vicinity of Derby and Curtis streets. The fire was finally brought under control about 2 A. M., June 26.

In the path of the conflagration there was practically nothing of a combustible nature left unburned. Toward the border of the fire zone however some buildings possessing automatic sprinkler protection or some special feature of construction calculated to act as a fire stop escaped total destruction. Two interesting photographs of examples of this kind are shown at the end of this book, although these properties were not insured by the companies insuring the Naumkeag Mills.

WEATHER CONDITIONS.

There is no weather bureau station at Salem, but the official records at Boston for temperature and wind velocity June 25 are as below. Probably there was not much difference between the two places, except as wind velocity might be affected by the fire and local conditions.

Time	Temperature	Wind Velocity (Miles per hr.)	Time	Temperature	Wind Velocity (Miles per hr.)
1 P. M.	93	13	8 P. M.	84	13
2	94	15	9	82	11
3	94	15	10	79	12
4	92	15	11	—	10
5	91	15	12	—	12
6	89	15	1 A. M.	—	9
7	86	14	2	—	7

The fire reached the Naumkeag Mills, from its starting point, a little over a mile away, in about five hours. It was

under control in about twelve hours, burning over two hundred and fifty-three acres. Comparing other conflagrations: Chelsea, burned area, 275 acres, 6 hrs. before under control. Baltimore, " " 140 " 25 " " " " Paterson, " " 57 " 18 " " " " "

FIRE DEPARTMENT.

The Salem Fire Department has four steam fire engines with twenty-three permanent men, the rest of the personnel being call men. It is understood that at the time of the fire five of the permanent men were having their day off, and that others were at dinner. A general alarm was sent in four minutes after the first alarm for this fire, and help was asked from neighboring towns and cities as early as 1.50 P. M. The calls for assistance were very generally responded to, and steam fire engines or automobile fire engines arrived from the following places:

Peabody I at 1.55 P. M., I at 2.25 P. M.
 Lynn I at 2.10 P. M., I at 6.00 P. M.
 Swampscott I at 2.05 P. M.
 Boston I at 4.00 P. M., 2 at 6.00 P. M. and 2 later

The following cities furnished one fire engine each: Chelsea, Somerville, Everett, Gloucester, Marblehead, Beverly, Lawrence, Reading, Wakefield, and Newburyport. Also an automobile fire engine built by Fore River Shipbuilding Company rendered assistance. These with the Salem engines, made a total of twenty-five. Beside these there was other fire apparatus sent. The Militia were called out at 2.30 P. M. to do police duty.

The engines from out of town, in a good many cases, were unable at first to give much assistance after they had arrived. There was some difficulty about connecting up with

hydrants on account of difference in hose connections, and because it was necessary to use chuck hydrants. The early part of the fire the tide was out, and steamers were unable to draft from salt water, although at least two cases were noted, by eye witnesses, where the steamers failed to take advantage of opportunities for such suction when it was available. In another case, the crew of an automobile engine failed to realize the possibility of connecting to a hydrant through a 2½-inch connection when a 4-inch outlet was lacking, until prompted, and after they had made the connection, those in charge were unable to start their pump through lack of familiarity with the apparatus.

Dynamite was used in an effort to stop the progress of the fire, but with indifferent success, as its effect in some cases was said to simply scatter burning material.

PUBLIC WATER SUPPLY.

The supply comes from Wenham Lake and Longham Meadows. Water is pumped from the lake by two 5,000,000-gallon pumps, directly into the mains or to the distributing reservoir in Beverly, 20,000,000 gallons capacity. The usual static pressure in Salem is about fifty pounds. A record of pressures obtained during the fire from the recording gage in the Water Works Office on Church Street is appended. This gage is at a slightly higher level than the Naumkeag yard. During this fire the pumping was directly into the mains against check valves at reservoir. The reservoir contained 19,500,000 gallons the morning of the fire, and lost 500,000 gallons during the fire. From the pumping station and reservoir there are two pipes, 30-inch and 20-inch, which reach the city by independent routes. The Beverly system is connected with both of these mains by 8-inch connections from 12-inch mains. Danvers has an 8-inch connection from

a 12-inch main to the 30-inch Salem pipe. Peabody has a 16-inch connection to a 16-inch Salem main that ties into the 20-inch and 30-inch pipes. These several connections were all opened during the progress of the fire to reinforce the Salem supply. The times at which these several connections were opened and closed is shown on the diagram of pressures attached to this report, the same diagram also showing an estimate of the amount of water that was furnished. There is also a 6-inch connection with the Marblehead Water Works, and this was opened, but was almost immediately closed to conserve the water in the Marblehead standpipe, as the Marblehead pump, which is operated by electricity from Salem, was soon obliged to shut down.

There is a considerable amount of cement-lined pipe in the Salem distribution system. This did not give any trouble during the fire, but there was apparently some hesitancy about turning in the higher pressures from surrounding towns until it was apparent that there was sufficient draft from the Salem mains so that the pressure would not build up.

NAUMKEAG STEAM COTTON COMPANY

CONSTRUCTION.

The main manufacturing buildings were five stories high, and of good standard mill construction with brick walls. There was a one-story Weave Shed with sawtooth roof, a four-story reinforced concrete Storehouse for finished goods, some frame Cotton Houses, and a frame building occupied as a Cloth Hall. The general arrangement of these buildings is shown on the accompanying view, a small scale reproduction of the insurance plan. As a whole the construction of the property was rated fully good.

EXPOSURE.

The mill yard was surrounded by water on three sides; on the other was a tenement district that constituted an increasing exposure as the district grew.

PROTECTION.

The property was thoroughly sprinklered. The yard pipe system had recently been strengthened, and was modern and ample. The primary supply was from two 8-inch connections from two 12-inch city mains, fed about 1,000 feet distant by a 20-inch main. The normal static pressure was 50 pounds, and this service was capable of supplying a draft of about 860 gallons per minute at 40 pounds pressure under usual conditions.

There were two 1,000-gallon Underwriter pumps well located in the pump room north of Boiler House, and taking suction from South River.

STORY OF THE FIRE AT THE MILL.

Mr. French, of the Arkwright Mutual Fire Insurance Company, and Mr. Teague, of the Inspection Department, both reached Salem about 5 o'clock, before the fire had changed its direction so as to threaten the mill. They found that the mill had shut down, that there was a considerable number of men on duty under the direction of the Chief Engineer and the Chief Draftsman, that hose lines were laid out, and that the pumps had been started and were reported to be operating satisfactorily. Apparently everything was in readiness to make a stand, if necessary. The city water pressure at this time was about 20 pounds. They then went into the town, but as soon as it became apparent that the mill was threatened, returned, and assisted in fighting the fire, and were of the last to leave the yard, so that an

accurate description of the burning of the mill property is available.

When the fire got into the tenement district south and west of East Gardner, Lynch, and Peabody streets, it progressed with great rapidity, and the wind in the vicinity appeared very strong, this probably due to the heat of the conflagration. The mill help had several streams going at this time to wet down the roofs of the mill buildings, and also used their streams to put out fires as they started in the tenement district to the south and west of the property.

The first direct attack on the mill property was shortly before 7 o'clock, when fire reached the wooden Cotton Storehouses at the south side of the plant. A stream was brought into action at this point, but the heat was so intense from the burning tenement houses that those handling the hose were driven back, although they were able to reach the hydrant and shut off the water, thus conserving the supply. Outside sprinklers on the west side of the Weave Shed had been turned on some fifteen minutes before, and at first gave good results, but finally the intense heat striking No. 6 Weave Shed, overcame the sprinklers, and seemed to turn the water into steam. The men who were fighting the fire in East Gardner Street and on the roof of No. 6, using three hose streams, were unable to stay long, and had to draw back toward Lynch Street, leaving this building and the storehouses to the protection of the sprinklers.

In the meantime the fire with seemingly renewed energy had attacked the whole fifteen hundred feet of mill frontage on East Gardner, Lynch, and Peabody streets. There were not enough men available to cover this long line, and it was almost impossible to secure co-operation between the different groups of fire fighters. In addition many of the mill firemen had seen their houses totally destroyed, and probably were not sure that their wives and children were safe. This took the

heart out of many of them, and some had been obliged to leave earlier, so that it was difficult to muster a sufficient force to handle the hose lines expeditiously. This lack of effective organization explains why the defense by the mill fire brigade was weaker than it should have been along the street in the early stages of the fire. The city water pressure was less than ten pounds, but at this time good pressure from the pumps was available at the yard hydrants.

There was no piece of public fire apparatus and no public firemen near the mill, or close enough to the district to be of any help. The few men at the mill were most unfortunately left to their own resources, and apparently no effort was made to render assistance to them.

The wooden tops of No. 1 Mill towers took fire, and men rushed to them and tore off the burning wood; fire pails were also used on the roof. Fire showed itself in No. 5 Mill, and a number of men were sent to check it. The Office began to burn, also the tenement block on Lynch Street. Two or three hose streams from the mill pumps were being used along Lynch and Peabody streets. A determined attempt was made to keep the southern side of the Cloth Hall wet, but the men could not endure the heat and smoke, were driven back, and the fire entered this building.

Up to this time the hose streams had shown strong pressure and one hundred to one hundred and twenty-five pounds had been maintained at the pumps, showing that there was ample water supply for all purposes, but now, at about 9 p. m., one of the pumps developed a loose cross-head and had to be shut down. With but one pump in service the pressure fell. Only one or two hose streams were in use at this time as it was impossible to work them in the terrific heat, and these were shut off immediately to reserve water for the sprinklers, but the pressure continued to fall, so that it was reduced to about ten pounds. Presumably the system was being

bled by the increasing number of sprinklers that were opening. This was undoubtedly a vital moment, as it is likely that where sprinklers were open and holding the fire in the mill property, the reduction in the pressure permitted the fire to gain an advantage that was never recovered. While pressure was kept up the sprinklers in No. 6 Mill had seemed to be checking the fire there.

Machinists worked vigorously on the defective pump and it was repaired in about fifteen minutes, but when again started, the pressure could not be brought above twenty pounds. An attempt was made to shut off the yard main on East Gardner Street, but the heat was so intense that the valve in front of No. 1 Mill could not be reached.

The upper story of the Cloth Hall was now in flames. The cornices and wooden window-casings of No. 1 Mill were blazing, and as the doom of this mill was sealed, as there was not sufficient pressure to reach the highest sprinklers, the sectional controlling valves in the yard at No. 1 Picker House and at the western end of No. 3 were closed, cutting off the pumps from No. 1 Mill and all south of it. This resulted in the restoration of pressure to the balance of the yard pipe system, and about one hundred and twenty pounds was available. The floors and walls of No. 1 began to fall in about twenty minutes.

Up to now (about 9.30 P. M.) the men engaged in fighting the fire in the mill yard had an avenue of escape across the bridge over South River, but with property burning on both sides of the bridge, the Chief Engineer decided that the safety of his men depended on immediate retreat. There were not boats enough for all the party to escape by water, but five or six men remained with the Chief Draftsman and the two Mutual men, and steam was kept up on the boilers, and the pumps were kept running in the hope that the remainder of the property might be saved by maintaining

pressure on the sprinkler system. A boat was held on the water-front for the escape of this party. Soon after 10 o'clock, the increasing heat and smoke made breathing difficult in the Boiler House and the Pump Room. Fire in No. 1 Picker House threatened the line of retreat, and with a good fire under the boilers and the pumps left running under full speed, the men were forced to leave. Later the fire attacked No. 2 Mill, No. 3, and then No. 5, the fire in No. 5 apparently starting at the east end and burning back against the wind.

SALVAGE.

The only buildings in the entire plant that escaped destruction were No. 10 Storehouse and No. 1 Storehouse. The former building originally was a gasometer, has joisted roof covered with asbestos roof covering, non-combustible cornice, and brick walls. There were but two openings in the walls, protected by double fire doors. Very likely owing to the fact that the doors were double, the fire did not enter, as the outer door was somewhat warped. There were several skylights glazed with thick glass in wooden frames, all of which are intact. It is a low building, and although the platform around it was burned, it probably was rather sheltered, and in this way escaped destruction. It contained 1,300 to 1,500 bales of cotton, which is undamaged.

Number 1 Storehouse is of reinforced concrete construction, walls, roof, and floors. There are some small wired glass windows in metal sash, mostly fixed, which are protected in addition by wood tin-clad shutters on the inside of the building, hinged at the top and swinging vertically, and these were held open normally by fusible links. These links all melted and allowed the shutters to close. Two stories of this building contained finished goods in cases, but although

the building was exposed to the full force of the conflagration on its west side, so completely did the window protection do its work, and so well did the concrete walls stand up against the flame that fire did not enter the building. Not a sprinkler opened, and the contents are intact. The damage to the building is so slight as to be almost negligible, and while the wired glass windows in several cases suffered so much heat that they softened and bulged out at places, and in one case completely melted out, yet the interior shutters withstood the attack, and did not allow the fire to enter the building.

LESSONS.

1. The power of a conflagration is well nigh invincible as contrasted with the hazard of the usual immediate exposure.

2. A property cannot be safeguarded against the conflagration hazard by ordinary means of protection, but must be physically able to withstand it; that is, walls must be incombustible, of brick or concrete, cornices and window-casings must be fire-proof, and window openings protected. Window protection will require shutters or wired glass, or both, and open sprinklers may sometimes be a valuable aid. Wired-glass windows alone will not withstand a severe exposure fire, and heat is easily transmitted through them.

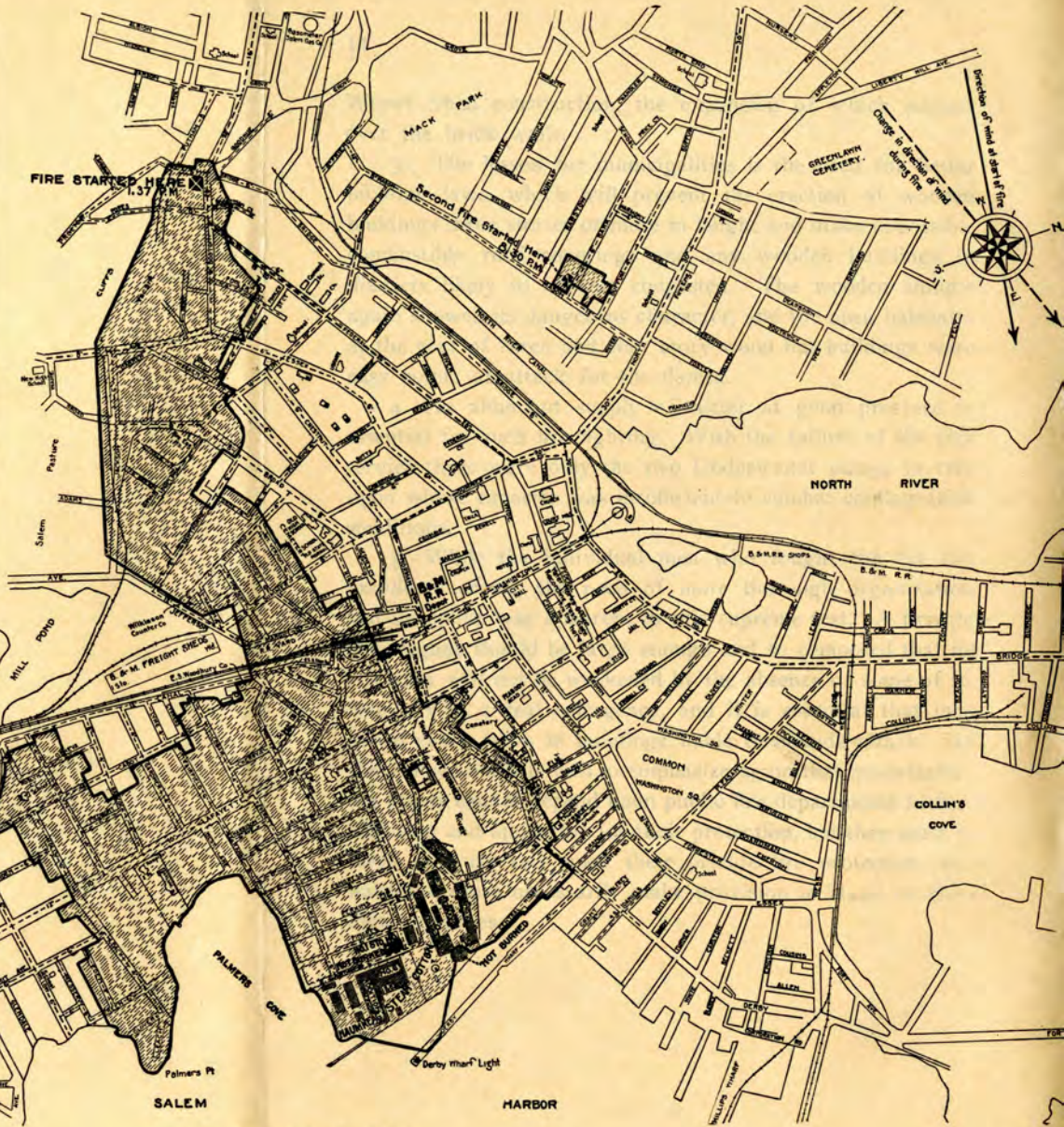
This is forcibly demonstrated by the experience with the concrete Storehouse No. 1 and the non-combustible Salem Electric Light Plant, both of these buildings being in the zone swept by fire, and practically escaping unharmed. In contrast were the vulnerable wooden cornices and window-casings of the mills, which offered an easy point of attack, and the unprotected steel beams in the

Weave Shed construction, the expansion of which pushed over the brick walls.

3. The lesson for municipalities is the need for better building laws, which will prevent the erection of wooden buildings three stories or more in height and make impossible combustible roof coverings and any wooden buildings in districts likely to become congested. The wooden shingle again showed its dangerous character, and the open balconies at the rear of three and four story wood flat buildings were easy points of attack for the flames.

4. An abundant supply of water at good pressure is essential for such fire fighting. With the failure of the city service there were only the two Underwriter pumps to rely upon whose capacity was insufficient to combat conflagration conditions.

5. While the individual men who fought the fire did excellent service, the need of more thorough organization and discipline was apparent in this supreme test. A private fire brigade should be large enough and so composed that its efficiency will not be weakened by the absence of some of its members in a real emergency, and it is essential that men guard every room in buildings liable to outside attack. In this connection it is well to emphasize again that manufacturing plants cannot depend upon public fire departments to furnish men and apparatus for their protection, but they must in large measure rely upon their private fire protection, and must therefore necessarily make provision to stand on their own resources.



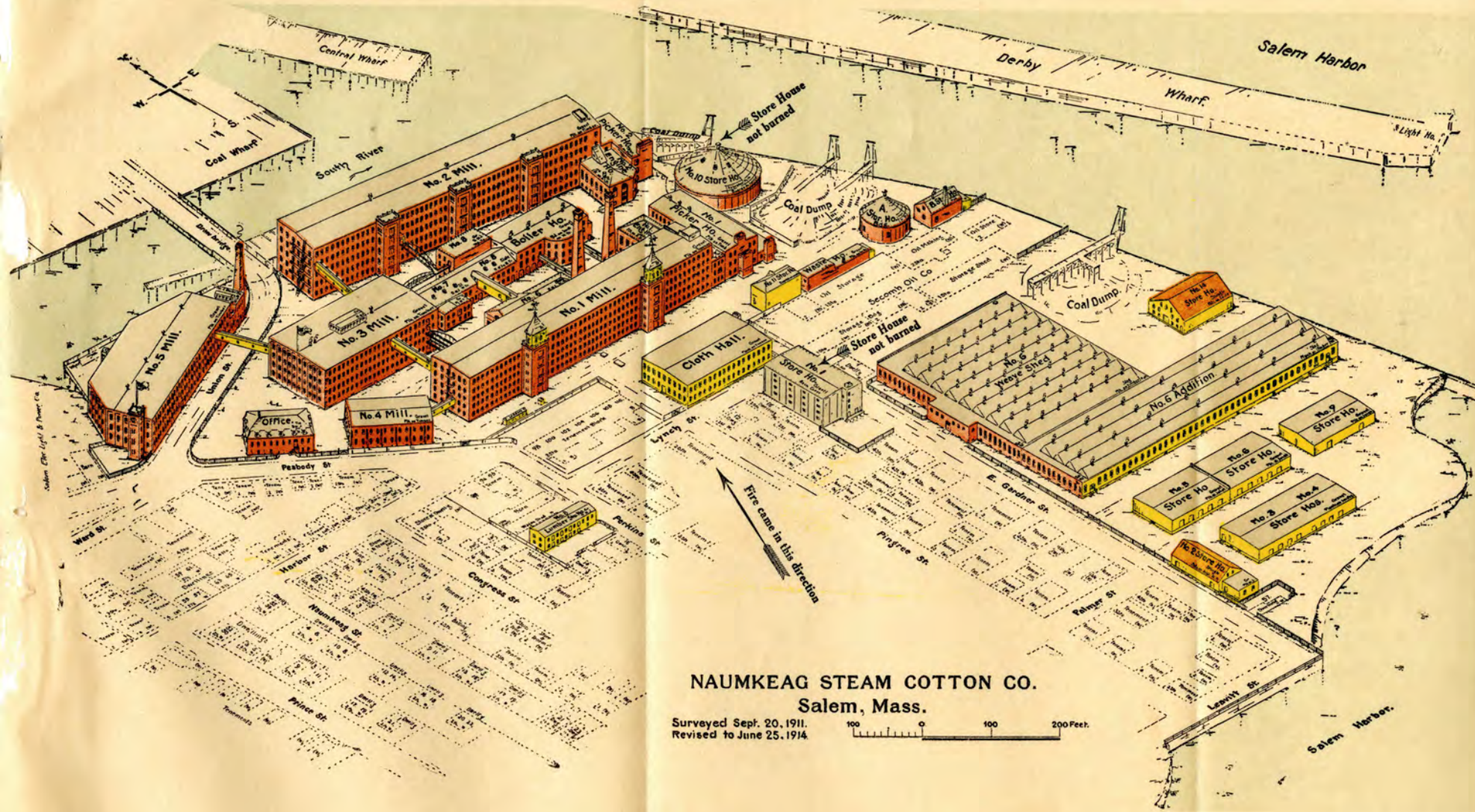
PART OF SALEM, MASS.
Showing Area Burned in Conflagration,
June 25, 1914.

Scale of feet
0 200 400 600 800 1000



A PORTION OF THE AREA OF SALEM BURNED OVER.

Reproduced from Aeroplane view taken by the Photographer of the Boston Journal. The ruins of the Naumkeag Mills are in the distance at top of picture. Note undamaged concrete Storehouse in the middle of background.



NAUMKEAG STEAM COTTON CO.
Salem, Mass.

Surveyed Sept. 20, 1911.
 Revised to June 25, 1914.

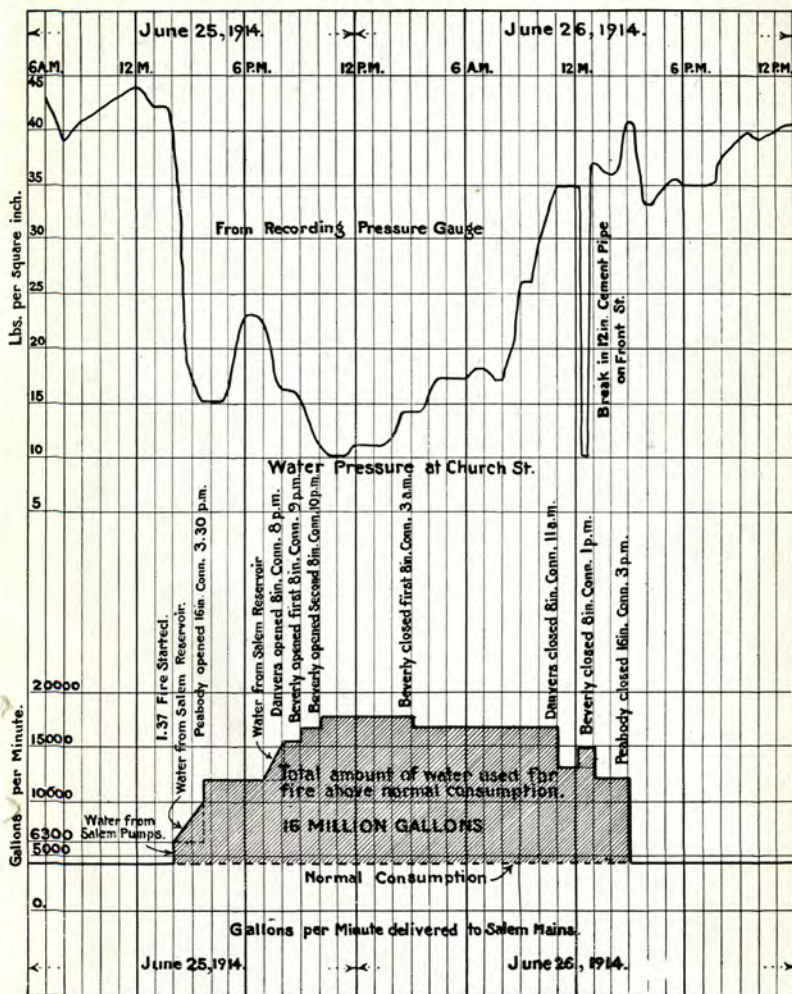


Store House
not burned

Store House
not burned

Fire came in this direction

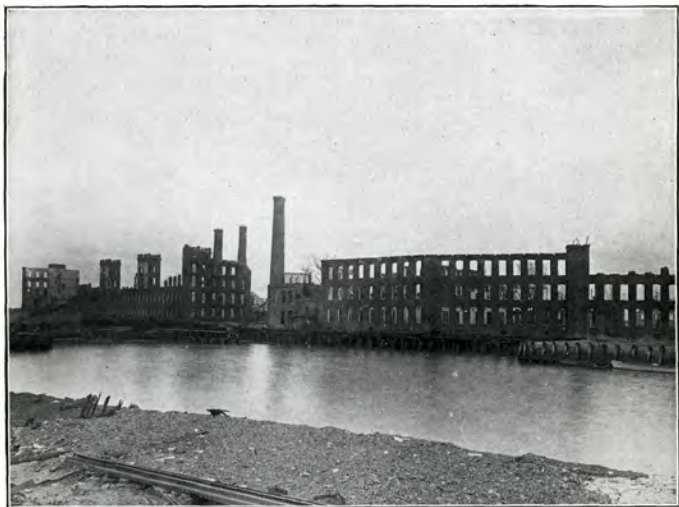
Salem, Mass. 1914



CURVES SHOWING WATER PRESSURE
AND
APPROXIMATE QUANTITY DELIVERED TO SALEM MAINS
Conflagration of June 25-26, 1914.



General view looking east, showing Office Building
and Nos. 1, 3 and 4 Mills.



North side of Plant, showing No. 2 and No. 5 Mills.



No. 5 Mill. Exterior.



No. 5 Mill. Interior.



General View of Ruins. From roof of No. 1 Store House looking northwest.



General View of Ruins. From roof of No. 1 Store House looking northeast.



North Side of No. 2 Mill. Burned bridge in foreground.



Interior of No. 2 Mill, showing wreckage of machinery.



Wreckage. Interior No. 1 Picker House.



Wreckage. Floor beams, etc., No. 6 Weave Building.



West Wall, No. 6 Weave Building, as pushed out by expansion of steel floor beams.



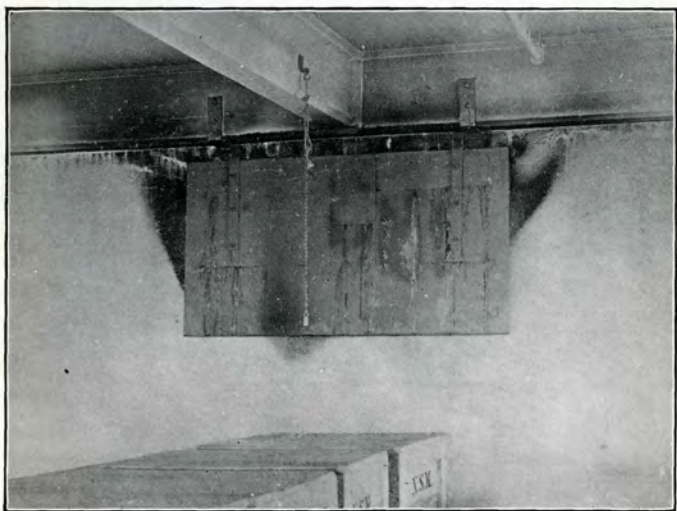
South Wall, No. 6 Weave Building, thrown over by expansion of steel floor beams.



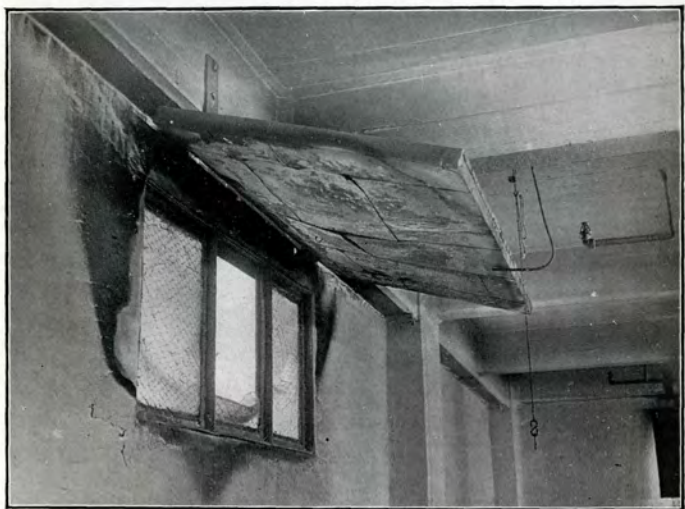
No. 1 Store House. Reinforced concrete construction.
Practically uninjured though severely exposed.



Interior of No. 1 Store House. Note perfect condition
of building and contents.



Interior No. 1 Store House. Fire shutter closed automatically by melting of fusible link.



Interior No. 1 Store House. Fire shutter in open position. Note collapsed wired glass and effects of heat on the shutter.



E. S. WOODBURY CO., CANAL STREET

Three-story wooden shoe factory subdivided by 12-inch brick parapeted fire wall. Door openings protected by fire doors on each side of wall. Equipped with automatic sprinklers supplied by city water and 11,000-gallon tank. Water supplies for sprinklers failed, but fire was stopped at the fire wall with the assistance of the fire department.



WILKINSON COUNTER CO., JEFFERSON STREET

Three-story wooden shoe factory, walls slate-covered. Equipped with sprinklers supplied by city water and 30,000-gallon tank. Top story burned off after tank water was exhausted, but city pressure was sufficient to save the lower stories. No assistance from the fire department.

These two views are inserted to illustrate the value of sprinklers and fire walls under less severe conditions of heat and flame than attacked the Naumkeag Mills. **THESE FACTORIES WERE NOT INSPECTED BY THIS DEPARTMENT OR INSURED BY THE COMPANIES CARRYING THE NAUMKEAG MILLS.**

THE ASSOCIATED FACTORY MUTUAL FIRE INSURANCE COMPANIES

1	MANUFACTURERS MUTUAL F. INS. CO.,	<i>Providence,</i>	JOHN R. FREEMAN, Pres.
2	RHODE ISLAND MUTUAL F. INS. CO.,	<i>Providence,</i>	JOHN R. FREEMAN, Pres.
3	BOSTON MFRS. MUTUAL F. INS. CO.,	<i>Boston,</i>	J. P. GRAY, Pres.
4	FIREMEN'S MUTUAL INS. CO.,	<i>Providence,</i>	F. W. MOSES, Pres.
5	STATE MUTUAL F. INS. CO.,	<i>Providence,</i>	JOHN R. FREEMAN, Pres.
6	WORCESTER MFRS. MUTUAL INS. CO.,	<i>Worcester,</i>	W. E. BUCK, Pres.
7	ARKWRIGHT MUTUAL F. INS. CO.,	<i>Boston,</i>	R. W. TOPPAN, Pres.
8	BLACKSTONE MUTUAL F. INS. CO.,	<i>Providence,</i>	WM. B. McBEE, Pres.
9	FALL RIVER MFRS. MUTUAL INS. CO.,	<i>Fall River,</i>	C. S. WARING, Pres.
10	MECHANICS MUTUAL F. INS. CO.,	<i>Providence,</i>	JOHN R. FREEMAN, Pres.
11	WHAT CHEFR MUTUAL F. INS. CO.,	<i>Providence,</i>	FRANK L. PIERCE, Pres.
12	ENTERPRISE MUTUAL F. INS. CO.,	<i>Providence,</i>	JOHN R. FREEMAN, Pres.
13	MERCHANTS MUTUAL F. INS. CO.,	<i>Providence,</i>	WM. B. McBEE, Pres.
14	HOPE MUTUAL F. INS. CO.,	<i>Providence,</i>	FRANK L. PIERCE, Pres.
15	COTTON AND WOOLEN MFRS. M. I. CO.,	<i>Boston,</i>	BENJ. TAFT, Sec.
16	AMERICAN MUTUAL F. INS. CO.,	<i>Providence,</i>	JOHN R. FREEMAN, Pres.
17	PHILADELPHIA MFRS. M. F. INS. CO.,	<i>Philadelphia,</i>	E. I. ATLEE, Pres.
18	RUBBER MFRS. MUTUAL INS. CO.,	<i>Boston,</i>	BENJ. TAFT, Sec.
19	PAPER MILL MUTUAL INS. CO.,	<i>Boston,</i>	R. W. TOPPAN, Pres.

The Associated Factory Mutual Fire Insurance Companies were organized more than seventy-five years ago, by certain prominent manufacturers of New England, for the purpose of providing insurance at actual cost. They confine their business almost exclusively to large isolated manufacturing properties. They have improved the construction of buildings, introduced better fire protection, and each risk is subject to regular expert inspection. They insist upon complete sprinkler protection, fire pumps, and ample water supply from at least two independent sources.

These methods have resulted in preventing interruption of business by fire, and have enabled the Mutual Companies to return to policy holders a large proportion of their premiums which otherwise would have been used in payment of heavy fire losses.