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# *The Ice Storm of November, 1921*

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A Brief Story of its Causes  
and its Effects in Lowell and  
Vicinity, Particularly with  
Reference to the Problem of  
Maintaining and Restoring  
Electric Service.

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**The Lowell Electric Light Corporation**

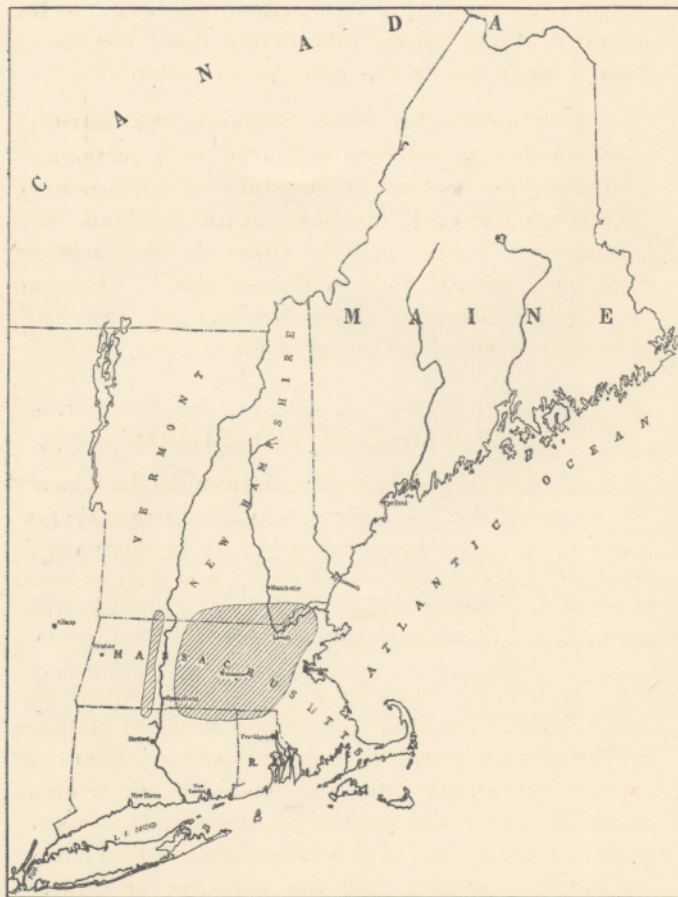
## FOREWORD



This booklet has been prepared for distribution to the customers of The Lowell Electric Light Corporation for the purpose of presenting a historical record of the disastrous ice storm of November, 1921, which caused great inconvenience and some suffering throughout the electrical distributing system in Lowell and surrounding towns. It is hoped that some facts which have not been heretofore understood and appreciated will be presented herewith.

March 1922.





MAP SHOWING AREA AFFECTED BY ICE STORM OF  
NOVEMBER 1921.

THE ice storm of November 27, 28 and 29, 1921, will go down in history as one of the most disastrous on record in the territory affected. In the memory of the oldest inhabitants there has never been a storm of its character or its severity.

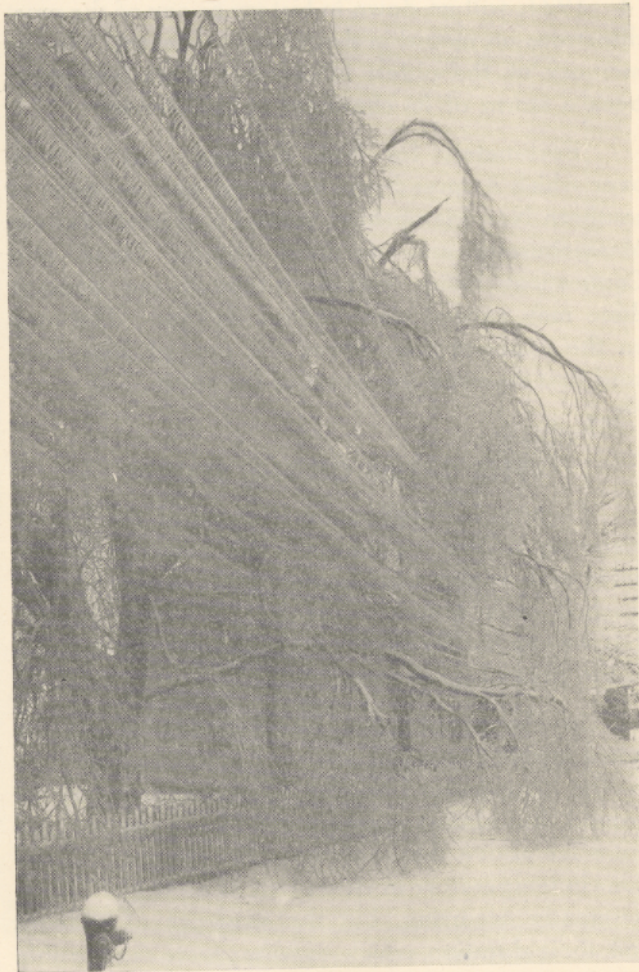
Fortunately for New England, the territory over which it spread was not large, only sections of southern New Hampshire, central and north-eastern Massachusetts and northern Rhode Island and Connecticut being visited, although the damage done may exceed eight million dollars. The map on the opposite page shows the part of New England that received the worst of the storm.

### THE CAUSE OF THE STORM

Experts in the Weather Bureau of the United States report that ice storms, while occurring several times each winter have never before in this vicinity reached such severity. In fact, it is their opinion that we can hardly expect a similar occurrence within the present generation.

In the seventy-two hours during which the storm lasted, there was not only a series of changes in the temperature of the atmosphere near the ground, but almost opposite changes in the temperature far above the earth near the clouds. Variations in temperature in either belt of air are of course frequently occurring, but the sequence of changes and their duration which together were responsible for the severity of the storm, are, fortunately rare.





TYNGSBORO ROAD, NORTH CHELMSFORD, SHOWING ICE ON  
TREES AND WIRES.

On Sunday, November 27, there was a fairly heavy fall of damp snow driven by a strong wind. This snow adhered to all objects it struck, particularly trees and poles. On Sunday evening, following a slight rise in temperature, the snow changed to a fine rain. There was not sufficient rain, however, to melt the snow which had previously fallen although there was enough to saturate that particularly on the trees. During Sunday night the temperature near the ground dropped below the freezing point but it still remained warm up in the clouds and the saturated snow on the trees and poles was frozen where it lay.

Early Monday morning, November 28, the rain began to fall heavier although the temperature of the belt of air nearest the earth still remained below the freezing point. The icy covering on limbs, poles and wires began to build up due to the rain which froze as it struck. The larger the diameter of the ice-encased limbs and wires, the greater was the surface presented for the accumulation of more ice, and this condition continued for at least 48 hours.

Professor Brooks of Clark University writes "The unusual duration of this ice storm seems to have been due to a large supply of cold air flowing southward and of warm air going northward above it. The cold wind at the surface, as is usual when sleet or ice storms occur formed a barrier over which the warm wind had to rise. It was this rising and consequent cooling by expansion which



produced rainfall. The two currents in this case were surprisingly well balanced. The temperature of the lower one did not rise enough above freezing to prevent the continued formation of ice, while the wind, above, after the first fall of snow, remained continually so much above freezing that all the precipitation from it was in the form of rain."

The equivalent amount of rainfall during the entire storm was nearly four inches. In one respect it may be fortunate that this was not all snow, for its equivalent in snow is about four feet.

A few miles north of Lowell the same changes in temperature did not occur and mostly snow fell, while in and south of Boston, after a light fall of snow much rain fell, but did not freeze. In this narrow belt, therefore, every twig, branch, tree, wire and pole which was exposed to the rain and snow was after a few hours coated with a load of ice far beyond anything which Nature had provided against and man had met in his experience. And, as if Nature was trying to outdo herself, on Tuesday morning, November 29, there was a thunder storm.

### THE RESULT OF THE STORM

The culmination of this series of temperature changes was nothing short of a disaster. Branches laden with tons of ice were snapped off like pipe stems and in falling carried with them any wires, poles or structures that were underneath. The wires

themselves were coated with ice weighing over a pound on each foot, which load was too great to be supported by the wire itself and in very many cases causing it to break. The wires in breaking brought about an uneven strain on the poles which were supporting them and which themselves were already carrying a load of ice almost to the breaking point, with the result that this unbalanced load caused many poles in turn to fall.

At 7.30 o'clock on Monday morning November 28, the first electric power feeder owned by The Lowell Electric Light Corporation to show the effects of the accumulated ice was the long line to Forge Village and Westford. The feeder to North Chelmsford soon became affected and from then on, for two consecutive days, reports of trees, wires and poles down or in a dangerous condition came in as fast as five clerks in our main office could handle them.

By Monday night every street light circuit in Lowell and surrounding towns with the exception of those in the central part of the city of Lowell was broken and the only lighting feeders operating were those in the center of the city and in parts of Belvidere and the Highlands. It is estimated that on the night of November 28 fully seven thousand customers in the Lowell territory were without electric service. It has been reported that over two hundred thousand homes in the central part of Massachusetts were without electric lights on that night.



## THE RESTORATION OF SERVICE

During the morning of November 28 the officials of this Company, appreciating what would result from a continuation of the storm, communicated with every electric light company in New England between Portland, Maine, and Fall River, Mass., asking for the services of any experienced linemen that could be spared. As a result, before the day was over, line crews with trucks and full equipment were on their way to Lowell from Lynn, Brockton, Fall River, and New Bedford. In the other cities where appeals were made no men could be spared as the electric light companies were themselves feeling the effect of the storm.

The first work to be done was to clear the streets of fallen wires and poles and during the first two days the attention of already augmented line crews was confined to this work. Over four tons of wire were cut down and returned to the store room and one hundred or more poles moved out of streets where they were obstructing traffic. With our distributing system practically demolished the problem presenting itself was the restoration of service in the quickest practical way. Appreciating that every customer whose service was interrupted was inconvenienced and in many cases this inconvenience was accompanied by great discomfort, the officials were forced to adopt a policy, which although at first appearing to be hardship to some, proved to be the only practical way of doing the greatest good in the shortest time.



VIEW ON BARTLETT STREET, LOWELL. HUNDREDS OF TREES AND BROKEN LIMBS FELL ON  
POLES AND WIRES.



The first work attempted was the restoration of service to hospitals and the efforts of the crew from New Bedford in clearing the line to the Lowell General and Isolation hospitals is worthy of commendation. Three times were they obliged to rebuild the line because trees on Varnum Avenue were continually breaking and in falling carried wires with them.

Following the work for the hospitals, such power customers as were without service were attended to in order that their employees would not suffer from lack of employment. Among the users of power to whom precedence was given were pumping stations supplying town or community water service. Where it was possible the workmen then restored service to those customers who were using electricity in connection with the production and distribution of food, such as dairies and pasteurizing plants. Unfortunately, however, it was impossible to restore service quickly to all these customers since long stretches of main feeder had to be replaced before they could be reached.

The restoration of house lighting was the next step taken. The feeders for this class of service radiate from our Perry Street power plant to the various parts of the city and the surrounding towns. Consequently, in order that this work should proceed systematically the different crews were assigned to the various feeders, their repair work to proceed from the power plant. Being nearest the center of distribution, the Belvidere section was the



SCENE ON VARNUM AVENUE NEAR LOWELL GENERAL HOSPITAL. PARTS OF THIS LINE HERE HAD TO BE REBUILT THREE TIMES ON ACCOUNT OF FALLING LIMBS.

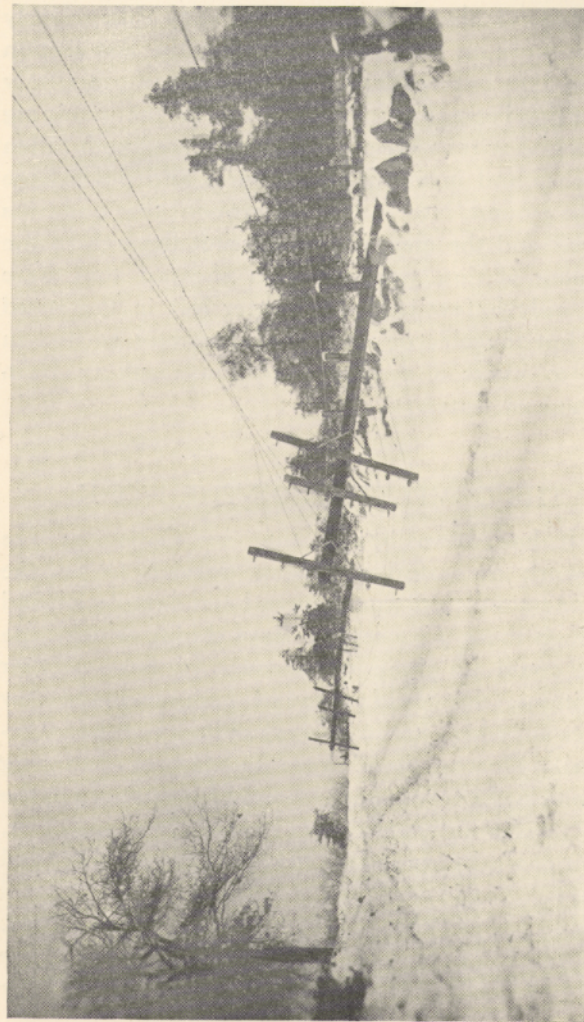


first part of the city where lighting was completely restored, although crews were also working rapidly in other sections. It was not until December 14, that the work on the various city feeders was sufficiently completed to permit crews to systematically push on beyond the city limits.

### THE RACE TO WESTFORD

Among the very important installations that were affected was the pumping station supplying the town of Westford with water. The power feeder supplying this plant was the first one to be interrupted on the morning of November 28. It was impossible to attempt any restoration work on that day but on Tuesday morning, November 29, a crew of eight men was assigned to the work of clearing the lines to North Chelmsford, and by night had pushed through to that town. The roads beyond North Chelmsford were almost impassable due not only to deep snow and ice, but to fallen trees. However, by night on the following day, with a reinforced crew, by chopping away hundreds of fallen trees and branches, the advanced party had pushed through to Forge Village. Most of the way the electric power line follows the Lowell & Fitchburg St. Ry. track and the day's work included seven miles of travel on foot.

Word had been received that the stand pipe in Westford was rapidly emptying and the men were spurred on in their efforts to reach the pumping station before the supply of water was exhausted.



LINE OF POLES DOWN ON VARNUM AVENUE.



Leaving the city long before daylight on Thursday, December 1, the crew arrived in Forge Village early in the morning intent upon clearing the last section of the line before dark. Although for practically the entire distance from this town to the pumping station the wires were completely covered with fallen branches and in many places wires and poles were on the ground, late in the afternoon the line was cleared and the electric current sent through to the pumping station. Investigation showed that there were only a few inches of water left in the stand pipe but the electric driven pumps were started in time to avert a serious condition resulting from shortage of water.

### THE COMPLETION OF THE WORK

It had been hoped that by Christmas eve the work of restoring lighting service to all the customers affected would have been completed and although there were several days during which little work could be done on account of bad weather conditions, the holiday found comparatively few homes in which electric service had not been restored. Most of these were located in outlying sections in the towns and a few isolated places in the city. It was not until New Year's Day, however, that it could be said that the lighting system had been put back to normal conditions. There still remained a section of North Street, Chelmsford, that was without service, which section was to be entirely rebuilt jointly by the Telephone Company



BEACON STREET, LOWELL, AT RESERVOIR. THE DAMAGE ON THIS STREET WAS SEVERE.



and this Company. This work was promptly started as soon as the necessary arrangements could be made and has since been completed.

The street lighting system with the exception of the down-town section of Lowell was entirely disrupted and after the restoration of the house lighting was well under way, attention was given to the street lighting circuits. Outside of the "White Way" the first circuit to operate after the storm was on December 2, and from that date on, an average of one circuit each day was repaired and put in operation. By December 31 the entire street lighting system was in operating condition with the exception of a few short sections in the remote parts of some of the towns; but a short time after, these were repaired and the circuits were operating as they were before the storm.

### WHAT HAS BEEN ACCOMPLISHED

Now that the work of restoration has been completed, it may be interesting to present some statistics covering what has been accomplished since the storm struck our system. Prior to November 27 our line construction department consisted of forty men divided into five crews using five trucks. On the first day of the storm the working force was immediately increased, the additional men in many cases being former experienced employees who were permitted through courtesy of their present employers to offer their services in the emergency, and by the night of November 28 ten crews with a total of sixty men and ten trucks were struggling to



VIEW AT THE CORNER OF HIGH AND EAST MERRIMACK STREETS, LOWELL, SHOWING DAMAGE CAUSED BY FALLING LIMB.



clear the streets of fallen wires and poles. With the coming of re-enforcements from out of town, together with the experienced men who responded to our advertisements in the newspapers for help, the working force was increased to one hundred men using fourteen trucks.

Between the day following the storm and January 21, 1922, there were set two hundred and forty-pole. Of this number forty-five were telephone poles on which electric light wires were run jointly with those of the Telephone Company. This work alone is equivalent to the construction of five miles of new pole line and if this task had been undertaken by one ordinary line crew, the time required to build the line complete with all fixtures, would have been three months.

Besides the erection of the new poles, there was strung approximately twenty-eight miles of new wire and over one hundred and fifty miles of line were patrolled, cleared of fallen branches, broken wires repaired and slack wire taken up. This latter task represents nearly a year's work of one ordinary line crew. Twenty-five street arc lamp fixtures were replaced; one hundred incandescent street lamp fixtures were remounted, and innumerable shades on street lamp fixtures were replaced, having been torn off by the heavy load of ice. To the line-men who accomplished this task so quickly is due much credit. Appreciating thoroughly the discomfort and inconvenience of those who were without electric service, they worked diligently and efficiently every daylight hour, Sundays included, until it could be said that the work of restoring service was finished.

## WHY NOT UNDERGROUND WIRES NOW?

The fact that those customers in the center of the city whose electric service was entirely underground suffered little from the storm, has caused the question to be frequently asked "why should not all the electric service wires be underground?" The answer is readily given; it is precisely a matter of cost. Experience has shown that underground construction costs twenty times that of overhead wires for the same amount of electricity to be delivered. In the concentrated business districts large amounts of current are used in a comparatively small area and underground wires are usually installed in those districts. Outside of the business section the volume of money received for electric lighting is relatively small as compared with that received in the center of the city. Consequently the large investment necessary to install wires and cables underground, if no other form of construction could be used to serve residential sections, would from the financial standpoint alone, prevent extensions from being made.

This condition is all the more evident in the outlying sections of the city and surrounding towns where homes are separated by hundreds of feet. This scattered business can only be served by overhead wires. On the other hand, if such extensions had been made and consisted of underground wires and conduits, and the rates for current sold on these extensions were based on a reasonable return on the money required to make them, the prices for electricity would be so high as to preclude its use except among a very few people.



Everyone who has become at all familiar with what has been accomplished by the Public Utility Companies in restoring electric service, will appreciate that this work of restoration has cost immense sums of money. And yet, up to January 31, 1922, the total cost for repairs of storm damages to overhead poles and lines in the entire Lowell and suburban overhead districts, if used to build underground duct system and install cables (not including cost to be paid by customers themselves for cables, conduits, trenches, etc., from curbing across lawns) would only provide underground conduits and cables along Andover Street from Nesmith Street to Clark Road.

This same amount of money, if spent for underground conduits and wires on Bridge Street, would only provide a complete system on that street between First and Eighteenth Streets. These instances are cited to indicate what a very small percentage of the total system in Lowell and vicinity could have been changed from overhead to underground distribution had the storm not happened but the money represented by its damage applied to conduit and cable construction.