Eleventh Street Bridge
Spanning the Turners Falls power canal on Eleventh Street
Montague
Franklin County
Massachusetts

HAER No. MA-107

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PHOTOGRAPHS
WRITTEN HISTORICAL AND DESCRIPTIVE DATA

Historic American Engineering Record
National Park Service
Department of the Interior
Washington, DC 20013-7127

HISTORIC AMERICAN ENGINEERING RECORD

ELEVENTH STREET BRIDGE
HAER No. MA-107

Location:	Spanning the Turners Falls power canal on Eleventh Street in the Village of Turners Falls, Montague, Franklin County, Massachusetts UTM: Greenfield, Mass. Quad. 18/699760/4719300
Date of Construction:	1915
Structural Type:	Steel triple-barrel double-intersection Warren through truss bridge
Engineer:	Unknown
Fabricator:	Eastern Bridge & Structural Company, Worcester, Massachusetts
Builder:	Turners Falls Company, Turners Falls, Massachusetts
Owner:	Town of Montague, Massachusetts
Use:	Vehicular and pedestrian bridge
Significance:	The Eleventh Street Bridge is a unique configuration of a double-intersection Warren through truss, with a pair of trusses on either side of the roadway, and lateral bracing between each pair, but none over the roadway. The bridge was engineered by the Eastern Bridge & Structural Co. of Worcester, Massachusetts, a significant twentieth-century bridge manufacturing firm. The bridge was paid for and erected by the Turners Falls Company for the town of Montague, during a very significant period (1912-1915) of the hydro-electric development of Western Massachusetts.
Project Information:	Documentation of the Eleventh Street Bridge is part of the Massachusetts Historic Bridge Recording Project, conducted during the summer of 1990 under the co-sponsorship of HABS/HAER and the Massachusetts Department of Public Works, in cooperation with the Massachusetts Historical Commission. Lola Bennett, HAER Historian, August 1990

Description

The Eleventh Street Bridge is a triple-barrel, 167-foot, riveted steel double-intersection Warren through truss. The main configuration is a central roadway barrel with no overhead lateral bracing, with a through truss sidewalk barrel on either side. Each of the four trusses is identical. The upper chord of each truss is comprised of two channels, connected with a plate on the upper side and lacing and tie plates on the lower side. The inclined end posts are built up in the same manner as the upper chord, except that the channels have two plates riveted to their inner faces. The bottom ends of the end posts are riveted to steel plates, which are bolted to the concrete pier at the west end of the bridges and rest on nests of rollers on the piers at the east end of the bridge. The lower chord is two angles connected with lacing. The upper and lower chords are connected by means of vertical hip posts (3½"x5" angles connected with tie plates) at the end panel points, and by built-up diagonal members, crossing between panel points throughout the length of the truss. The diagonals angling down toward the ends are comprised of two 3"x5" angles connected with a solid plate, and pass through the center of the diagonals angling up toward the ends, which are comprised of two 3"x5" angles connected with tie plates. The lower end of the vertical hip posts and diagonal members are attached to the lower chord and floor beams by means of riveted gusset plates. The floor system is comprised 24"x13" I-section steel beams and 5½"x10" steel stringers, and corrugated steel decking, which support a poured concrete deck, and an asphalt-paved roadway, 27'-0" wide. On either side of the roadway is a raised sidewalk, 7'-6" wide, with latticed railings on the outer sides. Above each sidewalk is overhead lateral bracing and portal bracing, consisting of two angles riveted together, connecting the outer truss and inner truss. Both ends of the bridge rest on concrete piers, with a short stringer approach span extending from pier to abutment at either end. (See field photos and copies of original plans in field file.)

Early History of Turners Falls

The Village of Turners Falls, the largest and most recently developed of the five villages in the town of Montague, Massachusetts, is located about two and a half miles east of the town of Greenfield, and nine miles south of the Vermont border, on the eastern bank of the Connecticut River. At this location, the river describes a double turn, flowing to the west and northwest for several miles, then suddenly turning to the southwest for a short distance, and then finally turning once again to the south. (See Figures 1 and 1a.) At the point where the river makes an abrupt "hook" from north to south, it also drops sharply over a ledge of rock, at the place called Turners Falls. Originally, this spot was known as "Great Falls," and was a popular Indian fishing ground. It was renamed for Captain William Turner, who fought the Indians there in 1676, during King Philip's War. Yet, while historic maps indicate that this place was known as Turners Falls, as early as the 1700s, the village itself did not exist until the year 1867.

Shortly after the close of the Revolutionary War, when internal improvements were being planned in various parts of the new nation, a group of men living in the Connecticut River Valley proposed the development of a

system of locks and canals on the Connecticut River at South Hadley and at Turners Falls in Montague. Until that time, transportation in the Connecticut Valley, as elsewhere, had been limited and difficult. By the late eighteenth century, however, competition between Massachusetts and Connecticut seaport towns over control of northern New England trade created a need for unobstructed navigation on the Connecticut River.[1] On February 23, 1792, the state legislature passed an act, incorporating the Honorable John Worthington Esquire, and others,

> for the purpose of rendering Connecticut River passable for boats and other things, from the mouth of the Chicopee River Northward throughout this Commonwealth, by the name of the Proprietors of the Locks and Canals on Connecticut River.[2]

Two years into the project, the proprietors realized the immensity of their enterprise, and under another act of legislature, divided their interest into the Upper and Lower Canals. The original proprietors remained a corporation, and a separate corporation was formed, by the name of "The proprietors of the Upper Locks and Canals on Connecticut River."[3] Within a few years, the project was completed, making the Connecticut the first river in the country to be improved by locks and canals.[4] This canal system was one of the most popular means of transportation in the Connecticut Valley until the development of the railroad in the 1840s, and for nearly half a century, the upper canal, otherwise referred to as the "Montague Canal," operated successfully.

In 1846 the first steam locomotive reached Greenfield, by way of the Connecticut River Railroad. The canal system was just no match for the railroads, and as time went on, "a larger and larger proportion of the freight of the valley was diverted to the rails."[5] In 1856, just ten years after railroad tracks were laid to Greenfield, the last boat passed through the locks at Montague, and the canal was abandoned and left to decay.[6]

The Village of Turners Falls

The development of the Village of Turners Falls began a dacade later, in 1865. That year, while searching for a more direct route to Greenfield than the one taken by the Vermont & Massachusetts Railroad, Colonel Alvah Crocker (see Figure 2), one of the leading citizens of Fitchburg, observed the falls and canal at Montague, and realized that the location had tremendous potential for water-powered industries. The following year, Crocker organized the "Turners Falls Company," by buying and redeveloping the property and franchises of the old canal corporation. An act of legislature authorized the new company to build and maintain a dam and canal, and to lease and sell the use of water for power purposes.[7] The company also purchased large plots of land in the northwest corner of the town of Montague, and set about the task of creating a great industrial city, known as "Turners Falls." Located at the crossroads of the Connecticut and Deerfield Valleys, with water-power, undeveloped land, laborers, and access to railroads in abundant supply, the development of industry at Turners Falls was destined to be a great success. Crocker wished to see Turners Falls "rival Lowell, Holyoke and other

manufacturing cities in size and commercial importance, and even to excel them; and to that end he spared nothing in his wonderful genius and manifold resources."[8]

The first project undertaken was the construction of a dam across the river, completed in 1867. Shortly thereafter, William Crocker, Alvah's brother, was employed as engineer to excavate the power canal and plan the city. Maps from the early 1870s show Turners Falls as it was conceived in Crocker's mind--an impressive grid of streets extending out on both sides of the main canal, with at least twenty-five mill sites lined up along its length.(See Figures 3 and 4.) The power canal, 50' wide, 600' long and 10' deep, was dug parallel to the river. During the next decade, it was extended another 1,500' to the southwest, to accomodate more mill sites.

The first industry to establish itself at Turners Falls was the Turners Falls Lumber Company, which built a sawmill at the north end of the dam and began operations in 1868.

> This enterprise was attracted to Turners Falls by the great river which provided power and down which logs from northern forests could be floated to the mill, and by the promise of an enourmous (sic) demand for lumber for building the factories and homes of the projected city.[9]

Shortly thereafter, a number of other industries were established at Turners Falls, including the John Russell Cutlery Company, the Montague Paper Company, Keith Paper Company, Shawmut Manufacturing Company (makers of imitation leather), Clarke & Chapman Machine Company, and the Criswoldville Manufacturing Company (a cotton mill). By 1879, the village was populated with 2,000 people, and in addition to the manufactories previously mentioned, contained:

> a fine hotel, two banks, four church edifices, two handsome and costly school buildings, a steam fire-engine company of 18 members, a weekly newspaper publication, several handsome brick business blocks, numerous stores, a public library, and many elegant private residences.[10](See Figure 5.)

Although the village and industries continued to grow and thrive on into the first quarter of the twentieth century, Turners Falls was never to achieve the prosperity and greatness prophesied by Alvah Crocker. This was largely due to Crocker's untimely death in 1874. Turners Falls, it was said, was the chief ambition of Crocker's life:

> What he would have accomplished for the place had he been spared to test his energies to the full, no man can say; but, estimating the probable results of the future from the great achievements he had effected in the few years he was permitted to devote to the task, it cannot be denied that he would have left Turner's Falls as a splendid monument to his greatness.[11]

While the village of Turners Falls was never to achieve industrial greatness

in its own right, Alvah Crocker's development of water power there would eventually become part of a vast public utility system, one of the largest in New England.

Hydro-Electric Development at Turners Fall

On June 9, 1886, A.S. Clarke of the Clarke & Chapman Machine Company, made arrangements with the Turners Falls Company for "a six-hour additional use of water," for the purpose of generating electricity at night. Soon afterward, a small company of public-spirited citizens leased water to drive a thirty-five kilowatt generator, and established the Franklin Electric Light Company.[12]

Eighteen years later, in 1904, Charles Hazelton, treasurer of the Turners Falls Company, proposed to the board of directors that that they make better use of the water power being wasted, by widening and extending the canal, and establishing a hydro-electric generating plant of 5,000 kilowatt capacity. His proposal met with unanimous agreement, and was carried out during the next three years.[13]

A few years later, an Boston investor by the name of Philip Cabot, who owned stock in the Amherst Gas Company, the Greenfield Electric Light & Power Company and the Easthampton Gas Company, purchased an interest in the Turners Falls Power & Electric Company, and was invited to become a director for all of these companies. With these companies--which basically controlled the generation and transmission of electric power in the Connecticut River Valley--in close association with one another, Cabot proposed the development of a hydro-electric plant of 36,000 kilowatt capacity at Turners Falls. Work commenced in 1912. In 1914, Cabot and his directors decided to consolidate the Turners Falls Company and the Amherst Power Company, under the name of the Turners Falls Power & Electric Company.

Through a series of further consolidations in the late 1920s and 30s, the Western Massachusetts Electric Company was formed.[14] This company has most recently merged with Connecticut interests to form Northeast Utilities, one of the largest public utility companies in the region.

Construction of the Eleventh Street Bridge

Between 1912 and 1916, the Turners Falls power canal was extended south about a mile and a half, and a huge electric generating plant, later named Cabot Station, was built.(See Figures 6 and 7.) Of this development, the local newspaper reported:

> The development so far as mapped out is merely the beginning of the great work of utilizing the power of the river in permanent construction, and Turners Falls will look brighter from now on in many ways. ...
>
> In the first place, a section of concrete dam will be laid close up to the present dam beginning at Creat Island, in the centre (sic) of the river, and extending 330 feet toward the bulkhead. It will be practically 30 feet high, with the usual base for height calculated for such work, and will contain somewhere

for height calculated for such work, and will contain somewhere between 9,500 and 10,000 cubic feet of masonry. This dam will back up the present dam at its weakest point, and make the whole structure of immense strength.

Now the present canal will be widened from the old point of widening at the Cutlery works, to the beginning of the widened canal near the cotton mill. The new work will be east of the present canal, leaving a core of 20 feet, to be removed at a later time. The old canal is 50 feet, and the new work will be 65 feet, making the finished canal eventually 135 feet wide, capable of carrying an immense body of water to its full depth of 18 feet.

... New steel bridges will be put over the canal at the Griswold mill, the lower suspension bridge crossing, the Keith mill and at the Cutlery works.

The contractors will begin work in about 10 days, carrying along the railway removal and the canal together, and the whole work will be finished inside of 15 months.

When completed there will be a lot more power for sale, and it will be sold preferably to local parties to be used in manufacturing, and the President of the Company is very anxious to make every inducement in reason to parties desiring to locate here, especially small plants, and many of them, in which good wages are usually paid.

The coming year's activity will stimulate business here in all lines, and will be appreciated by our many merchants and professional men. It may be the turning of the tide that is going to carry us all to fortune.[15]

The construction of the bridges over the canal at Sixth Street and Eleventh Street were a significant part of this project, because the extension of the power canal would, in effect, create an "island" in the center of Turners Falls. The section of town known as the "South End" would be bordered on all sides with water--the Connecticut River on the north and west, and the power canal on the east and south--and connected to the rest of the village by only a small strip of land to the north.(See Figure 8.) While a magnificent suspension bridge spanned the river at Sixth Street, and there were several small bridges crossing the upper part of the canal, the lower section of the canal would need to be bridged between the center of town and the South End.

The Sixth Street Bridge was constructed across the canal in 1912. It was a riveted, double-intersection Warren through truss, designed by the Eastern Bridge & Structural Company of Worcester, and erected by a crew of workers from the Turners Falls Company. The bridge crossed the canal at a point where it directly lined up with the suspension bridge to Greenfield. Adjacent to the bridge, on the northeast side, a smaller pedestrian bridge was erected at the same time. The pedestrian bridge was of a similar configuration as the vehicular bridge, but smaller in scale.(See Figure 9.)

Documentary evidence for the Eleventh Street Bridge seems to indicate that it was originally designed to be very similar to the bridge at Sixth Street. The original plans for the bridge, drawn up by the Eastern Bridge & Structural Company in May of 1914, show a double-intersection Warren through

truss, with a 21-foot wide roadway, upper lateral bracing, and no sidewalks.(See Figure 10.) A second set of plans for the same bridge, dated May, 1915, shows a pair of double-intersection Warren trusses on either side of a roadway 27 feet wide, with a 6-foot wide sidewalk running between each pair of trusses. Rather than the standard upper lateral bracing over the center barrel, the second set of plans shows lateral bracing only over the sidewalk barrels. The two inner trusses are referred to, on several of the sheets, as "old trusses," with a job number that refers back to the first set of plans.(See Figure 11.) Why did this change in plans occur? Even after a considerable amount of research, there does not appear to be a conclusive answer, but apparently, some discrepancy arose between the Turners Falls Company, which was paying for the bridge, and the residents of the town, who were the beneficiaries of the whatever infrastructure changes the company were required to make.

On October 23, 1914, at a town meeting, the town voted:

> that the bridge to be built across the new canal at Eleventh Street in the Village of Turners Falls shall have a roadway of not less than thirty (30) feet in the clear, it shall have two sidewalks one on each side, each walk shall be six (6) feet in the clear, with suitable guard on the outside of such walks to prevent children from falling from bridge into the canal and that the town of Montague demand that the bridge be built by the Turners Falls Company as mentioned above ... and that the council for the town be and is hereby authorized and instructed to take such legal action as may be necessary to protect the interests of the town in the matter of building a bridge across the new canal at Eleventh Street.[16]

A few months later, on March 25, 1915, that vote was rescinded, and another vote was passed, authorizing the Turners Falls Company "to construct a steel bridge across the new canal at Eleventh Street in Turners Falls which shall have a roadway twenty-seven (27) feet in width and one (1) sidewalk six (6) feet wide on each side of the said roadway."[17] At the same meeting, a committee of five citizens of the "South End" was chosen, to act with the selectmen in approving the plans for the bridge.[18] Clearly, there was some discrepancy between what the Turners Falls Company had made plans for, and what the town felt it needed. While this suggests the general basis for the changes in plans for the Eleventh Street Bridge, there are apparently no written records as to the specifics of those changes. The original plans called for a narrow bridge (21 feet wide), with no sidewalks; the later plans showed a much wider bridge (27 feet wide), with a 6-foot sidewalk on either side. While this change could have been made quite easily on the drawing board, a considerable amount of time had passed since the initial plans were drawn up, and the reference on the drawings to "old trusses" indicates that they had already been fabricated, and perhaps even shipped to the site by that time. Increasing the size of the bridge and adding sidewalks meant that the already-fabricated trusses would have had greater dead and live loads to carry, probably more than they could bear. Instead of designing and fabricating a new bridge and scrapping the old, which could have been quite

costly, the engineers apparently decided to increase the load-carrying capacity of the old trusses by adding two identical trusses to the design. Once that was done, and the width of the bridge was increased, new lateral bracing was necessary. By spanning the shorter distance between the outer and inner trusses, rather than the entire distance between the two outer trusses, the strut sizes could be considerably reduced. As finally constructed, the Eleventh Street Bridge represented a unique engineering solution to a project influenced by both public and private interests.

The Eleventh Street Bridge was erected according to the second set of plans and specifications, during the early summer of 1915. In May, the local newspaper stated:

> Work has commenced erecting the superstructure of the new bridge over the canal at Eleventh Street. The work will probably require two or three weeks to finish, and in the meantime the street is closed to all but pedestrians. Other travel has to go around the I street bridge to get to South End.[19]

Four weeks later, the bridge was finished, and this item appeared in the Greenfield newspaper: "The bridge over the canal at 11th street was completed this week by the Eastern Bridge and Const. Co."[20] A 1915 photo, taken during construction of the canal extension, shows the bridge exactly as it appears today.(See Figure 12.) At each end of the bridge is a plaque, bearing an inscription. The plaque on the east end reads:

Built by the Turners Falls Company
for the Town of Montague

Fred C. Haigis
Michael J. Carey Selectmen
Lester T. Bartlett

Eastern Bridge & Structural Company
Manufacturers, Worcester, Mass.

The plaque on the west end bears the names of the bridge committee: Daniel Shanahan, Fred J. Treml, Thomas R. Casey, A.J. Nims, and Thomas Ducharme.

The Eleventh Street Bridge is still in use today as the only vehicular and pedestrian bridge in Turners Falls' South End. It is significant as a unique configuration of a double-intersection Warren through truss, and is the unique result of a project in which political factors played a major role in the final appearance of the structure. The bridge is also a significant artifact of the development of hydro-electric power in western Massachusetts. The bridge fabricator, Eastern Bridge & Structural Company, was an important regional bridge-manufacturing company in the early- to mid-twentieth century.

Eastern Bridge & Structural Company

The Eastern Bridge & Structural Company was established in 1900 by Ralph H. Brown and A.S. Miller, Jr. Prior to that time, the two men had been

associated with the Boston Bridge Works (see HAER report MA-103), but eventually decided to form their own company.[21] With the help of some Worcester investors, the founders purchased an old car barn on Crescent Street in Worcester, and began manufacturing structural steel for buildings and bridges in March of 1900.[22]

Eastern Bridge & Structural Company was listed in Worcester city directories, under the heading of "Bridge Builders," beginning in 1901. Ralph H. Brown was listed as chief engineer from 1901 until his death in 1919. A. Sherman Miller Jr. was listed as treasurer from 1901 until 1937, at which time, John C. Stewart, of Stewart Boiler Works, took over as president and treasurer of the company.

Over the years, the company grew from 50 employees in 1900, to 200 employees in 1930; expanded their plant from 9,000 square feet, to 60,000 square feet; and increased their output from 300 tons of steel each month, to 1,500 tons of steel each month.[23]

According to city directories, the name was changed in 1941, to "Eastern Bridge Company." In 1947, a branch company was added, known as "Eastern Bridge Supply Company," which sold builders materials, masons supplies, and insulation and roofing materials.
Both companies were listed in city directories until 1961, after which only the supply company was listed. The last listing for the supply company was in the 1971 Worcester city directory.

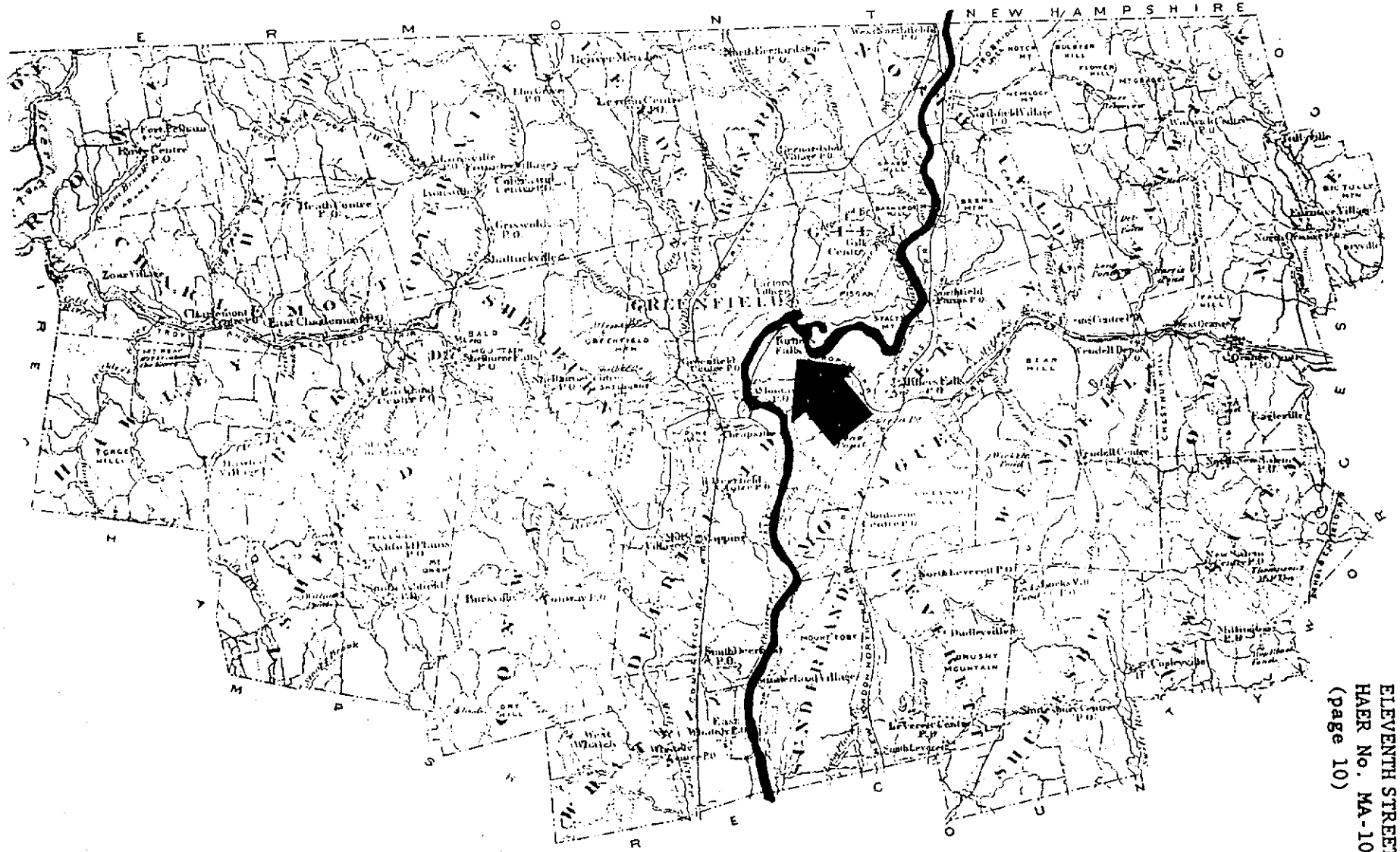

Figure 1. Map of Franklin County, Massachusetts (F.W. Beers, 1870), showing the course of the Connecticut River and location of Turners Falls.

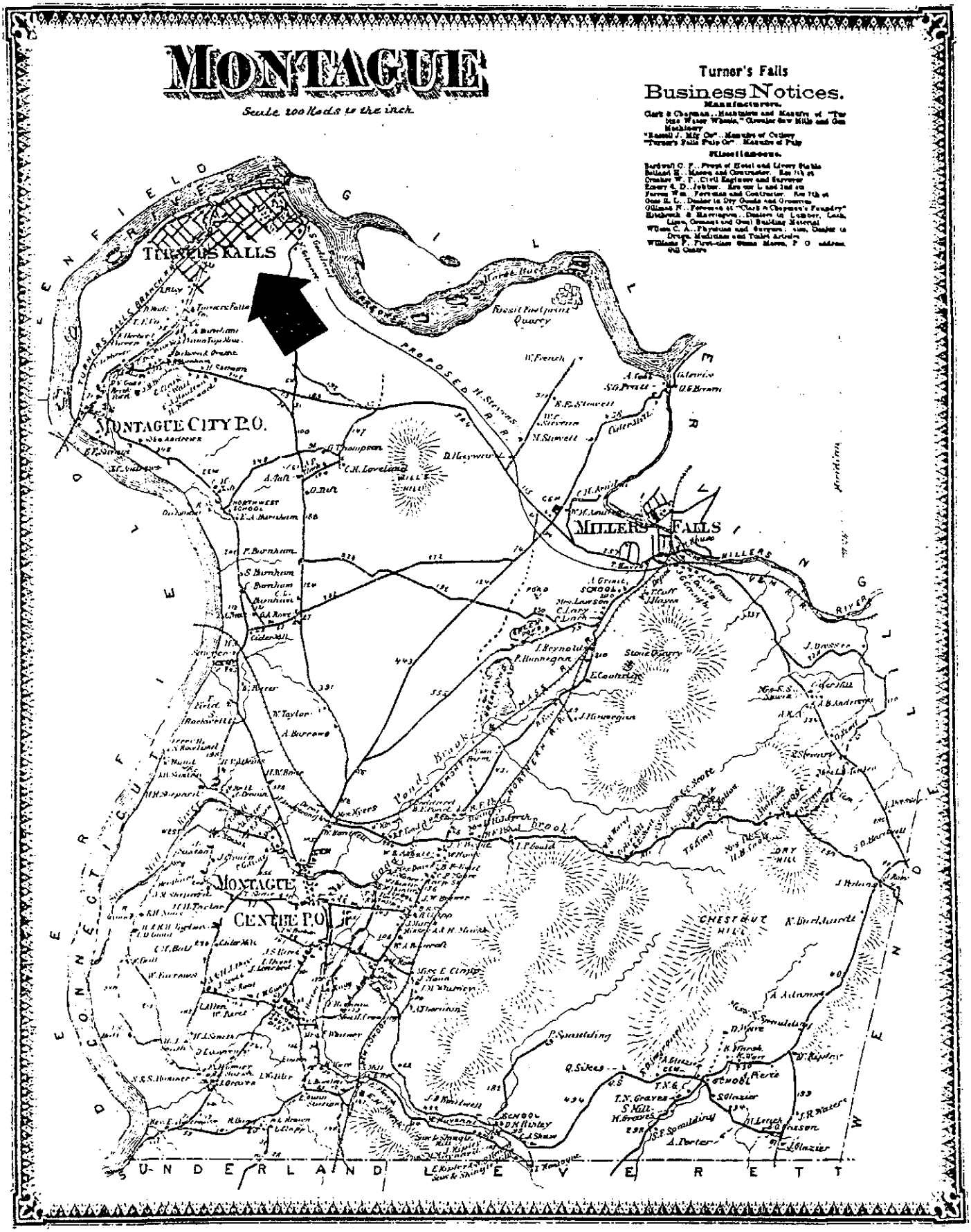

Figure 1a. Map of Montague, Massachusetts (F.W. Beers, 1870), showing location of Turners Falls.

Figure 2. Portrait of Alvah Crocker (Hurd, 1889).

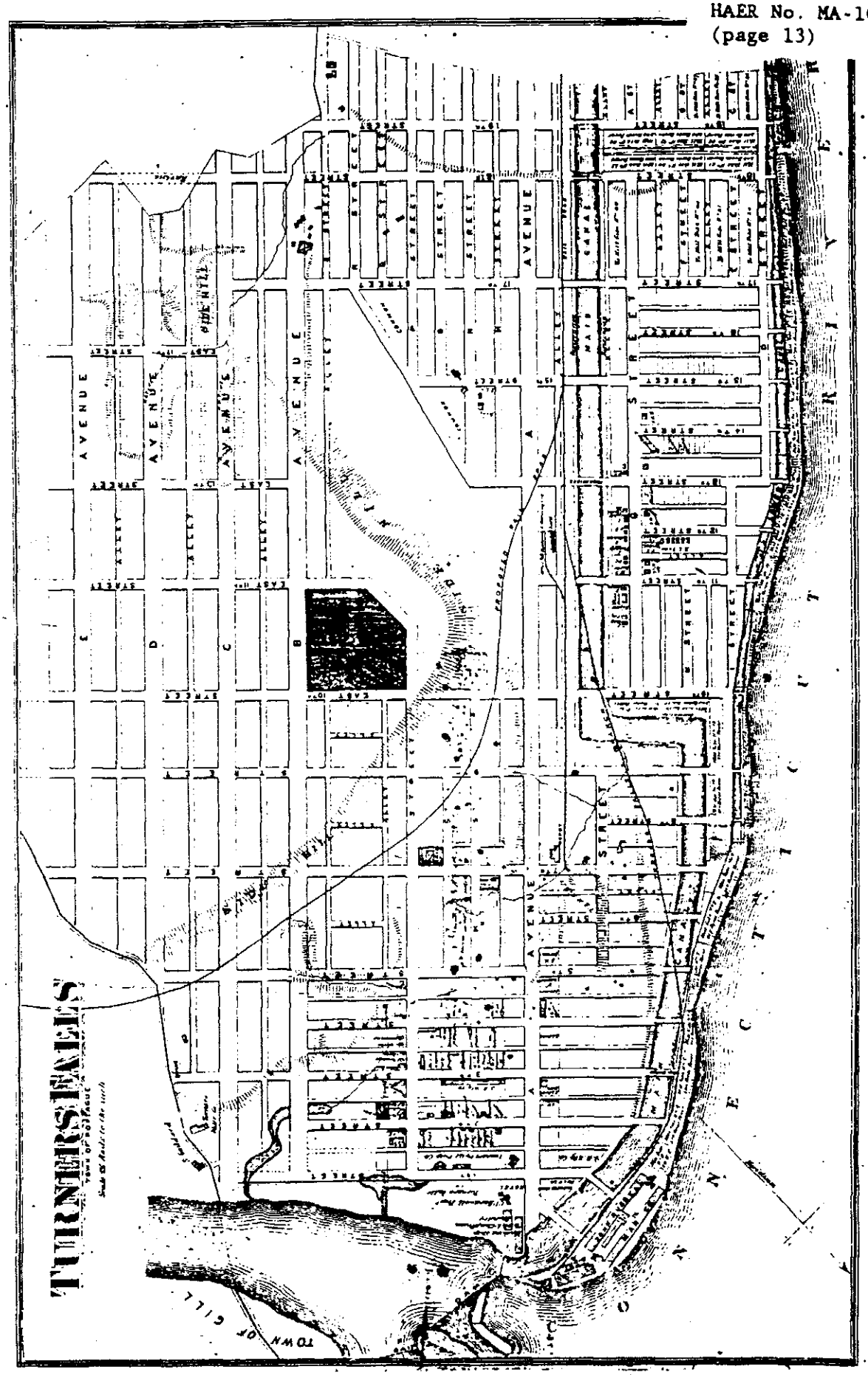

Figure 3. Map of the proposed city of Turners Falls (F.W. Beers, 1870).

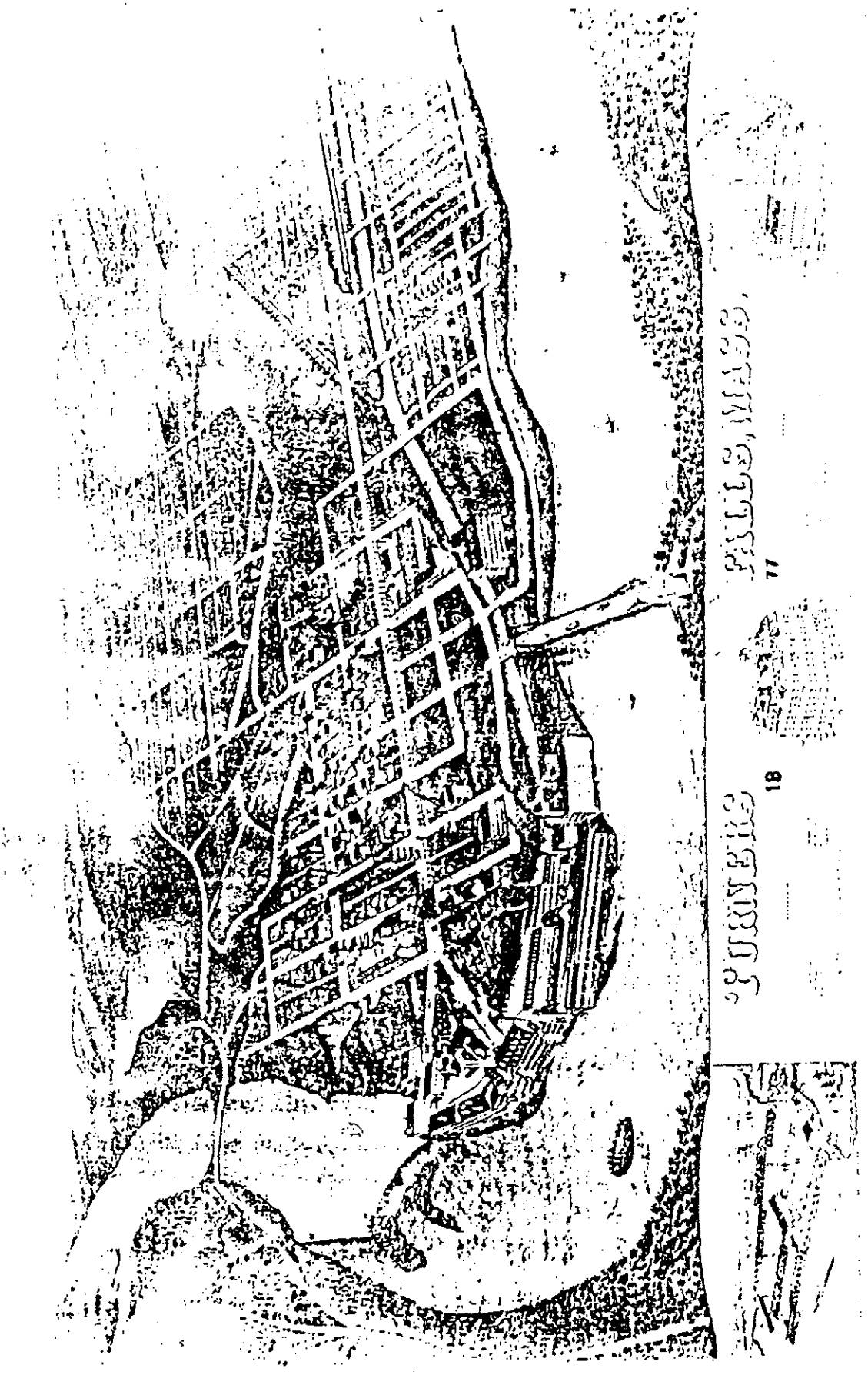

Figure 4. Bird's-Eye View of Turners Falls (William Crocker, 1877).

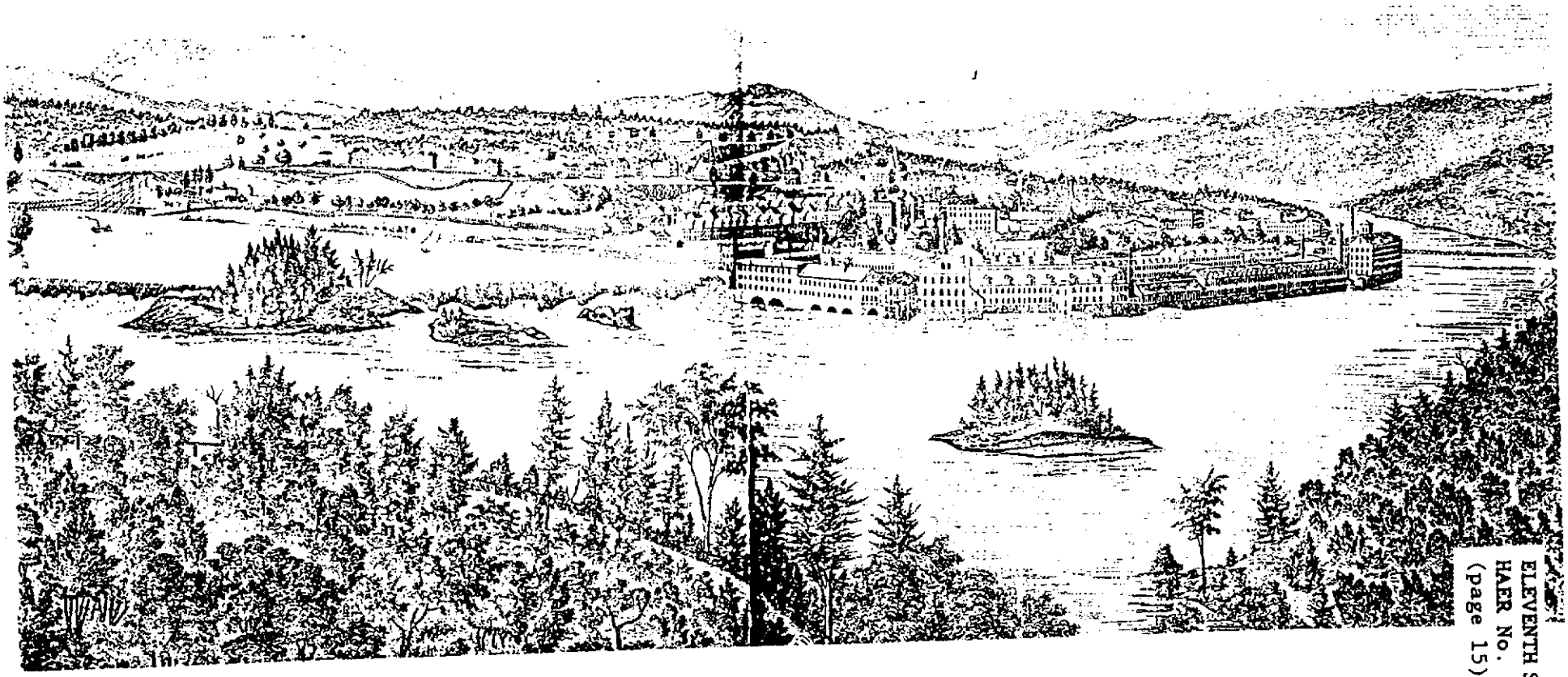

Figure 5. Bird's-Eye View of Turners Falls (Everts, 1879).

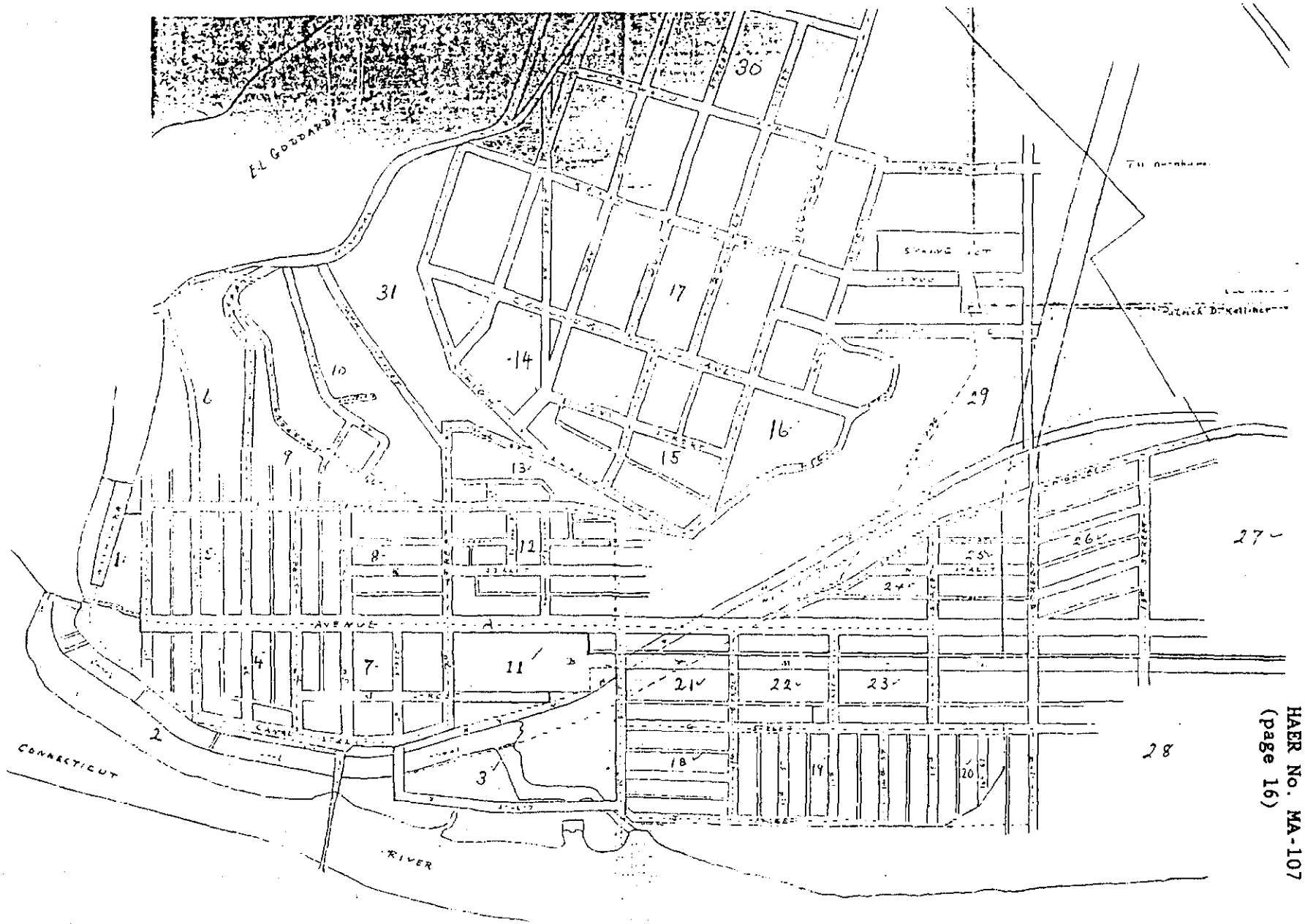

Figure 6. "Index Plan of Turners Falls, 1913."
(Courtesy of Western Massachusetts Electric Company.)

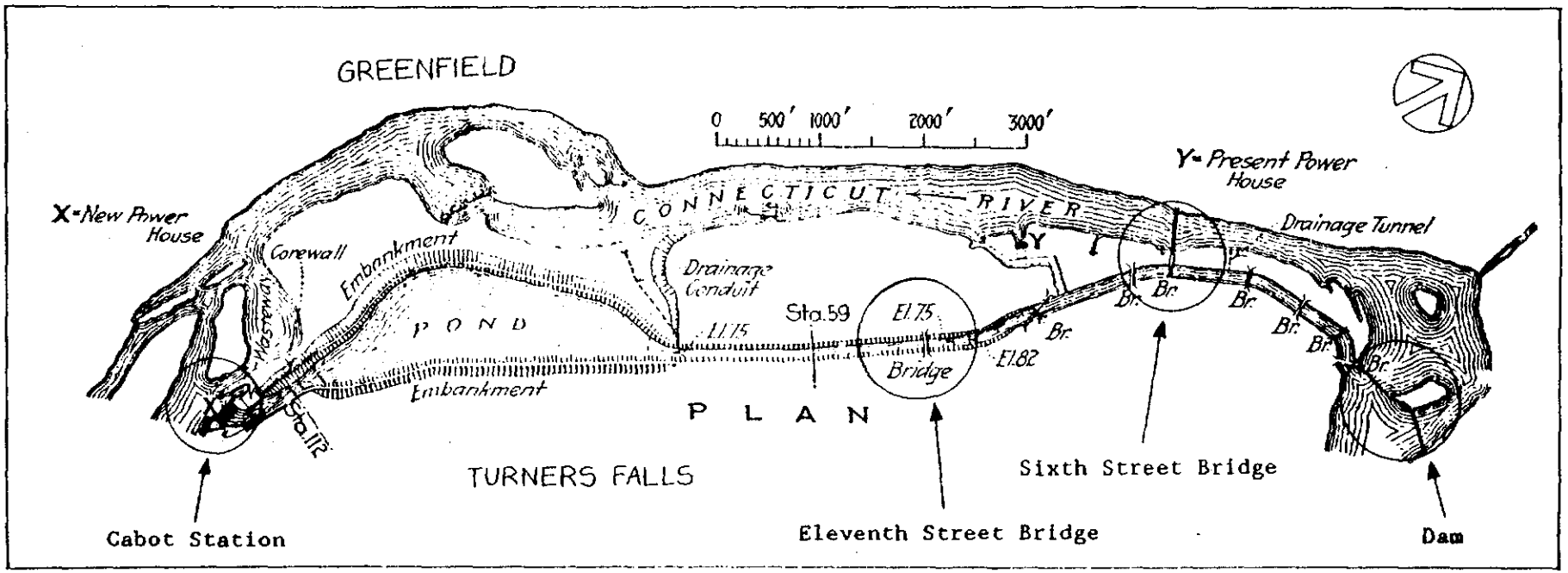

Figure 7. Plan for hydro-electric development at Turners Falls, 1912-16, showing extension of canal to Cabot Station. (Published in Engineering News, July 29, 1915.)

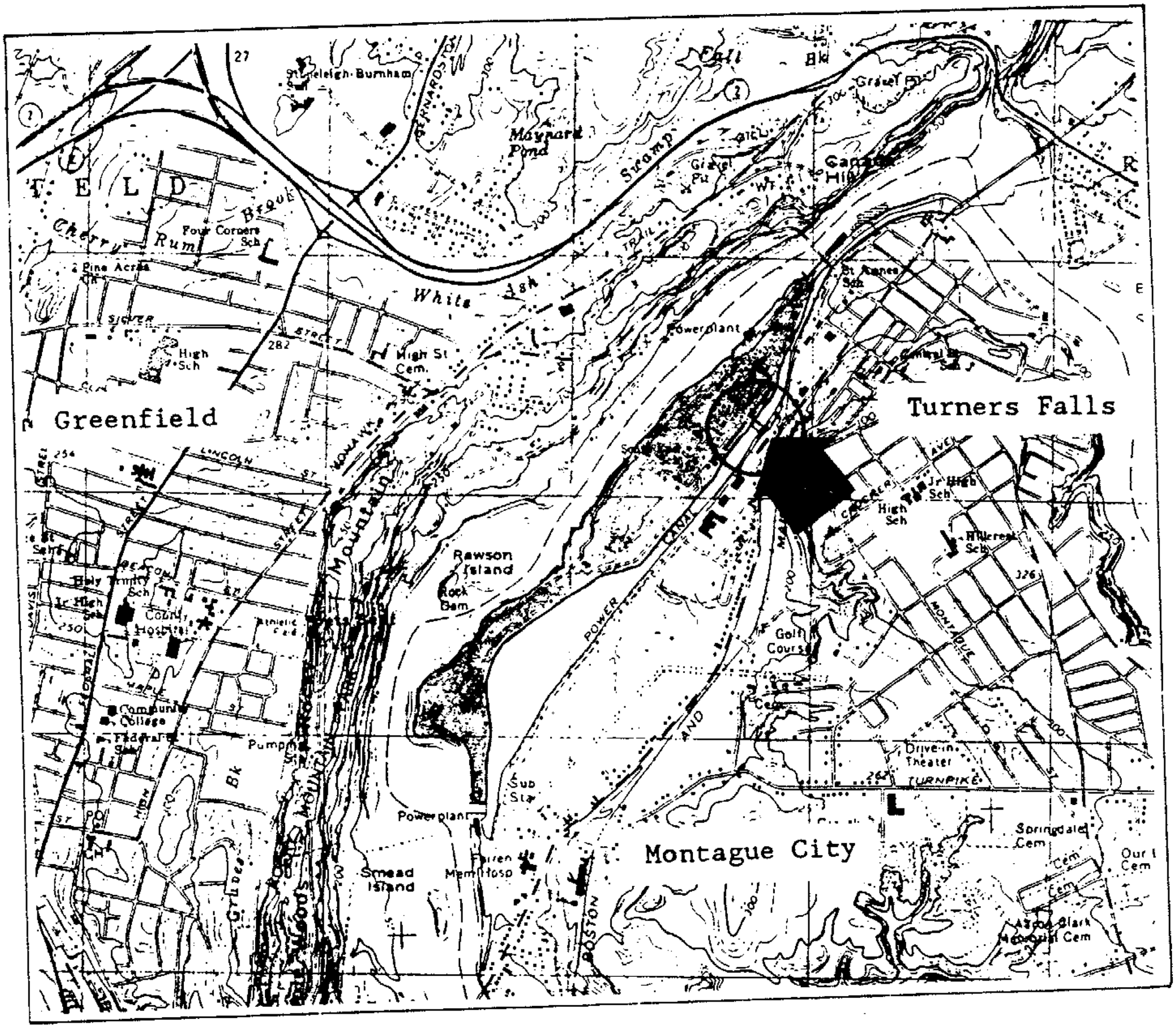

Figure 8. U.S.G.S. Map: Greenfield, Massachusetts, Quad., showing the "island" of Turners Falls South End and the Eleventh Street Bridge.

Figure 9. Photo of Sixth Street Bridge, c.1914.
(Courtesy of Western Massachusetts Electric Company.)

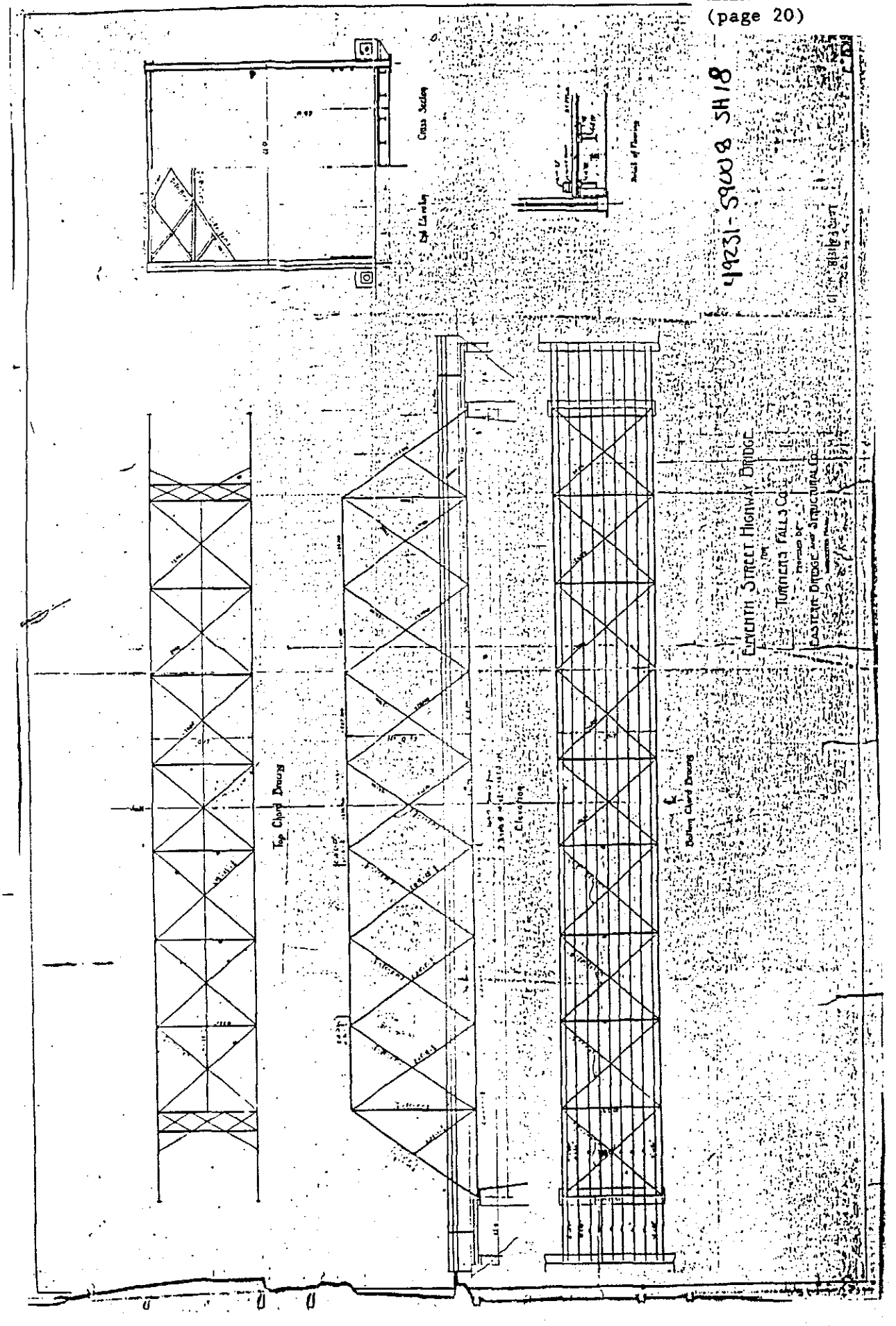

Figure 10. Original plan for Eleventh Street Bridge, 1914.

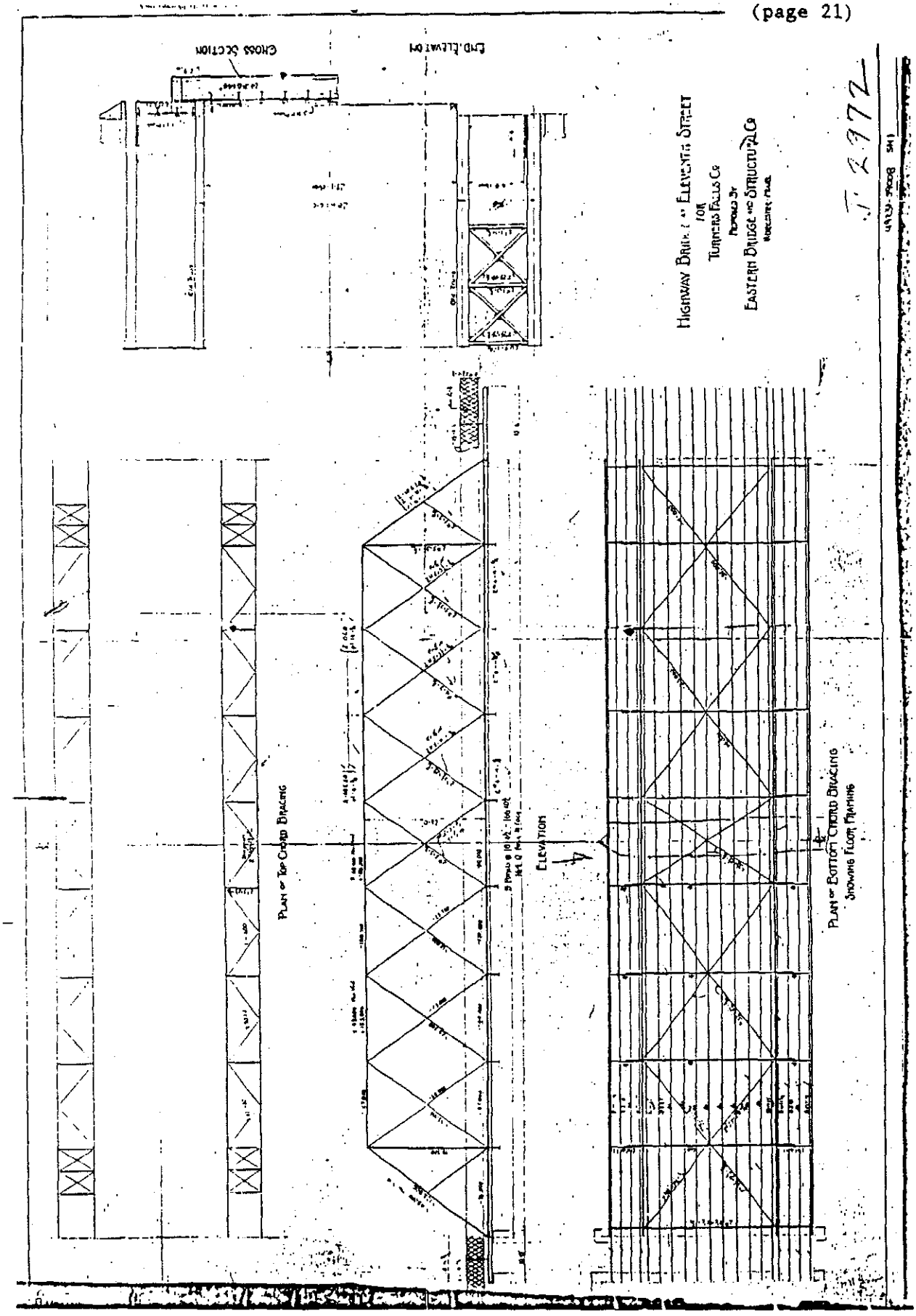

Figure 11. Revised plan for Eleventh Street Bridge, 1915.

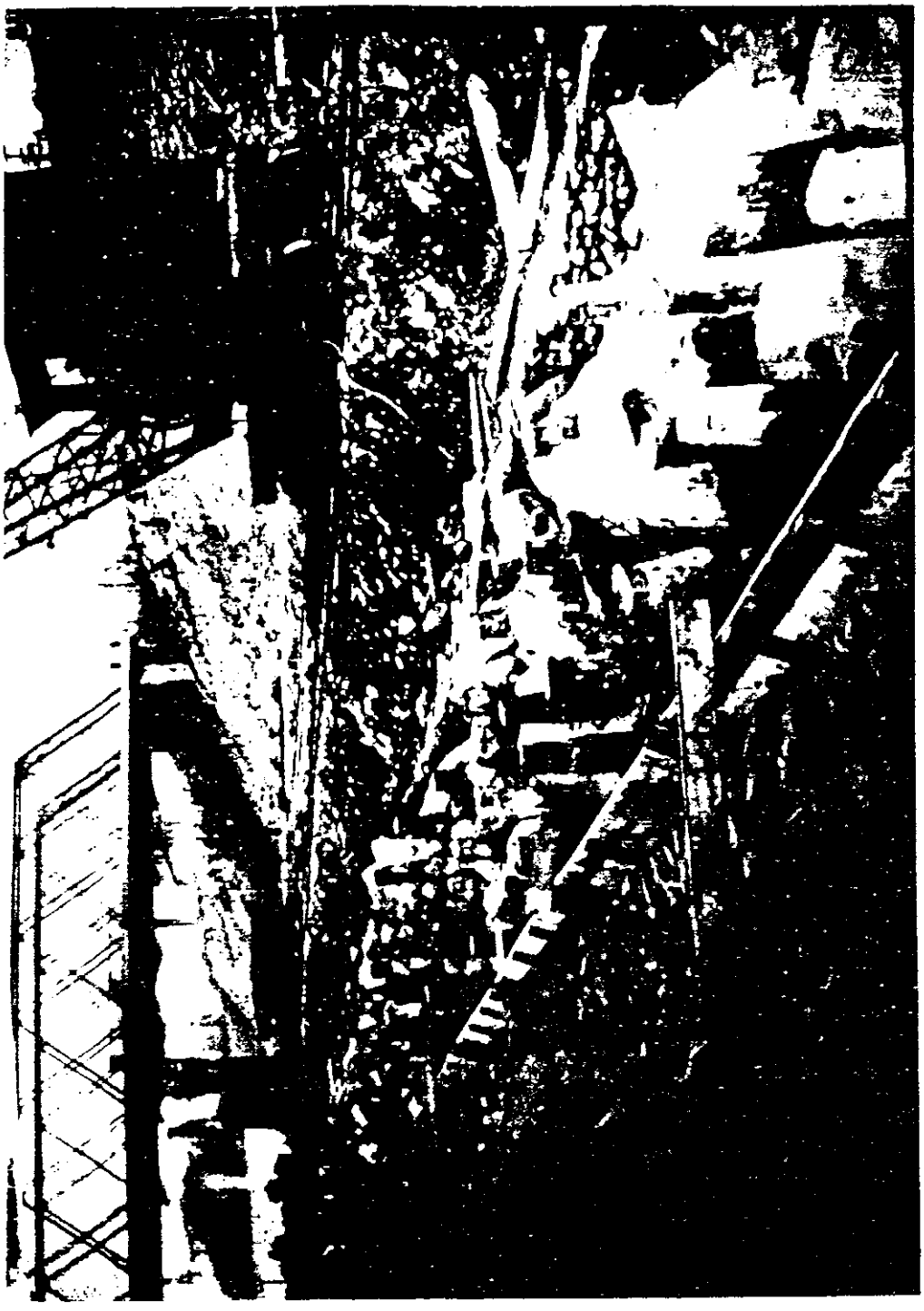

Figure 12.
Photo of Eleventh Street Bridge during expansion of power canal, 1915.
(Courtesy of Western Massachusetts Electric Company.)

ENDNOTES

1. Edwin M. Bacon, The Connecticut River and the Valley of the Connecticut (New York/London, 1906), p.310.

2. Acts of Massachusetts, 1792.

3. Ibid, 1794.

4. Bacon, p.310.

5. John Norman Carls, "Industrial Geography of Turners Falls, Massachusetts," thesis (Clark University, Worcester, Massachusetts, 1934), p.9.

6. Ibid.

7. Acts of Massachusetts, 1865.

8. D. Hamilton Hurd, History of Worcester County, Massachusetts, vol. 1 (Philadelphia, 1889), p.312.

9. Carls, p.22.

10. Louis H. Everts, History of the Connecticut Valley in Massachusetts, vol. 2 (Philadelphia, 1879), p.627.

11. Hurd, p.312.

12. Fred C. Abercrombie, The Turners Falls Power and Electric Company, A Public Utility since 1792 (Turners Falls, Massachusetts, 1925), p.13.

13. Ibid, p.14.

14. Charles Sidney Severance, History of Greenfield, 1930-1953 (Greenfield, Massachusetts, 1954), pp.2223-24.

15. Turners Falls Reporter, Turners Falls, Massachusetts, January 24, 1912, p.1.

16. Montague Town Records, Book F, October 23, 1914, p.286.

17. Ibid, March 25, 1915, p.313.

18. Ibid.

19. Turners Falls Reporter, May 26, 1915, p.4.

20. Gazette and Courier, Greenfield, Massachusetts, June 26, 1915, p.6.

21. Orra L. Stone, History of Massachusetts Industries; Their Inception, Growth and Success (Boston/Chicago, 1930), p.1788.

22. Ibid.

23. Ibid.

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