Coleman Bridge (Windsor Bush Road Bridge)
Spanning Phelps Brook on Windsor Bush Road
Windsor
Berkshire County
Massachusetts

HAER No. MA-119

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PHOTOGRAPHS
REDUCED COPIES OF MEASURED DRAWINGS
WRITTEN HISTORICAL AND DESCRIPTIVE DATA

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

HAER
MASS,
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HISTORIC AMERICAN ENGINEERING RECORD

COLEMAN BRIDGE
(WINDSOR BUSH ROAD BRIDGE)
HAER No. MA-119

Location: Spanning Phelps Brook on Windsor Bush Road, at the eastern edge of Windsor State Forest, Windsor, Berkshire County, Massachusetts
UTM: Plainfield, Mass. Quad. 18/664800/4710620

Date of Construction: ca. 1894

Structural Type: Iron-pipe queenpost pony truss bridge

Designer/ Builder: Charles Henry Ball, East Windsor, Massachusetts

Owner: Town of Windsor, Massachusetts

Previous Use: Rural vehicular and pedestrian bridge

Present Use: Barricaded and abandoned, 1980s

Significance: In 1893 Charles H. Ball, a mechanic and inventor from East Windsor, Massachusetts, patented a design for a small truss bridge constructed of iron pipes, which he described as "a strong, cheap bridge, that would last as long as any iron bridge, and cost but little, if any, more than a good wooden bridge." During the 1890s, Mr. Ball built numerous bridges of this type throughout western New England--including several bridges for Windsor and surrounding towns. At least twenty-five Ball bridges have been documented, but the Coleman Bridge is the only one still standing. There are, however, two others now in storage and awaiting restoration. The Coleman Bridge is an excellent example of C.H. Ball's patented design, and represents a late flowering of the mechanic-inventor tradition, which supplied much of the impetus for innovation in bridge design up through the middle of the nineteenth century.

Project Information: Documentation of the Coleman 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

Windsor Bush

The Coleman Bridge is located in a somewhat desolate and remote section of Windsor, Massachusetts, known as "Windsor Bush." Historically, this was always a low, swampy area with dense undergrowth, where the villagers used to go to fish at "Skeeter Pond," now called Windsor Pond, in the northeast corner of town. During the nineteenth century, however, Windsor Bush was actually quite thickly settled, and while farming was the main industry, at various times Windsor Bush also supported a cider mill, spruce oil distilleries, a number of sugar houses, mines for talc, mica and copper, several saw mills, and an axe factory.[1]

An 1876 map of Windsor shows more than a dozen houses in the Windsor Bush section of town, as well as a school and a cemetery. The area is crisscrossed with several roads and brooks. The map shows the road that is now Windsor Bush Road, crossing the brook near the residences of "H. Coleman" and "W.M. Coleman."(See Figure 1.) Nothing is known about early bridges at that location, other than the fact that whatever bridge was there was referred to as the "Coleman Bridge."

Description

The Coleman Bridge is a single-span, iron and steel queenpost pony truss, resting on concrete-faced abutments. The bridge measures 31'-0" long, 6'-2" high, and 12'-9" wide. The upper chord is an iron pipe, measuring 5¾" in diameter, with threaded sleeve splices on the inclined sections. The lower chord is comprised of paired, 1⅛" diameter rods with turnbuckles, which pass through the webs of the transverse floor beams, and are attached to the abutment ends of the upper chord by means of a bolt. The upper and lower chord of each truss are connected by two verticals (1" rods or 1½" bars), which loop over the upper chord and pass through both the upper and lower flanges of the rolled I-section floor beams. The verticals are secured at the top by a hook-ended bolt passing through the chord, and at the bottom by nuts. Diagonals are ⅞" rods with loop-welded upper ends and screw-threaded lower ends, and are secured to the upper and lower chords in the same manner as the verticals, with the exception that the diagonals pass through the webs of the floor beams, rather than the flanges. Five I-section stringers (4"x2½") are secured to the two floor beams (8"x4½") by straps bolted to the upper flanges of the stringers. The stringers support a 12'-wide wooden deck. The bridge is laterally braced under the deck by ⅞" diameter rods with turnbuckles, although only the rods in the central panel remain intact. The bridge is skewed at an angle of approximately 8 degrees. The present concrete abutment faces have been added--the trusses actually bear well behind them, and a 1923 highway report indicates that at that time the bridge had log abutments. The Coleman Bridge follows Charles Ball's patent very closely.(See Figure 2, HAER drawings, and photographs.)

Charles H. Ball

In the late nineteenth century, at a time when the bridge-building craft had been transformed into a high-growth industry, bridges designed and built by local carpenters, masons and mechanics were rapidly becoming relics of the past. The increasing demand for highways, canals, and railroads in mid-century, had created the need for professionally-trained engineers, and by the end of the century, these engineers, working with bridge-manufacturing firms, had largely replaced local builders as the driving force behind the industry. Within this context, Charles Ball, a local bridge-builder with no formal training, was something of an anomaly.

Charles Henry Ball, one of eight children of William Isaac Ball and Mary Pierce Ball, was born at Peru, Massachusetts, on January 14, 1861. His father had been somewhat of an adventurer in his youth, traveling to California in the gold rush of 1849, and then working as a waterfront policeman in New York City. He finally came to Peru, Massachusetts, to work as a farmer, marry and raise a family. In 1864 William Ball received U.S. Patent No. 45,382 for an "improved potato masher," an indication of the creative spirit that influenced his son Charles' life.[2]

Charles Ball received his only formal education in the district school, but he read a great deal and was said to be conversant on most subjects. As a young man, he worked for several years at the Stevens Manufacturing Company in Cummington, a manufacturer of wooden pencils and tool handles. In the 1880s, he entered the employ of Granville Jordan, proprietor of an iron foundry and machine shop at East Windsor, Massachusetts, which manufactured "Jordan's Improved Turbine Water Wheels," circular and band saws, and wood-working machinery.[3] By 1885, Ball had become a partner in the company, then known as "Jordan & Ball," and the shop was also manufacturing wrought iron bridge stringers.[4]

In 1888 Jordan & Ball sold a small bridge to the Town of Peru, for the sum of $50.[5] Whether this project provided the inspiration for Ball's vocation, or whether he was already tinkering with bridge designs and this was merely the first of his bridges to be built, remains somewhat ambiguous, but it was apparently this bridge which marked the beginning of Charles Ball's career as a bridge builder. That same year, Ball built a machine shop at East Windsor to work on his bridge designs. He employed his brother Frank, and a friend, Harrison Hathaway, in their construction and erection. Several years--and at least a dozen bridges--later, on July 25, 1893, Charles Ball received U.S. Patent No. 502,165 for an iron pipe truss bridge.(See Appendix A.) During the last decade of the nineteenth century, Ball erected at least twenty-five of these bridges throughout western New England.[6]

Exactly how many years Ball devoted to his bridge-building career is uncertain, but it appears that by 1895 he was moving on to pursue other interests. The reason for this change is also somewhat ambiguous. It has been suggested that bridge-building was not a profitable venture for someone like Charles Ball, and that lack of finances forced him to give it up.[7] It also seems reasonable to suggest that demand might have dwindled after a few years, if Ball had flooded the local market with his bridges, or that he simply could not--or chose not to--compete with the large bridge-building

companies. But, given the type of person that Charles Ball was--inquisitive, creative, ambitious, industrious, a bit eccentric--it does not seem unlike him to have relinquished a proven endeavor for a new and unexplored undertaking. Whatever the case, around 1895 Charles Ball purchased a portable sawmill outfit from someone in the nearby town of Savoy, and acquired a factory, known as the "Wooden Bench Screw Factory," at East Windsor.[8] He then launched a woodworking enterprise which would grow and thrive into the 1930s. "The High Ball Mill" at East Windsor, as it became known, manufactured barrel staves and brush handles, and after 1905 specialized in the manufacture of lollypop sticks, meat skewers, coat hangers, knitting needles, lead pencils, and other wooden items.(See Figures 3 and 4.) It is said that Ball--always the tinkerer--made improvements in all the existing machinery, redesigning every machine used in his mill. "This improved equipment greatly increased production, the daily output of the factory in its early days, 30,000 individual pieces, growing to 700,000 in later years."[9] By 1924 a large percentage of the manufactured products were being exported to countries around the world, and while his bridges had never made headlines, Charles Ball's lollipop sticks did.(See Appendix B.) In fact, Ball became so well known as a manufacturer, that he was listed in the National Cyclopaedia of American Biography in 1932.(See Appendix C.)

Throughout his life, Charles Ball participated actively in town politics, and held nearly every town office at one time or another. He was said to be "one of the best known and popular men in Berkshire county."[10] His mill employed about thirty people, which, at the time, was most of the available labor at East Windsor.[11] He also owned more than 2,000 acres of land and many of the houses at East Windsor, which he rented to his employees. He was a hard worker and a very generous man, beloved by all. Charles Ball died at East Windsor, May 15, 1928. He was buried at the Peru cemetery next to his wife, Cora (Jenkins) Ball, who had died in 1911. At the time of Ball's death, David J. Malcolm, Windsor school superintendent, said of him:

> Charles Ball was a lovable, God-fearing man who loved his neighbors and shared his goods with them. There are not enough men like "Charlie" Ball, typical of the New England old school--a rare soul who made living a pleasure.[12]

Ball's Pipe Truss Bridges

Charles Ball disparaged most iron bridges being built at the time, saying, "the builders of iron bridges seem to be paying more attention to appearance than to the strength of their bridges."[13] He also thought that rivets reduced the strength of the metal, and that their use constituted an unnecessary outlay of labor. Thus, Ball's bridges were designed for easy manufacture and assembly. The main members of the bridges were actually large sections of iron pipe. Connections were simplified by pre-curving the upper iron pipe compression member and by wrapping iron straps around it to form vertical members. Based on measurements taken at the site, the various members could be cut and bent to the desired shape, prior to the actual erection of the bridge. Once in the field, the various pieces simply needed

to be bolted together and fastened to the abutments. Charles Ball made it clear that aesthetics were not a consideration in his bridges, yet the designs are strikingly elegant in their simplicity. In a sales pamphlet, Ball described the premise of this bridge as follows:

> To meet the demand for a low priced iron bridge having all the important qualities of strength and durability found in the best iron bridges now made, I have perfected a pipe truss bridge which is shown in the sketches. The question of artistic or architectural effect was not considered in planning this bridge, the main point being to produce a strong, cheap bridge, that would last as long as any iron bridge, and cost but little, if any, more than a good wooden bridge.[14](See Appendix D.)

The majority of the bridges were based on the king- and queen-post trusses, although a drawing in his sales pamphlet suggest that Ball also considered a modified Howe truss design.

During the 1890s, C.H. Ball manufactured and erected numerous bridges throughout western New England, at least twenty-five of which have been documented. The concept of an inexpensive iron bridge for short spans was the key to Ball's success. Small towns could erect several Ball trusses for what it would have cost them to erect a single span designed by an engineer and fabricated by a large company. Thus, the Ball bridges were primarily built by small towns, for spans averaging between 20' and 40' in length.

While Ball trusses have been documented as far north as Jericho, Vermont, and as far south as Washington Depot, Connecticut, at least 75 percent of the known Ball trusses were built within a twelve-mile radius of Ball's East Windsor shop.(See Appendix E.) The Town of Windsor was, in fact, one of Mr. Ball's best customers. They bought a number of his bridges, and engaged him in many highway and bridge repair projects through the years. Annual reports for the town of Windsor indicate that between 1889 and 1895, the town paid Charles Ball for several bridges, but the details are unclear. The years and amounts are as follows:

1890--$106.92, for "work on bridge and iron work"
1892-- $85.00, for "bridge at Patterson's"
1893--$200.00, for "Iron Bridge," (Allen Bridge)
1894--$200.00, for "Iron Bridge at East Windsor"
1895--$386.00, for "bridge work"
1895--$161.00, " "
1899-- $92.67, for "repairs on bridge and plank"

These were the largest recorded amounts paid to Charles Ball, specifically for bridges, although nearly every year between 1890 and 1928, C.H. Ball was listed as having received some amount of money out of the town highway fund. Because of the ambiguous nature of the bridge descriptions and locations, it is difficult to determine exactly when the Coleman Bridge was constructed. Additionally, there has been some speculation that the Coleman Bridge might have been moved at some point from another location, possibly from the

Allenville section of town, but no documentation could be found to support this.[15]

The fact remains, however, that quite a number of these iron pipe bridges were built by Charles Ball during the last decade of the nineteenth century, and that the design was immensely successful for short-span bridges, given the fact that Ball had never had any formal engineering training, and that he was competing with large bridge-building firms. That Mr. Ball had great confidence in his bridges is evidenced by his sales brochure, in which he made this offer:

> As an earnest of my own faith, I will furnish a bridge for any town wishing it, and allow the bridge to be tested up to the point of its guaranteed strength. If any failure or weakness is developed by the test, I will remove the bridge at my own expense.[16]

Letters from the selectmen of the various towns that purchased Ball's truss bridges, attest to the fact that G.H. Ball had, indeed, found a market for his invention. One such letter, dated February 6, 1893, from the Selectmen of Worthington, Massachusetts, read as follows:

> Mr. C.H. Ball, East Windsor, Mass.
> Dear Sir: The bridges you put up for our town are giving good satisfaction. Think you have struck the right thing this time. It is a good, substantial bridge and comes within reach of small towns.[17]

Indeed, Charles Ball's bridges proved themselves substantial and able to withstand the test of time, as evidenced by the few surviving examples. There are three known surviving Ball trusses, all in Massachusetts: Holiday Road Bridge, built for the Town of Dalton in 1895; Stage Road Bridge (formerly Swift River Bridge), built for the Town of Cummington in 1890; and Coleman Bridge (also called Windsor Bush Road Bridge), built for the Town of Windsor at an unknown date.(See Figure 5.) While all three are still intact, the Dalton and Cummington bridges were both moved from their sites in 1990, and were put in storage to await restoration. Although no longer in use, the Coleman Bridge still spans the brook in Windsor Bush, a silent testimony to the creativity and ingenuity of Charles Henry Ball.

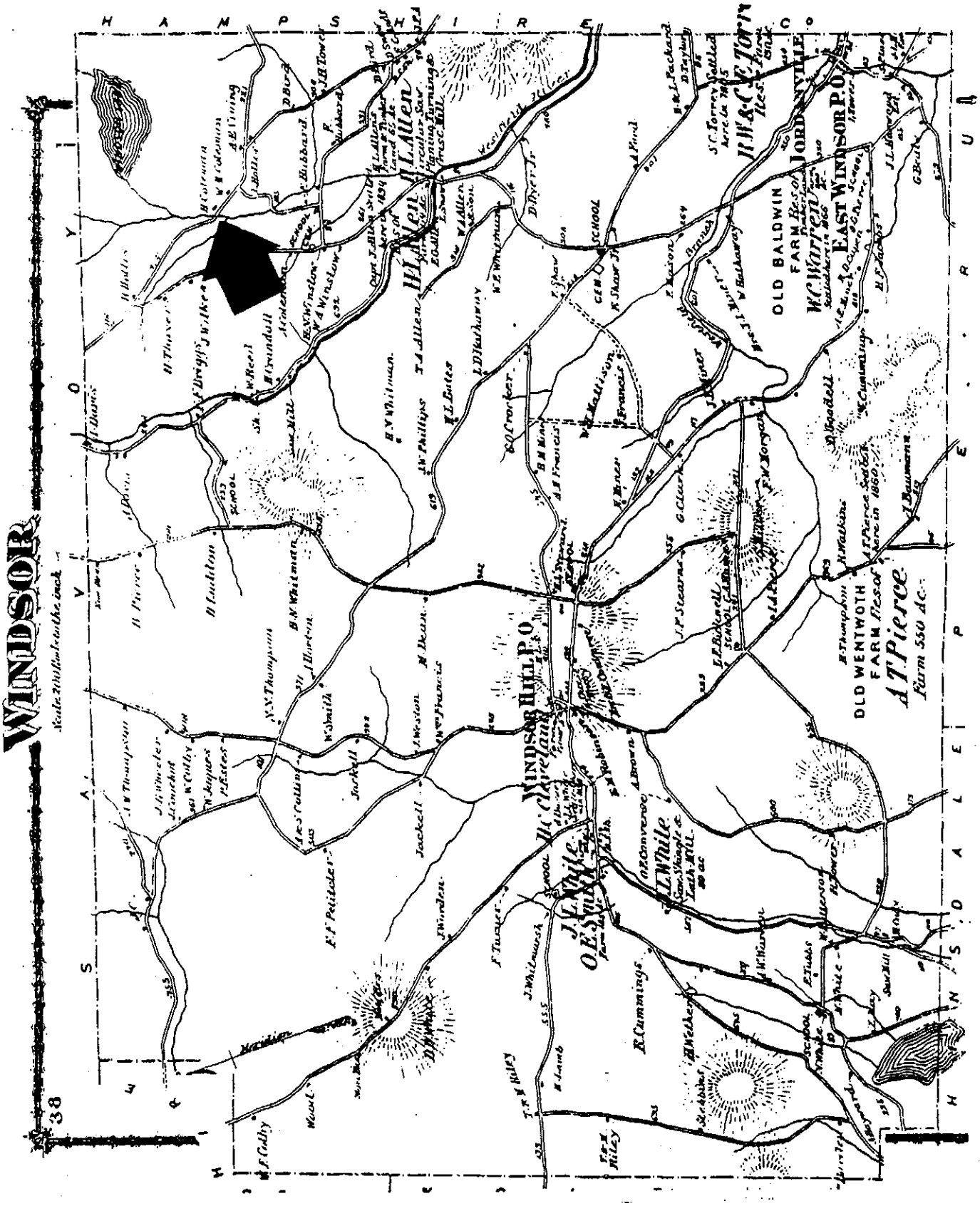


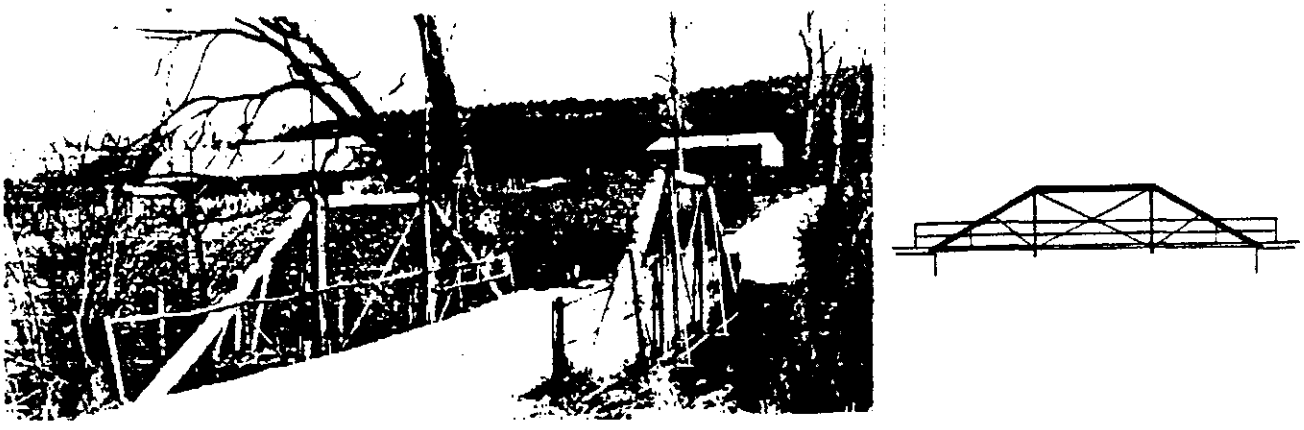
Figure 1. Map of Windsor, Massachusetts, F.W. Beers, 1876.

Figure 2. Photo of Coleman Bridge on Windsor Bush Road.
Bernard Drew, photographer.

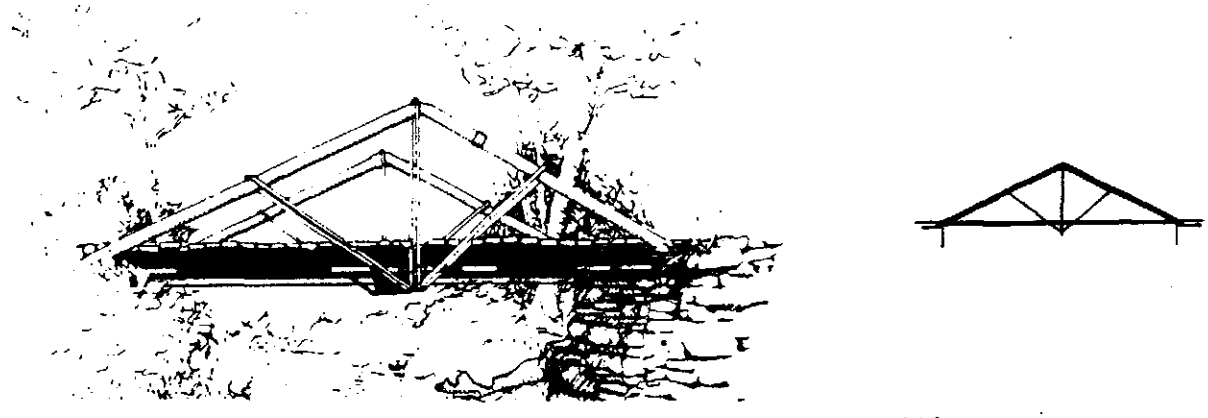
Figure 3. Ball Mill at East Windsor, Massachusetts.
(Photo: Windsor Historical Society Collection.)

Figure 4. Interior of Ball Mill at East Windsor, Massachusetts.
(Photo: Berkshire County Historical Society Collection.)

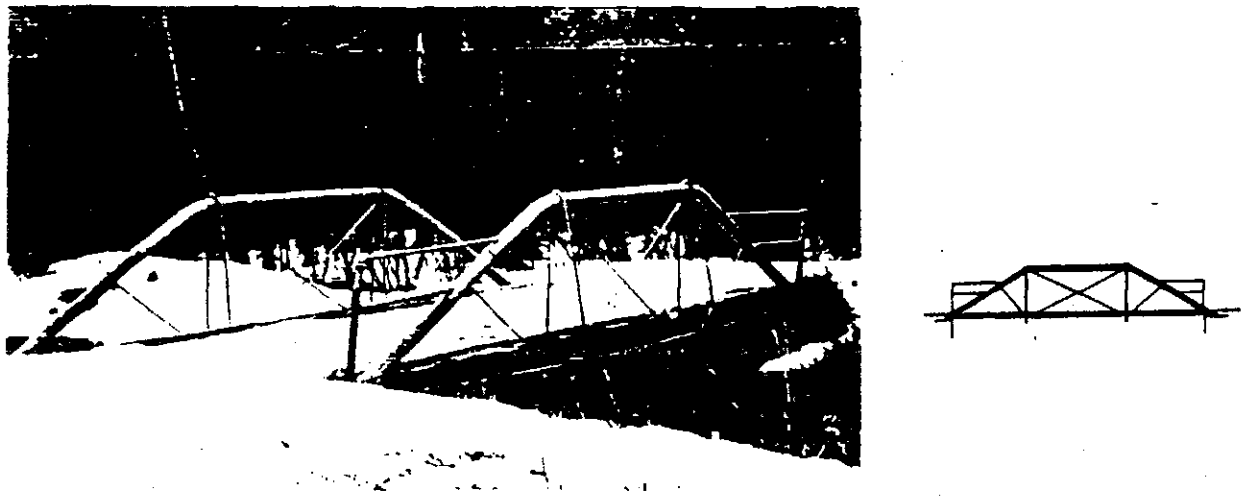
Figure 5. The three known surviving Ball truss bridges.



Holiday Road Bridge, Dalton, Massachusetts, 1895.
(Presently in storage at Windsor Historical Society, Windsor, Mass.)



Stage Road Bridge, Cummington, Massachusetts, 1890.
(Presently in storage at Cummington Town Garage, Cummington, Mass.)



Coleman (Windsor Bush Road) Bridge, Windsor, Massachusetts, c.1894.
(Spanning Phelps Brook on Windsor Bush Road, Windsor, Mass.)

UNITED STATES PATENT OFFICE.

CHARLES H. BALL, OF EAST WINDSOR, MASSACHUSETTS.

BRIDGE.

SPECIFICATION forming part of Letters Patent No. 502,165, dated July 25, 1893.

Application filed April 20, 1893. Serial No. 471,136. (No model.)

To all whom it may concern:

Be it known that I, CHARLES H. BALL, a citizen of the United States of America, residing at East Windsor, in the county of Berkshire and State of Massachusetts, have invented certain new and useful Improvements in Bridges; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to letters of reference marked thereon, which form a part of this specification.

The object of this invention is to provide a truss bridge of improved construction; and it consists in the construction and combination of the parts, as will be hereinafter fully set forth, and particularly pointed out in the claims.

In the accompanying drawings, forming part of this specification, Figure 1 is a side elevation of the improved bridge, and Fig. 2 is a sectional view through the line *x*—*x* of Fig. 1.

A A designate the piers or abutments upon which the ends of the chords B rest and are anchored in any suitable manner. The chords are preferably made up of tubes connected to each other by sleeves *b*, and they are so arranged that they extend upwardly at an acute angle from the abutments and are bent to provide a central horizontal portion B'. From the horizontal portions of the chords depend rods *a a*, which are made of a single bar looped over the chords and secured thereto by bolts *b'* which pass through the chords and are secured in place by nuts. The lower ends of the rods are spread and passed through the flanges of the I-rails or cross-ties C, which are apertured for the purpose, and the rods or supports are screw-threaded at their lower ends to receive nuts *c c*.

D D designate diagonal rods or braces which are attached at one end to the inclined portions of the chords B, pass through the cross-ties C on a line with the chords and extend therefrom to the bolts *b'*.

E E designate tension bars which are held in engagement with the lower ends of the chords by means of staples or bolts which connect with eyes in said tension bars. These tension bars pass through perforations in the cross-ties C and are attached to each other by turn-buckles *e*. The longitudinal beams F F of the bridge rest upon the cross-ties C C, and the floor boards, G, are secured to said beams in the usual manner.

A bridge constructed as hereinbefore described can be readily made and set up, and the chords being tubular are light and have great strength, and each chord being made of two pieces permits the parts to be shaped or patterned after each other so as to have uniform bends or angles.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a bridge, the combination of the tubular chords having inclined end portions and a horizontal central portion, looped bars connected to the central portion of the chords and to cross-ties, diagonal brace-rods D extending from the inclined portions of the chords through the cross-ties to the horizontal portion of the chords, and tension bars attached to the lower ends of the chords and extending through the cross-ties and connected to each other by turn-buckles, substantially as shown.

2. A bridge constructed substantially as shown and comprising chords having inclined end portions and horizontal central portions, looped bars connecting the horizontal portion of the chords with the flanges of cross-ties, diagonal brace-rods passed through the cross-ties on a line with the chords, said brace-rods extending from the inclined portions of the chords to the central portion, tension bars E having turn-buckles *e*, longitudinal beams F F adapted to rest upon the abutments and upon the cross-ties, and a floor secured to the longitudinal beams, the parts being organized substantially as shown.

In testimony whereof I affix my signature in presence of two witnesses.

CHARLES H. BALL.

Witnesses:
EDGAR E. JORDAN,
H. P. HATHWAY.

APPENDIX A: Charles Ball's patent, 1893.

(No Model.)

C. H. BALL.

BRIDGE.

No. 502,165. Patented July 25, 1893.

Fig. 1.

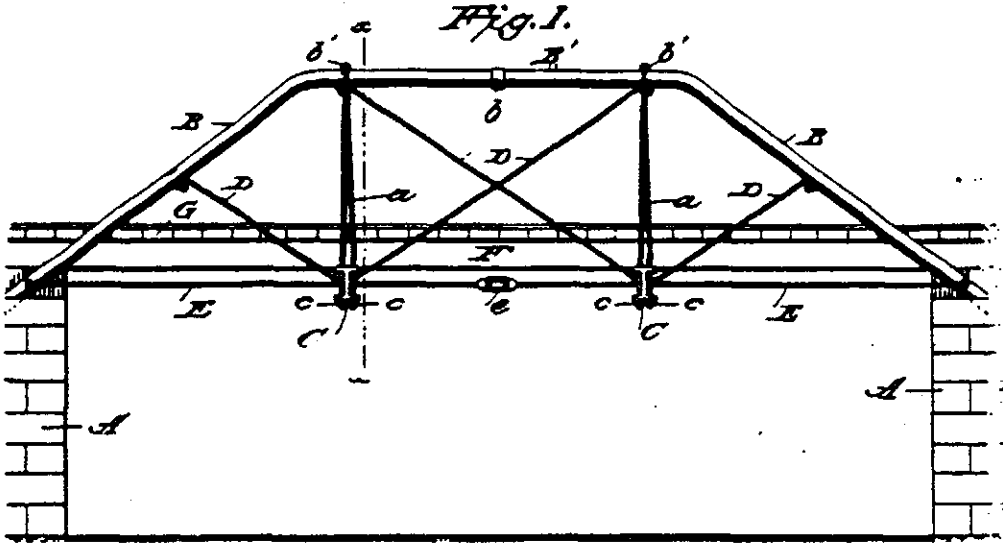
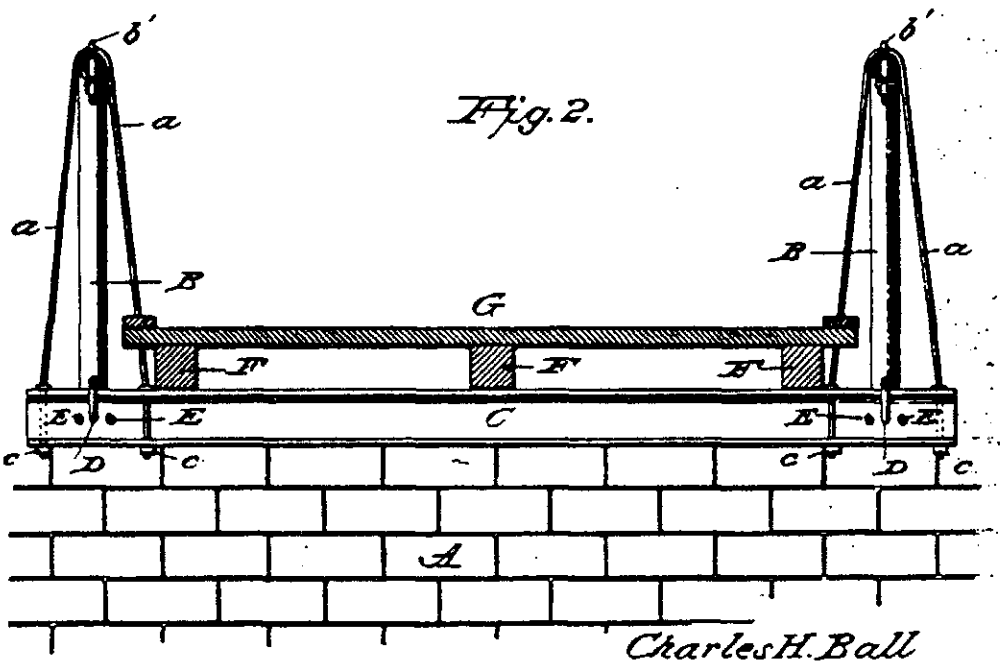


Fig. 2.



Charles H. Ball
INVENTOR

WITNESSES
L. S. Wright
E. W. Johnson

By [illegible] Attorney

MAKING MILLIONS OF STICKS FOR LOLLYPOPS

Little Factory in East Windsor Provides Handles in Large Quantities for Children's Favorite Confection

CHARLES H. BALL of East Windsor is manufacturing 100,000,000 lollypop sticks a year, and in spite of his 63 years he is pushing his industry in the same aggressive manner that has characterized him for the past two decades. Inasmuch as his output was sold practically in its entirety in foreign countries before the war, he suffered a severe setback when exporting was paralyzed, and it is only in the past few weeks that he has succeeded in getting back to his old stride.

CHARLES BALL

Behind His Orders.

Two weeks ago he made his first shipment to England for a period of several years, and at the present time his factory is running 10 hours a day and is way behind on orders. A new and generally unknown competitor has entered his field in the form of Japanese concerns, who have been manufacturing lollypop sticks and meat skewers out of bamboo. Their product has been sold practically exclusively in England, and Mr. Ball is inclined to believe that the Tokio earthquake may have put a temporary stop to their activities, allowing him to regain some of his old customers.

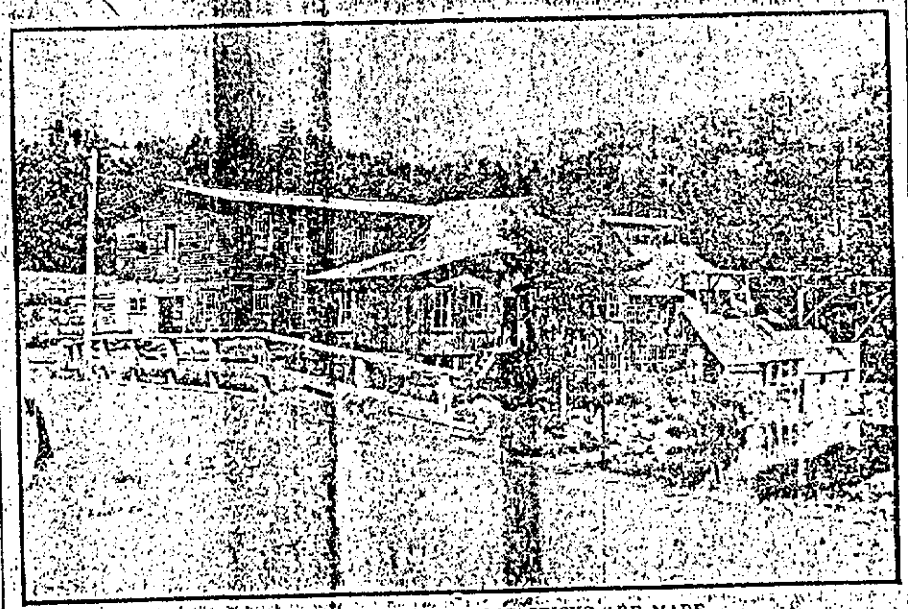
Mr. Ball was originally a builder of steel bridges, and he became interested in the lollypop stick and skewer industry through a rather peculiar circumstance. He was talking casually to an Armour buyer in Boston some 20 years ago, who complained of his trouble in buying good quality skewers. Mr. Ball suddenly decided to quit bridges and build good skewers.

Invents Own Machinery.

He was more than a year in getting into production. His machinery had to be invented, designed and built by himself, and no one who has not visited his plant can appreciate the vast amount of labor and ingenuity entailed. He acquired for his purpose his present factory, which was then known as the Wooden Bench Screw Factory. At the time scythe stones were being produced there, which enjoyed a sale all over the civilized world.

Soon after the Ball Skewer Factory was placed in operation the skewers manufactured by other concerns dropped in price about one half, and for a time the newcomer was subjected to very stiff competition. But he continued in the path he had hewn, turning out a quality product quite unperturbed by his competitors.

His business gradually expanded and through the medium of his inventive genius he was able to turn out 400,000 skewers in a day. Three quarters of his merchandise was shipped to England and most of the balance to The Argentine. At the present time the candy manufacturers in New York, Philadelphia and Brooklyn are his best customers, but he expects to be back in the export trade almost exclusively eventually.



BALL'S MILL WHERE LOLLYPOP STICKS ARE MADE

His friends often wonder that he has never patented any of his inventions, but Mr. Ball explains that there is such a limited market for this type of machinery that it would not pay him to go to the necessary trouble and expense. With his present equipment he can produce in addition to skewers and lollypop sticks, coat hangers, knitting needles and lead pencils. When the Mary Lyon black walnut tree at Mt. Holyoke College was damaged by a storm, Mr. Ball is the manufacturer who transformed the remains into coat hangers and knitting needles to be sold for war benefits.

Puts Silk in Banknotes.

Mr. Ball is also distinguished as one of the three who invented the machine for putting the silk in banknotes used at the Crane plant in Dalton. He chuckles as he talks of this device. For years competitive concerns have been endeavoring to obtain the secret of this machine's construction, but their efforts have been unavailing. Mr. Ball declares that the process is so simple that it is laughable, yet the cleverest counterfeiters can never seem to get the silk into their notes.

Does Not Use River.

Visitors to the Ball skewer factory frequently express surprise that the branch of the Westfield River which flows by the building is not used for water power. The owner of the property explains patiently that the water gets so low in the summer season that it would not pay him to bother with it, and in addition to that fact so much waste woods is obtained in the manufacturing process that the cheapest possible source of power is the burning of this scrap material.

In this connection it might be mentioned that Mr. Ball's talents are by no means confined to inventing. He is also a discoverer. One day while he was musing on the water power possibilities of Windsor it occurred to him that while the branch of the Westfield River at his feet flowed in a southeasterly direction to enter the sea by way of the Connecticut River, the stream a little west of him in the same town of Windsor flowed in a southwesterly course, making its way to the ocean in the Housatonic River, whose estuary is in Long Island Sound.

The fact that the waters of Windsor emptied into the ocean in two different places struck Mr. Ball as being rather unusual, when he reflected that the Dry Brook in the north part of Windsor flowed in a northwesterly course, emptying into the Hoosic and thence to the Hudson River and sea. Mr. Ball verified his observations by consulting a map. He was correct. The streams of Windsor flowed into the ocean in three different places.

A thorough study of the map failed to disclose any other town in Massachusetts or the East with a similar geographical distinction, and Mr. Ball is inclined to believe that Windsor may be the only town in the country whose streams have this unusual feature.

Mr. Ball is one of the best known and popular men in Berkshire county, where he has resided all his life, being born and brought up in the town of Peru. He is a large landholder, possessing over a dozen houses and more than 2000 acres of land. Mr. Ball has held practically every office the town offers and has been an office holder ever since he was 21. He was chairman of Selectmen so long, that he finally had to force his fellow citizens to give the job to some one else. He has been moderator at the town meetings for a period of 20 years. He has the best interests of his community always in mind and is justly entitled to the position of love and trust that he generally enjoys.

1924

COLEMAN BRIDGE
(WINDSOR BUSH ROAD BRIDGE)
HAER No. MA-119
(page 14)

APPENDIX B: Newspaper article, source unknown, 1924.

CHARLES H. BALL
MANUFACTURER

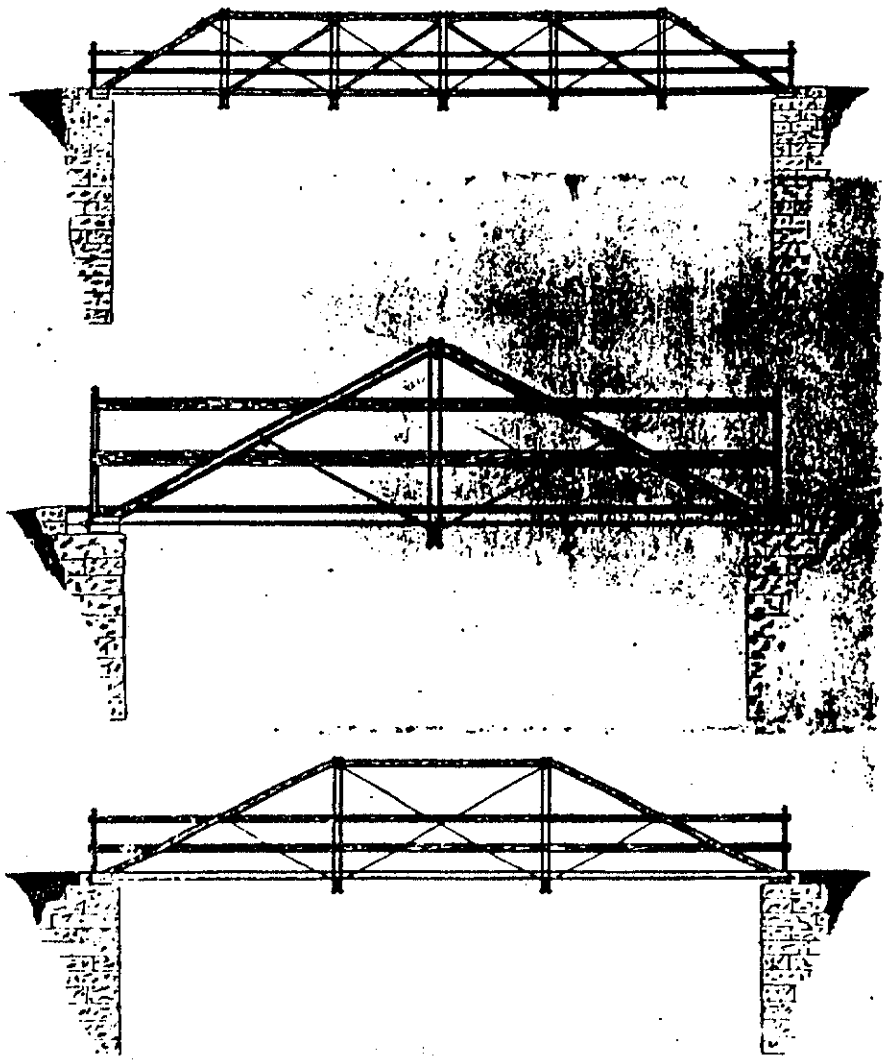
BALL, Charles Henry, manufacturer, was born at Peru, Mass., Jan. 14, 1861, son of William Isaac and Mary Adeline (Pierce) Ball. His father joined the emigration to California in 1849, sailing around Cape Horn; later he returned to Massachusetts and engaged in farming. Mr. Ball received his education in the district school at Peru and as a young man he entered the employ of Granville Jordan, proprietor of a machine shop at East Windsor, Mass. By 1896 he had become an independent machinist and for a while he was employed in bridge building. He opened a small wood-working shop to make barrel staves and brush handles, and after 1905 specialized in the manufacture of meat skewers and candy sticks. He made many improvements in all existing machinery, redesigning nearly every machine used in his mill. This improved equipment greatly increased production, the daily output of the factory in its early days, 30,000 individual pieces, growing to 700,000 in later years. He served as selectman of Windsor, Mass., for twenty years and was for fifty years moderator of the Windsor town meeting. In 1921 he was master of ceremonies upon the occasion of the town's 150th anniversary. He was a member of the Masonic fraternity. He was married, June 4, 1893, to Cora, daughter of Marshall Jenkins, of Cummington, Mass.; she died in 1911. They had one child, Mary Washington, who was married to Frederick George Bowman. Mr. Ball died at East Windsor, Mass., May 15, 1928.

APPENDIX C: Biographical sketch of Charles H. Ball.
National Cyclopaedia of American Biography, 1932.

BALL'S PIPE TRUSS BRIDGE.

WROUGHT IRON AND STEEL.

PATENTED JULY 25, 1893.



The Cheapest Iron Bridge in the World.

AS STRONG AS THE STRONGEST. AS DURABLE AS IRON AND STEEL.

CHARLES H. BALL, East Windsor, Mass.

IT is evident to every observer that highway bridges made of wood have had their day. Long timbers are growing scarce, wood decays in the vital parts of bridge work so rapidly as to compel frequent renewals for safety, or if neglected bringing hazard to life and limb, and finally the inevitable lawsuit or settlement for damages *and a new bridge*. Iron and steel is being substituted and found to be cheaper in the end. But the builders of iron bridges seem to be paying more attention to appearance than to the strength of their bridges, or why the notice over so many beautiful iron structures, "No driving on this bridge faster than a walk." The structure has many rivet holes and bears other evidences of great outlay for labor. Every rivet hole reduces the strength of the metal in proportion to its size, and more material must be used to compensate for this loss of strength which in the aggregate is large.

The extra labor and material required for appearance sake, make the first cost of iron bridges so high as to prevent their use in many places. To meet the demand for a low priced iron bridge having all the important qualities of strength and durability found in the best iron bridges now made, I have perfected a pipe truss bridge which is shown in the sketches. The question of artistic or architectural effect was not considered in planning this bridge, the main point being to produce a strong, cheap bridge, that would last as long as any iron bridge, and cost but little, if any, more than a good wooden bridge. The letters of recommendation on another page speak for themselves of my success.

As an earnest of my own faith, I will furnish a bridge for any town wishing it, and allow the bridge to be tested up to the point of its guaranteed strength. If any failure or weakness is developed by the test, I will remove the bridge at my own expense.

The pipes used are *not* the ordinary *gas* and *steam pipe* found in the market, but are heavier, and are made for special purposes requiring great strength. The beams and floor joist are of steel and the rods and bars of best double refined iron. Sidewalks will be added when desired.

Please send dimensions of bridges needed, and estimate of cost will be furnished by letter, or in person. Measures should be taken on each side of the bridge between the abutments.

CHARLES H. BALL.

COLEMAN BRIDGE
(WINDSOR BUSH ROAD BRIDGE)
HAER No. MA-119
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APPENDIX D: Sales Pamphlet, "Ball's Pipe Truss Bridge," c.1894.
(Collection of the Berkshire County Historical Society.)

C. H. Ball, *Esq.*, Manufacturer of Iron Bridges.

East Windsor, Mass., Dec. 24, 1892.

Dear Sir :—We are very well pleased with the iron pipe bridge you put on for us last year, and shall recommend them as fast as we need new bridges in town. We think they are everlasting to all appearances and by far the cheapest iron bridge we ever heard of being put on the market.

Yours.

H. A. Ford, A. A. Shaw, } *Selectmen of Windsor.*

To whom it may concern :

We have one of Charles H. Ball's style of bridges in our town; have used it a year, and can truly say, for strength, lightness and cheapness, we know of no other that can take its place. We are well satisfied with the bridge, and when we want new ones, shall advocate using his pattern.

Yours, very truly.

D. E. Lyman, *Chairman of Selectmen.*

Cummington Mass., Oct. 4, 1892.

The undersigned, Selectmen of Hawley, certify that the iron bridge furnished by Charles H. Ball for our town in the year 1891, gives the best of satisfaction to all parties who use it. We cheerfully recommend this style of bridge to any parties who may be in need of new bridges.

Charles Chittenden,
L. W. Temple.

Hawley, Mass., Dec. 31, 1892.

Worthington, Mass., Feb. 6, 1893.

Mr. C. H. Ball, East Windsor, Mass.

Dear Sir :—The bridges you put on for our town are giving good satisfaction. Think you have struck the right thing this time. It is a good, substantial bridge and comes within reach of small towns.

Truly yours.

A. J. Randall, Willard Jones, D. L. Prentice, } *Selectmen of Worthington.*

Langsboro, Mass., Feb. 21, 1894.

Mr. C. H. Ball, East Windsor, Mass.

Dear Sir :—In reply to your favor of 19th, I can only say that your pipe bridge thus far has given general satisfaction. Having subjected the structure to no extraordinary test, I cannot of course speak more emphatically at present. I can say confidently, however, that when we desire to build another iron bridge—*and* at the price they are ultimately the most economical—you shall hear from us

Very truly.

E. M. Whiting, *Chairman of Selectmen.*

Jericho, Vt., Feb 22, 1894.

Mr. C. H. Ball,

Dear Sir :—The "Pipe Bridge" you built for our town last summer is all that you represented it to be, and is giving the best of satisfaction. Being tasty in appearance and very strong, we can recommend this style of bridge to anyone wanting a durable bridge.

Very truly yours.

A. C. Hoskins, *Chairman of Selectmen of Jericho, Vt.*

West Worthington, Mass., Feb. 23, 1894

Mr. C. H. Ball,

Dear Sir :—The Pipe Bridge you put on for our town is in every way as good as you represented it to be. There has been some heavy teaming over it, and has given good satisfaction. We take pleasure in recommending it to others.

A. J. Randall, Willard Jones, Samuel Cole, } *Selectmen of Worthington.*

Montague, Mass., Feb. 28, 1894.

C. H. Ball.

Dear Sir :—The 38 foot Pipe Bridge, which you built for the town of Montague last October, is perfectly satisfactory in every respect, and we take pleasure in recommending the Ball pipe bridge as an economical and durable bridge. Respectfully,

C. W. Hibmer, G. H. Goddard, S. H. Ambrose, } *Selectmen of Montague.*

Hawley, Mass., Feb. 28, 1894.

Mr. C. H. Ball, East Windsor, Mass.,

The Pipe Bridge purchased of you by this town in 1891, has given the best of satisfaction, and stan ls firm under heavy loads. This fact induced us to order one the past year, 1893, and it is admired by all for its simplicity of construction, neat appearance and strength. We recommend this style of bridge to all parties in need of new bridges.

Yours very truly,

L. W. Temple, A. C. Bissell, } *Selectmen of Hawley*

Washington Depot, Conn., March 1, 1894.

C. H. Ball, *Esq.*,

Dear Sir :—Replying to yours of recent date, we cheerfully say that the Three Pipe Bridges you erected for us last year, so far have proved all you recommend them to do. We have tested one of them with full 12 tons moving limit. It carried it without any swaying or trembling. I consider them a *first-class bridge* and hope to see more of them in use in this town in the future.

Very respectfully yours.

F. A. Kilburn, *1st Selectman Town Washington*

Bridges are now being built for the towns of Leverett and Greenfield, Mass

COLEMAN BRIDGE
(WINDSOR BUSH ROAD BRIDGE)
HAER No. MA-119
(page 17)

PROPOSAL.

Charles H. Ball, East Windsor, Mass.

To the .....

of ..... County of ..... State of .....

Gentlemen:

Charles H. Ball, of East Windsor, Mass., proposes to do all the work, and furnish all the material of every description except .....

..... requisite and necessary to complete in a workmanlike manner, and ready for travel, the superstructure for

A WROUGHT IRON AND STEEL BRIDGE

over the .....

at ..... in said County and State; at prices specified below.

Said bridge to be built in accordance with specifications and drawings given below or submitted herewith.

Should ..... the above proposal be accepted, he hereby agrees to enter into contract with your town for the building of said Bridge with full plans and specifications for such Bridge as may be adopted by you, and to form part of said contract.

Very respectfully,

.....

Date .....

APPENDIX D: Contract for Ball truss bridge.
(Collection of the Windsor Historical Society.)

APPENDIX E: BRIDGES KNOWN TO HAVE BEEN BUILT BY CHARLES BALL
(compiled from MDPW data and list by Bernard Drew)

Peru, Massachusetts, 1888

Hawley, Massachusetts, 1891

Cummington, Massachusetts, 1892 (28 feet)

Windsor, Massachusetts, 1892 (36 feet), "Allen Bridge"

Worthington, Massachusetts, 1892

Leverett, Massachusetts, 1893 (2 spans of 36 feet)

Montague, Massachusetts, 1893 (38 feet)

Hawley, Massachusetts, 1893

Lanesboro, Massachusetts, 1893

Jericho, Vermont, 1893

Washington Depot, Connecticut, 1893

Greenfield, Massachusetts, 1893

Worthington, Massachusetts, 1894 (22 feet)

Windsor, Massachusetts, 1894 (25 feet), "Cady's Bridge"

Dalton, Massachusetts, 1895 (41 feet)

Savoy, Massachusetts, 1896 (27 feet)

Hinsdale, Massachusetts, date unknown

Hinsdale, Massachusetts, date unknown

Windsor, Massachusetts, date unknown (33 feet), "Axe Factory Bridge"

Windsor, Massachusetts, date unknown (29 feet), "Patterson's Bridge" (wood)

Windsor, Massachusetts, date unknown (24 feet), "Schoolhouse Road Bridge" (iron stringer)

Windsor, Massachusetts, date unknown (30 feet), "Coleman Bridge"

Worthington, Massachusetts, date unknown (40 feet)

Greenwich, Massachusetts, date unknown

ENDNOTES

1. Gabrielle T. Drew, Town of Windsor: 200th Anniversary (Windsor, Mass., 1971), pp.26-28.

2. Ball Family geneological papers, Windsor Historical Society Museum, Windsor, Mass.

3. Hamilton Child, Gazetteer of Berkshire County, Massachusetts, 1725-1885 (Syracuse, N.Y., 1885), p.414.

4. Ibid, p.467.

5. Town of Peru Annual Reports, 1888.

6. Bernard Drew, Spanning Berkshire Waterways (Great Barrington, Mass., 1990), p.10.

7. Drew, "Charlie Ball: One Man Industry," Berkshire Off the Trail (Great Barrington, Mass., 1982), p.80.

8. "Making Millions of Sticks For Lollypops," newspaper clipping, source unknown, 1924.

9. "Ball, Charles Henry," biographical sketch, in National Cyclopaedia of American Biography, vol. 22 (New York, 1932).

10. "Making Millions," 1924.

11. Ibid.

12. Drew, "Charlie Ball: One Man Industry," p.80.

13. Charles H. Ball, Sales Pamphlet, c.1894.

14. Ibid.

15. Drew, "Charlie Ball: One Man Industry," p.79.

16. Ball, Sales Pamphlet.

17. Ibid.

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