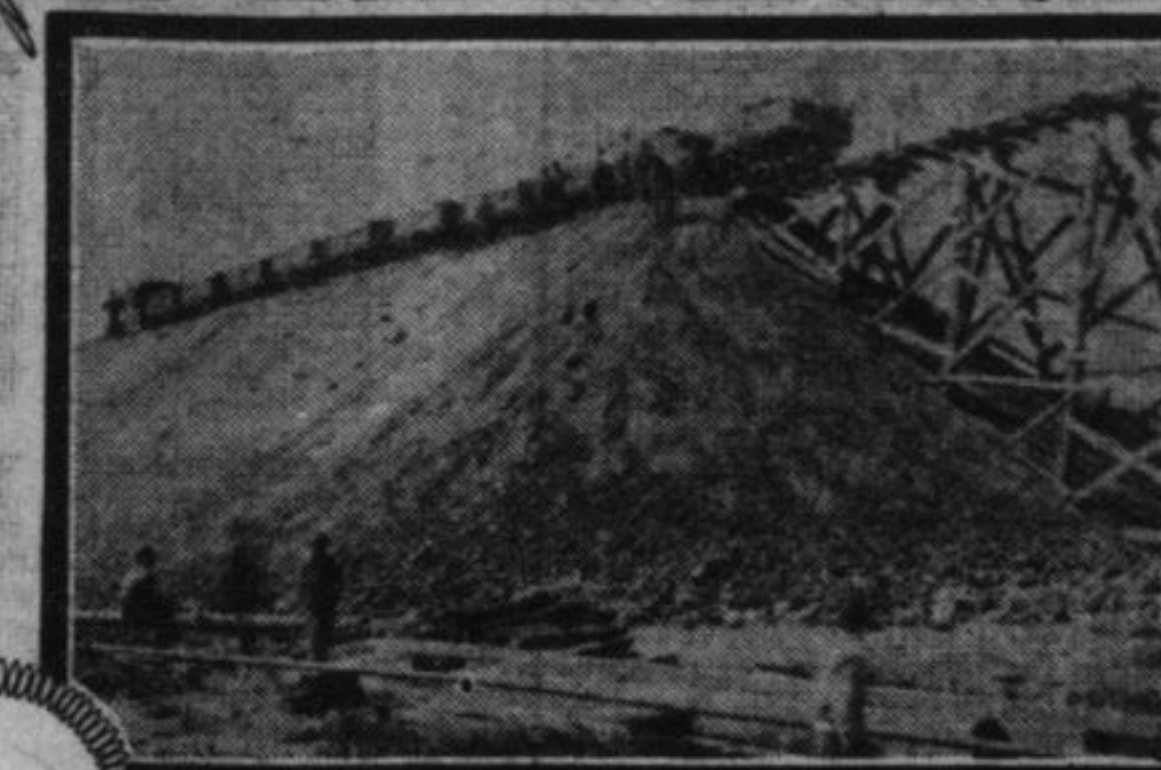


THE BRIDGE BUILDERS

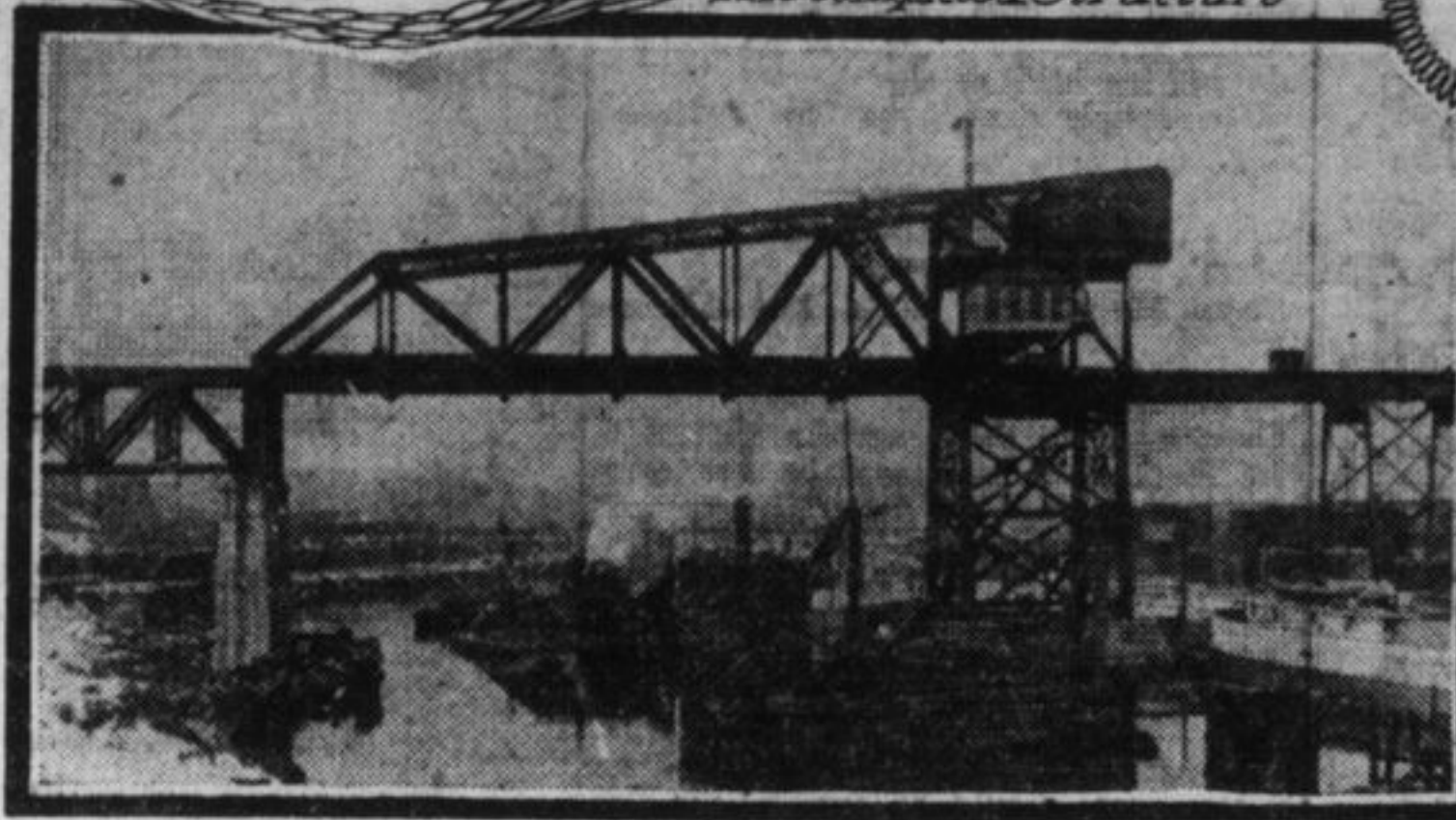


The Traveler

The Completed Structure



Building the Embankment or Approach



Modern Rolling Lift Bridge



The Completed Pier, Ready For The Iron Work

In the great advance made in mechanical arts and construction there is probably no thing that has reached such high degree of perfection as the bridge. When one speaks of a bridge it does not convey to the mind anything definite, as one knows that a bridge may mean any kind of a structure from a simple log thrown across a gully to those masterpieces that span great rivers and across which thunder heavy trains.

Bridge building is probably one of the oldest of the arts of man. Even the primitive gentleman who wished to shorten his route either felled a tree or else constructed a crude but effective suspension bridge of wild vines. Perhaps the idea of a suspension bridge was gleaned from watching the monkeys as they held on to each other and swung from tree to tree, thus making the first living bridge which has, in the "human bridge," been adopted into modern melodrama.

To speak of the origin of the bridge is merely to speculate, but it is highly probable that the Japanese were the first to apply anything like scientific treatment to the structures by the adoption of the cantilever system, crude, though effective.

For spanning a stream of considerable width they laid two balks of timber, one in each side of the bank, and connected them with a third balk. A structure of this character still stands in Nikko and, though built more than 200 years ago, is in good condition.

It was the Romans, however, who demonstrated to the world the art of building bridges that would not only answer the needs of the day, but would withstand the wear of centuries. They were the first people to utilize stone, and, with the application of the arch, gave to the world the first instance of a structure of that character about 127 B. C., when the Ponte de Rotto, or Senators Bridge, was built.

Trajan built the most remarkable bridge of antiquity in the stone structure across the Danube, near Warkel, Hungary, it being 4,500 feet long and

60 feet wide. There were 20 arches having 170-foot spans, and the roadway was 150 feet high. This structure, however, was destroyed by Adrian on the pretext that it would afford a passage-way for barbarians from the north.

For several centuries the Roman types of bridges were looked upon as being the only proper kind, hence most thoroughfares in Europe have stone bridges, though brick also plays an important part in construction. Wrought and cast iron did not make its appearance in bridge-work until toward the close of the eighteenth century, but since then there have been great strides in the use of this material, almost to the entire exclusion of stone owing to the cost of the latter.

Stone, however, in the form of concrete is once more claiming attention, and for short spans re-enforced concrete will, no doubt, be the material of the future.

Throughout the world the advance agent of the bridge is the railroad, and what improvements have been made in bridge work have been largely made by railroad engineers, and have been paid

for by the railroad companies. In the early days wood was largely used for constructing bridges, but with its increasing cost, its structural weakness and its cost of keeping up, iron and stone became the material. For culverts, stone and concrete are used, but for the great reaches across wide waters and gullies stone foundations are surmounted by steel lattice work.

These structures while light are strong. Kept well painted iron work lasts for years and may be readily replaced without interfering with traffic, the worn parts being replaced with new in a very short time; indeed, these bridges are not infrequently entirely rebuilt from the first to the last bit of iron without making the slightest change in the regular schedule of the road.

The building of one of these great highways of the air is most interesting. The approach is the first consideration, and is made to the bank on either side. Sometimes it is necessary to make a deep cut and sometimes a deep fill. In the latter case the earth is brought to the site in small cars and dumped until the embankment is completed.

In the meantime work on the piers between the banks is started, and it is laying the foundations for these piers that the greatest amount of labor is involved. In the beds of rivers quicksands are often encountered, necessitating the sinking of caissons to great depths. In such cases compressed air is used and huge steel bottomless boxes are forced down from 50 to 75 feet to solid ground and filled with concrete.

On the caisson is placed the layers of stone and thus the shafts arise to the desired level. Then begins the work of the iron-moulders. The iron work, having been carefully set up and taken apart at the foundry and each part marked, is shipped to the site. Wherever possible the engineers build from each side toward the centre, thus effecting a saving of time, but often it is impossible to do this and all has to be done from one end.

Beginning on the very edge of the spot to be bridged there is erected on rails a traveller, a curious framework on which are two or more derricks with long booms. With the derricks the

long iron beams are swung into position and held until squads of men can bolt them together. Then follows a gang of riveters with portable furnaces and presently there is a portion of the bridge solidly put up.

As the bits of iron are put together the traveller moves forward, stopping only when the last rod has been set and its portion of the work completed. American engineers have erected some of the finest specimens of stone and iron bridges in the world; in fact, so high do our engineers stand in the estimation of foreigners and so rapidly do our mills turn out the necessary iron work that American firms have captured scores of contracts in South America, Africa, Russia, Asia and other countries where new railroads are being built.

Of suspension bridges the most notable examples in the world are to be found in New York across the East River and Hell Gate, but one of the most interesting suspension bridges is in a Colorado canyon. It became necessary to devise some sort of a structure to enable a railroad to skirt the edge of a cliff but above the flood mark of

CENTRAL CANADA EXHIBITION OTTAWA

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Displays will far excel any previous year. Grand Pure Food Exhibit by Canadian Manufacturers.

High Class Vaudeville Programme, one daily in afternoon at Grand Stand, in addition to variety shows.

The Night Entertainment will consist of the latest Comic Opera, "What Happened Then?" by the famous De Wolf Hopper and all-star company. Popular prices.

A Grand Display of Paintings and Ladies' Work will open the Handsome New \$12,000 Building.

Special Attractions in front of Grand Stand in afternoon will include the latest European Novelty, "Dot Orca Performing Cows." This attraction appears in Ottawa for the first time in America. There will also be a most sensational Ladies' Automobile Race on a specially constructed incline.

Balloon Races daily with a double Parachute Descent from each Balloon in P.M. Hutchison and companion.

Get the official Programme issued next month.

T. C. BATE, President. E. McMAHON, Secretary.



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\$1.00 Per Pair.

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NEW MACHINE SHOP.

A call is invited for all kinds of general manufacturing and machine repairing. Special work such as machine sharpening, lawn mowers, guns, phonographs, scales, razors, edged tools, dies, brazing, model and pattern making. Best of attention given all work. Repairs may be tested before leaving shop. Work guaranteed. Charges moderate.

J. W. HUNTER, Machinist, 30 Montreal St. (near Princess) Kingston. Orders taken at Simmons Bros. and A. Vanliven's Parcel Delivery.

TRIALS FOR SHEEP DOGS.

Tests of Skill in Driving and Penning.

In hillside villages, where eyes are "few and far between," the local sheep dog trial stands out, a prominent landmark in the long, laborious year. It occurs in summer, says the Pall Mall Gazette, when every Westmoreland weather has its element and smothering moods, and on the appointed day away we all go—men, women and children—to the wide upland pasture, not with any appearance of undue haste, as the love of excitement increases with gratification and a townsmen will often walk miles to see the sight which would not move a dweller in the country as many yards.

The sheep-dog of the north cannot be called a beautiful creature. Short haired, rough coated, with lean, restless body, he bears little likeness to his distinguished relative, the Scotch collie. But his eyes shine with wistful intelligence, and nowhere in the world are man and beast more indissolubly one than among the fells of Westmoreland. His faithful friend accompanies the farmer everywhere; to market, to auction mart and round the fields in the peaceful idleness of Sunday morning. Small wonder that between the two prizes the bond of a perfect comprehension and master and servant understand one another without the aid of words.

The course at the dog trial of the course, as always, is 200 yards long, clearly marked with flags, beyond which the sheep must not be allowed to stray. Obstacles have been put up in the shape of open gateways or of flags and posts, and the dog's duty is to drive his three charges between them or else guide them outside to the right or the left, as the rules direct. The judges take their places in the mid-

dle of the course and the owner of the first competitor stands near the pen of hurdles erected at the far end. A rope is passed round his arm and secured to one of them, to make sure that he does not venture out of bounds in order to assist his dog, for it is best wisdom and not human wisdom that is now to be appraised and gloried.

Sheep have been lent by a farmer who has not entered for the trial, each one of the trio a member of a different flock, and a fresh lot is supplied to a new candidate. A flag is waved and the dog drives them from the starting point, while the crowd, hardly warmed up, watches him critically to see how he "frames." The first competitor is cautious and well up to his work. He proceeds quietly, taking care not to harry and persecute the timid creatures, but directs them in a masterly manner round and between the flags with evident if dignified enjoyment of his task. His owner is only allowed to guide him by whistling or by waving a stick, and the wise animal obeys the mute orders with unmeaning comprehension. How much patience, how many hours of companionship have led to this perfect understanding between man and beast the uninitiated stranger can only conjecture.

Grizzleface scarcely succeeds as well at the final act of the trial, the important operation of penning, at which his master is allowed to assist. The dog's duty consists in driving the sheep into the pen of hurdles, while the man secures them by putting up a fourth as gate. In this instance the sheep turn on the door, stamping their tiny round feet, and it is only after many blandishments that they consent to "walk into my parlour." A time limit is, of course, fixed, five minutes for the course and five minutes for the penning, and I see my neighbor, a stout, apple-faced farmer, take out his watch and shake his head. The next dog is a juvenile, making

his first appearance in public. He begins well, but becomes nervous and flurried and drives his sheep to the wrong side of the course. The sight of his master's face makes him pause in indecision, and the gathered on waves his stick frantically, and at last in defiance of rules bursts out in a mild exhortation. "Noo, laddie, what be ye a'heelin'?"

"My friend the farmer chuckles. "What's th' use, mon? That bain't the language t'dorg giv' at yam."

"Ay, and a gay thing, too," dryly observes his wife. Many dogs take their turns, some good, some bad, some middling, for the trial is a day's business. Yet through the long hours the spectators never grow tired, rather their interest quickens as time goes on. The afternoon is waiting when we have the most exciting event of all.

"Why, th' lar! 'un wins," announce my neighbor. "Th' lar! 'un is a slim black tyke with a streak of white down his muzzle. He is a dog of infinite self-possession and walks slowly past the heads of the sheep without even glancing at them, though mysteriously they always turn in the direction he desires. When every obstacle in the course has been successfully passed he has an extra minute left for penning, and this critical business is performed with the ease of a king of his craft. He must be well within time as his master puts up the hurdles, the latter doing his part so badly that the sheep nearly escape, for the man is obviously much more agitated than the beast. A deep northern "Hurrah!" greets the return of the victor, but he remains the image of bored indifference and does not even wave his tail.

When all is over the prizes, silver goods to be kept for generations in the farmhouses, are presented, while the lads and lassies press round to pat the successful dogs, the true heroes of the day, who have striven and triumphed for the sake of glory alone.

How To Stop Cold Sores.

When you first notice the swelling and uncomfortable feeling of the skin that marks the coming Cold Sore, apply Wade's Ointment. It will quickly remove it. It heals wherever applied, and cures Eczema (Salt Rheum), Burns, Piles, Blisters, Sore Feet, Dandruff, and all scaly or itching eruptions of the skin. In big boxes, 25c., at Wade's Drug Store.

It is better occasionally to do a foolish act of charity than to commit the folly of an uncharitable life. The man who can make children smile does not need to worry over his inability to preach sermons.

Black Watch Remarkable for richness and pleasing flavor. The big black plug chewing tobacco.

A GIGANTIC CHIMNEY

For G.T.R. Being Erected at Stratford.

Of all the wonders of engineering that are being unfolded at the New G. T. R. shops, the gigantic chimney in the course of construction will stand in the front rank, says the Stratford (Ont.) Herald, referring to building operations under way in that city.

When completed, the great stack will stand 187 feet from base to tip, and will be composed of one solid mass of concrete, reinforced by tee steel bars. The great tub stands on a foundation twenty-five feet square. Embedded in the concrete of the foundation is a perfect net work of diagonal and rectangular steel bars similar to those in the walls of the chimney.

Reaching up from the mass of steel and concrete are 168 steel bars which form the reinforcement for the first twenty-five feet of the tube. Their number gradually decreases until when the top is reached only twelve bars are embedded in the walls.

At the base of the chimney the walls are fifteen inches in thickness and contain a four-inch air chamber, which encircles the stack and has openings leading from it to the outer air. The object of this air space is to equalize the temperature of the outer and inner walls, and thus reduce the possibility of the concrete cracking to a minimum. This air space continues up the stack for seventy-eight feet, where it opens into the inner, or smoke tube proper. The inside diameter of the stack is 7 feet 6 inches, and the outer and inner walls stand parallel with each other. The Weber Co., of Chicago, have the contract for the work.

The whole of the reinforcement used in the construction is the finest steel, of dimensions 1 1/4 x 1 1/4 inches by three-sixteenths.

Put Her Rival To Flight.

The Gentlewoman. One of our young society women has a very good looking husband of whom she is most proud. Having noticed that this gentleman was paying marked attention to a lady in her own set she kept a careful watch and was fortunate enough to discover among her husband's papers a number of letters written by the said lady.

She then reflected as to what course she should pursue. She thought long and at last hit upon a strange plan. From among the correspondence the lady selected four letters, posted them on the back of her fan, and then accompanied her husband to a dinner where she knew she would meet her rival. It was not long before the fan attracted the attention of the guests, who asked to be allowed to look at it.

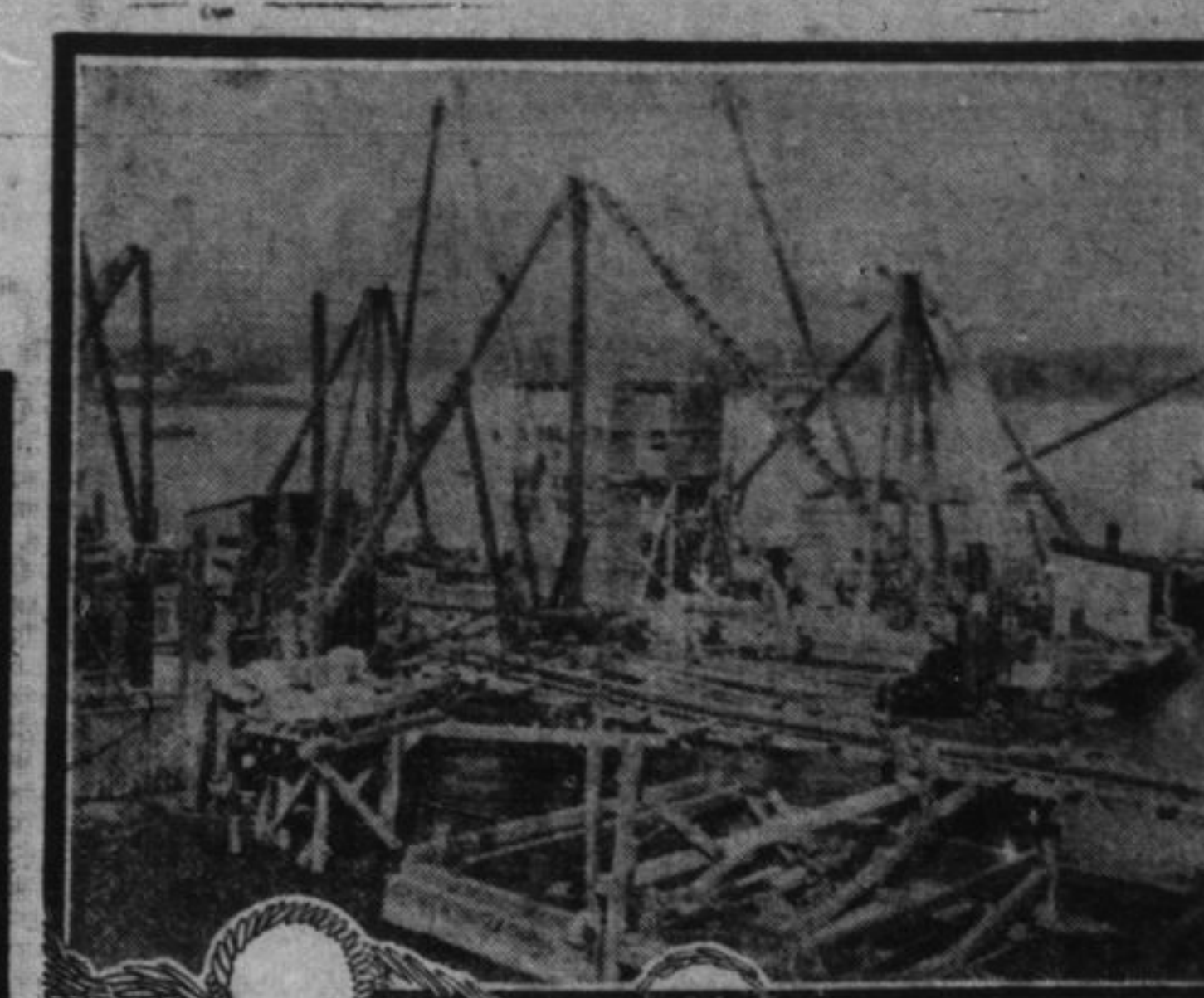
The fan then passed from hand to hand, and when it reached the rival she turned crimson and under the pretext of a sudden indisposition withdrew hastily.

Not Affected By Hot Air.

Baltimore American. "Truth," sentimentally remarked the press agent, who had just proffered a "true story" that really happened, "lies at the bottom of a well."

"Yes," dearly remarked the dramatic editor, "and it is one of the things which hot air can't raise from there."

It takes more than the hatred of certain sinners to make you a saint.



Erection of the Pier Sinking the Caisson

After considering the location it was decided that the only kind of a bridge adaptable would be a hanging structure, and this it was built, tied to the cliff at the outer edges.

Following the bridge as a means of crossing streams came the conversion of the moats of defense for castles and even towns. These bridges were the first of the movable type and were used chiefly as bascules or drawbridges to span the moats surrounding the point of defense. Being of short span but little iron was used in their construction. They revolved or lifted about a hinge, pivot or trunion in a vertical direction, and were sometimes counterbalanced similar to a see-saw. They were very effective, but upon the introduction of gunpowder and cannon they became obsolete, as did the moat and other forms of defense of the period.

With the advance of civilization and the spanning of wide and deep water courses it became necessary to provide for the interests of shipping which had advanced proportionately. Thus came the introduction of the drawbridge at the channel.

The mediaeval pivot or trunion bridge was early applied to the purpose, but it was not until the nineteenth century that there was much development in the movable bridge, when iron was largely substituted for wood.

For more than half a century the most distinguished engineers of Great Britain wrestled with the problem of erecting a bridge across the Thames River in the vicinity of the Tower of London. Owing to lowness of the banks it was not feasible to build a subway on account of the great grades necessitated nor was it feasible to build a high level bridge for the same reason. The desire to have the channel as wide as possible precluded the use of the swing bridge with its central pier, so there was but

one type left—the bascule—and it was adopted.

This structure ranks as the finest of its kind in the world. It required eight years to build and represents an outlay of \$4,000,000, of which \$500,000 was expended for the artistic embellishment of the towers. In view of the bridge having a span of waterway 200 feet in width it stands for the highest development of that type. At the same time, owing to its slowness of operation and expense of maintenance, it also marks the culmination of the bascule, for since it was completed, in 1894, no large bridge of that character has been built.

In this country, however, the bascule received but little attention, every effort being directed toward the swing, suspension and high level types, and there are many remarkable structures that will stand as monuments to their builders.

In water-front cities where navigable waters thread their way into the very heart of the business district, the problem of bridges is all the greater. The swing bridge is highly objectionable on account of its central pier; indeed, the conditions confronting the engineers were identical with those that perplexed the Britisheer.

About 1893 William Scherzer, now deceased, invented a new type of bridge which bears his name, and which is known as a "rolling life," a modern adaptation of the bascule, with the advantages of cheaper construction and higher efficiency. It is capable of a greater span than a swing bridge and when open it forms a positive barrier on either side.

This bridge has opened a new era in the spanning of narrow waterways and not only is it coming into general use in this country but a structure of the type has been erected across the great Neva River leading to the Winter Palace of the Czar of Russia at St. Petersburg.

This shows the Fused Joint idea in "Hecla" Furnaces

No dust can escape through "Hecla" Fused Joints. They are absolutely tight and will remain so. That is what makes the "Hecla" the safest and most sanitary furnace to buy. It supplies only pure and fresh warm air, without a trace of gas or dust.

The "Hecla" is economical in the consumption of fuel. The Steel Ribbed (Patented) Fire Pots, which have twice as much radiating surface as any other style of fire pot, draw a great deal of heat from the fire that in other furnaces would be sent out of the chimney.

Our catalogue tells more about these and other exclusive features of "Hecla" construction.

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It will astonish you how long you can run a fire with a scuttle of coal in this Range. Where your old Stove took armfuls of wood, a handful will do the same work on the Universal Favorite.

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