

# WATERFORD'S BRIDGES

## INTRODUCTORY

It is surprising that in a place so important, politically and commercially, as the ancient and opulent City of Waterford no attempt to construct a permanent bridge across the Suir at Waterford was made until the close of the 18<sup>th</sup> century.<sup>1</sup>

In a book entitled " A Scheme For Building a Bridge across the Suire at Waterford "2 the author, Mr. Thomas Covey, writing in the year 1770, expressed the opinion that the Danes had constructed a wooden bridge spanning the Suir when they were in possession of the City, but this conjecture is not based on any stronger evidence than discovery in the bed of the river of portions of an old wooden bridge. Very likely these were remnants of the temporary bridge, which the Cromwellians threw across the Suir in the year 1649. This was a temporary structure for the facilitating of the progress of the Cromwellian forces when they attacked the City from the Northern side of the river, but it appears to have existed in 1690, when it was made staunch and strong " to carry the army carriages [of William III.] to reduce Waterford "

Although the Great Charter of Charles I. (1626) granted to the City the Port of Waterford - the limits of which were " between the entrance between Rodybank and Rindoane and from thence to Carrigmagriffin "3 - and " all the land and soil covered with water or being between the flowing and ebbing of the sea within the bounds " and much of the land adjoining the foreshore, no mention is made of ferry or pontage right. It is a fact (little-known) that the royal successor of Charles I. granted the ferryage and pontage rights over the Suir to his illegitimate son, the Duke of Monmouth. When the Duke was attainted of high treason in 1685 these rights reverted to the Crown and were granted, in 1693, by William III. to James Roche, known as " Roche the Swimmer." In a petition to the Crown dated November 19th, 1697, John Newport claimed some forfeited estate on the plea that he had " supplied the timber to make up the broken bridge over the River Suir." Roche sold his rights in 1698 and was given forfeited lands in the vicinity of Waterford to the value of £50 a year.<sup>4</sup>

The principal Ferries across the Suir were those at Passage, at Waterford City, and at Granagh. In the municipal records frequent mention will be found of the ferries at Waterford and Granagh. In 1672 Mr. Fuller was allowed by the Corporation twelve shillings for ferrying the Judges' horses across the river at Assizes, and the Admiralty granted him six shillings for horse hire to the Court of Admiralty and for ferrying the Judges' horses at a previous Assize the sum of eight shillings and sixpence. Andrew Keating, in 1679, was paid by the Corporation £3 19s. 2d. for the ferryage of His Grace, James Duke of Ormond, Lord Lieutenant of Ireland, and his suite.

In the year 1715 special attention was called in the Town Council to the bad condition of the highroad leading to the Ferry at Granagh, and instructions were given to put the road into proper repair. In 1721 the Council ordered that a breast wall should be built " over the little wall and precipice near Mr. Cooke's wall on the said Road to prevent Travellers and carriages falling down."

Notwithstanding the risks attendant on ferryage and the lack of facilities for the conveyance of merchandize across the river, the citizens of Waterford do not seem, during the greater part of the 18th century, to have realized the absolute necessity of constructing a bridge, and when, in 1770, Mr. Covey put before them a reasonable scheme he seems to have aroused little local interest.

## THOMAS COVEY'S PROJECT

Mr. COVEY says in his book that "A Bridge over the River is preferable to a Ferry. I need not dwell," he adds, "on the conveniency of one and the inconveniency of the other only to add that a person must ride twenty-five miles who is unwilling to venture himself on the water to get by means of bridge from the other side of the River to this and if it happens to be at Ballyhack, which is reckoned but five miles from Waterford, he must travel, mostly a bad road near seventy miles before he can get to the city"

Mr. Covey deals not only with the plans for his proposed bridge of stone: he furnishes an account of the riparian traffic of Waterford in his day, and gives an insight into its commercial life as it appeared to him. The following extracts from his book should interest all students of the history of Portlairge and of the river, which flows past the ancient city.

" The best place for building a Bridge over the River Suire at Waterford is, in my opinion, at the upper end of the New Quay, at the place commonly called the Graving Bank; and where some time ago a bank of

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<sup>1</sup> The old stone bridge which spans the Suir at Carrick, about thirty miles from the mouth of the river, is said to have been built in the middle of the 14<sup>th</sup> century under a grant of murage and pontage from Edward III. It was partly blown up by Irish Republican forces in August 1922.

<sup>2</sup> Printed and published by Esther Crawley and Son at the Euclid's Head, in Peter Street, Waterford.

<sup>3</sup> Now Carrickbeg, Carrick-on-Suir, on the south side of the Suir.

<sup>4</sup> It is only recently that the last of these lands passed out of the hands of the Roche family.

gravel had been run out a considerable way into the River; which, as I have been told, hath since been reduced by lighters for ballast, and from thence to the opposite shore, which happens to be a large abutment of rock. The soundings here in the deepest part of the Channel at low water spring tide is fifty three feet, and that happens to be nearest to the opposite shore; and the soundings from thirty-one feet to fifty feet, takes up about one- third part of the breadth of the River at this place.

"There are many shallower places in the Channel from this depth opposite the Graving Bank, to the Ring Tower; which takes in the extent of the Quay, and runs from forty seven feet to twenty four feet; and opposite Mr. Paul's to near the Ring Tower it sounds but eighteen feet at low water. It may be advanced, why a Bridge may not be founded in some of these shallower waters; and several have mentioned to have it at the Fish-house opposite Barronstrand Street, and that it would be more convenient to the town; and by opening the narrow part of this street to Broad Street, would make a fine and commodious street from the Bridge to John Street. The situation of it comes nearest, as that of Caple Street to Essex Bridge in Dublin. At this place, in the deepest part at low water is twenty-six feet. But it is to be considered, that building of a bridge here, would not permit a ship to come higher than the Lower ferry slip, by which means the best half of one of the finest Quays in Europe would be rendered useless for the lading and unlading of shipping. Otherwise by making good the Quay up to the Bridge at the upper place, there might from thence to the extent of the Quay down, three hundred ships be safely and commodiously arranged: And for the conveniency, it will not take above five minutes to walk moderately from the Bridge at the upper place through King Street and Little Barronstrand Street, to the Cross, being the centre of the City, and the most public market place in it. It is also to be considered the additional expense of building the Bridge here; the River being two hundred feet wider at this place than at the Graving Bank, which is about one-third more of the River's breadth; and consequently will take one third more in money; above ten thousand pounds to add to the Estimate.

"It may be argued, that the city may extend itself, by making of Quays, and building of merchants' dwelling-houses; warehouses and other conveniences, down the River."

"To execute such a project must take a great deal of money, the expense of building Quays and houses, must fall on the industry of the Merchants, particularly those who are, by building a Bridge at the Fish-house, excluded from their proper share of the Quay, and thereby routed from their present settled habitations. Beside, the consequence of taking fifty or sixty thousand pounds from trade, to be employed in buildings immediately for the reception of those who must quit the conveniences they have on that account, and possibly to their hurt, by laying a part of their Capitals out in this manner and thereby sinking what should extend them in their business. Hereafter, on the increase of trade and inhabitants, may give a latitude to Building; but it will never answer for the present.

"To obviate this it may be observed, that a draw-bridge might be contrived at the centre Arch; or at some other of the Arches, to let masted ships pass to the upper Quay; and that Draw-Bridges have been made to London Bridge, and to Thomond Bridge at Limerick, and at other places for that purpose; particularly to the former." Draw bridges are generally constructed to Garrisons and Forts to secure the entrance to them, and are drawn up in the night time or in times of siege, and on many other occasions. But a Draw-Bridge fixed on any part of this, must be very inconvenient well as a weakening to the Bridge, for, in whatsoever place it is contrived, I may say, that there, it cuts the Bridge into two parts, and divides united strengthening of the arches to each other; and as there can be no middle stanchions to receive a double-leaved fall, the single fall cannot be less than thirty feet wide, to let a vessel pass with her masts and yards; which latter must be trimmed fore and aft, without the benefit of her canvas to help her on. And should the ship happen to hitch or entangle herself in her progress through, the danger is that by the rising of the Tide either the Bridge or the Ship must receive damage; possibly both. .... Therefore it is best to erect the Bridge in the place I have mentioned, where no Drawbridge is requisite.

"There are few places in the Kingdom better laid out by nature for trade than the City of Waterford, and it only wants this one projection of Art to make it the best in the Kingdom. No Port has the advantage of carriage by water more, and no Port the advantage by land carriage less. From the conflux of the Rivers Suire, Nore, and Barrow into its Harbour, renders the carriage by water cheap and commodious to and from many of the Inland counties of the Kingdom; and it will be more so when the navigation of the Nore is completed. But for the want of a passage by land carriage a great part of the Trade which its situation has laid it happily out for, is impeded, and consequently many other disadvantageous incidents attend it. The principal export Trade of this City hath been for these many years past chiefly in Beef, Pork, and Butter; and those are commodities that are mostly brought here from other counties that have not the advantage of water carriage, and if they had, the commodity of Beef, in which may be included Hides and Tallow, are inconvenient to be brought by water, but are generally drove by Land. And in driving those useful and beneficial creatures to our markets, just at the door thereof through which they are to enter, Behold! there is a full-stop made; they must be battered and drove into the Ferry-boat, fretting and wasting themselves, while they are bound down with rings and ropes to secure them. The young well-fed beast will not comply to this usage, but often plunges out into the tide, and after a long drift way up stream or down stream as

the current answers, the fatigued creature is with much difficulty got to land. What relief can there be, for what is so prejudicial to the trader, but a Bridge.

“By completing such a work the advantage must be an increase of the Beef, Pork, and Butter Trade, an addition of Corn, Hides, Tallow, and Leather, and many other useful Commodities, by which every individual would in some measure profit. And beside that part of the county of Waterford that lies contiguous to the city, the counties of Kilkenny, Carlow, such part of the county of Tipperary as lies East of Carrick, the county of Wexford, Kildare, the King and Queen's counties must, by opening such a market, have greater demands for those commodities on which the riches of those counties depend; and, of course add much to the sale of cattle at the great fairs of Ballinasloe and Banagher. And the addition of other commodities that may in time arise from those inland parts, namely Oak, Coals, Wool, Cheese, Rapeseed, Marble, Bark, etc., as are yet unseen to us, must augment our export manufactures so that what by the advantage of our water carriage and this of our land carriage we shall be able with our exports to vie with foreign competitors in any foreign market, and thereby assist the Domestic manufactories, subject to export in the whole Kingdom.

" The Port of the City of Waterford is confessedly ranked third Port for Trade in the United Kingdom. Its Revenue for Imports, Exports, and Inland Excise has been for some years past Sixty Thousand Pounds yearly and upwards; and appears still to be on the increase. From such a considerable annual Revenue it must naturally follow that the Merchants are active, as well as extensive in Trade, and deserve every encouragement that tend to the increase thereof. That they are also fair Traders; and as such, a set of the most useful Men to the welfare of Society.

" There are more ships sent from this Port yearly to Newfoundland than are sent from all the other ports in the Kingdom; as the Banks of Newfoundland are inexhaustible for Fish, and that Fishery unrivalled by any other Nation. It draws the Trade to the Catholic Countries; from whence we draw chiefly Money to our West India Islands; and from thence their commodities to us; which of late has caused a great importation, particularly Rum, through the proper channel of trade into this Kingdom: And has much lessened the importation of French wines and spirits, and rendered the produce of our Colonies cheap, and of course the consumption thereof more; while the others stand up at a high price above what the bulk of consumers can come at. Sure such a Trade ought therefore to be encouraged, and particularly in this City that has so extensively laid itself out for it: And nothing can more amply contribute thereto than this passage over the River for a greater supply of Provisions for that Trade and what can in no manner affect any other Port, as Pork is reared more in, this County than in any other part of Ireland and fitted for that Market.

When we consider how often the Provisions of our Market were raised to exorbitant prices, it requires our looking into the cause more minutely. And notwithstanding, they may be heightened by Forestallers and Hucksters who will take every advantage of the most assiduous to suppress them; yet, not having a ready and easy passage to cross the River, the extraordinary expense that attends getting over inflames the price of these portable articles on the Consumer. The Countryman coming to market with Provisions meets a delay at the Slip of two or three hours. He refreshes himself and charges the expense on the Commodity he brings. If the weather proves severe, and wind and currents run high together, he cannot get over at all in Market time; and often returns back with his Provisions, to the disappointment of our Market and the Seller, who has no other market for fifteen miles to apply to. And his disappointment occasions a disappointment in the payment of his Rent by which the Landlord suffers; whereas if he had a ready passage over he would trudge on to Market without delay and vend his goods readier and cheaper than he now can afford it. This is a standing tax on our Provisions.

“ Had the City of Waterford been built on the County of Kilkenny side of the River it would reap many advantages that without a Bridge it cannot now enjoy; and a Ferry might answer the purpose of whatever trade might arise from its own county.

" The City of Waterford is large and populous, with generally a Regiment or more of Soldiery quartered there, and therefore requires large and well-stored markets to supply it. And whenever our Provisions are dear we seldom find that it is so from a scarcity among our neighbours but from the difficulty of bringing it to our Markets. And should not every evil be removed that occasions the like in a Populous Trading and Manufacturing City, the increase of which must add new acquisitions to the whole Kingdom. Also to be considered the damages often done to Carriages and Cattle by endeavouring to get them into a Ferryboat Gentlemen should have their Horses taught the manage of this part of the Horsemanship; how to leap into it, as Chargers are brought to stand fire, to save them from accidents which often happen."

Whatever may be the advantage or interest of a few individuals, it is an unreasonable objection to be made against carrying a Work of much public Utility into execution. The Ferries of Waterford and Granny are those only that will be affected by this Work; and it is to be presumed that the Proprietors will shew their titles, the damages they sustain, and the intrusion that will be made upon them. I apprehend that the latter can make no claim of the kind as it lies about a Mile and a half above the City, but the former will be sensibly affected by it.

" It is proper here to mention the conveniences that are to be on the Bridge for Passengers, Carriages, etc. Leaving the Bridge forty-four feet from out to out as before observed; by allowing parapets each two feet thick, will leave a clear way of forty feet, and out of that take one flagged foot-way of ten feet broad, will leave thirty feet of a paved way for Carriages, Quadrupeds, etc., which will admit of more than three Carriages to drive abreast. The flagged way for foot Passengers, to be enclosed with a range of upright Stones, about four feet high, and at six feet distance from each other, with bars of iron let in from Stone to Stone, one bar to be on the top, and another to be about half way the height, to hinder cattle from breaking in, with a falling Gate or Turnstile at each end. As it is necessary for the safety of foot Passengers to have the footway thus enclosed; one large footway on the side near the City, will answer more convenient than two. For should a person pass on, with a view to look for another, and both happen to take different footways, on account of the en-closures they must walk about the length of the Bridge before they can meet; or pass across and inconveniently climb the enclosure; when by meeting on one footway remove the obstruction.

" It will be proper to have lamps fixed on each side of this Bridge, and Watchmen to take care of it, to prevent Robberies, Riots, etc., from being committed, that too frequently happen on places of this kind; for which purpose a convenient House should be built at each end, as well for the watch-men as for those who may be appointed to collect Pontage thereon. At present, there needs no upper Ornaments or Head dress to adorn it, but a strong plain Parapet of clean Masonry, cap with a dripcut Stone, and the recesses the same. Ballustrades, Arched recesses, Entablatures, etc., may be the Work of a hereafter."

Mr. Covey next deals with various objections which had been raised against his project, the principal one being that some people argued that he building of the Bridge "would cause greater eddies in the several Docks at the Quay, and consequently would cause greater quantities of Mud to settle there." He refutes this argument to the best of his ability, and then goes on to deal with the possible opposition of landlords possessed of property at the City side of the river who might see in the Bridge a likelihood of a fall in rents (which Mr. Covey says " were now at a high rate"). The building of a Bridge may and will raise the price of lands on the other side; and possible for a considerable extent into the county. But that will be owing to an increase of Trade and an increase of Inhabitants, and as this offers, the land on the City side will still keep up, as they lie most contiguous to the bulk of the citizens, who must have those Conveniencies. The high price for land is but for a few acres in comparison; of Soil and Meadowing that lies near the City, and that is generally set to Gentlemen, who must have each a Field or two for the Conveniency of their Cattle. It is not known that any Grazier or Dairy Man will give Five. Six or Seven pounds an Acre, in order to make the rent of it, and a profit for himself; these are removed to a greater distance, where Land is much cheaper; beside, there is scarce any of the dear Lands, but are set by lease for many years to those solvent tenants, so that, be there a Bridge or not, the rents must be paid, and no Landlord can be a Sufferer, and at the time those Leases terminate by the increase of Trade and Inhabitants, those lands will stand improved and built upon, and rather rise than all in their Value.

"The objection that many of the citizens will remove their effects, and live on the other side, is rather a matter to be wished for, than offered as an objection. For what merchant or trader, who is well settled on this side, will unsettle himself to go and live on the other? He must waite the building of several houses to fix himself, the Establishment of Quays and other Conveniencies for the carrying on of trade, with many other matters that attend it. It is more likely, the young men that intend to begin trade may be the first Planters there. And whenever that happy time comes, I doubt not but the Inhabitants of that side will be found to be Opulent Denizens; who have removed themselves and their fortunes from other places and settled there.

"Another objection has been offered, that the Navigation of the River will be obstructed.

"It is well known what kind of craft ply above this City on the River. They are flat-bottomed boats, that carry from Fifteen to twenty tons; and the most water they draw when loaded, does not exceed four feet, made for the Shallow shores and Pills that run into the River, and that carry up goods to the towns of Clonmel and Carrick; for none other will answer .the purpose. Then what obstruction can those meet with; not from the Bank, because there will be a foot or two of Water more, than the largest of them draws, at flat Low-water, and a time, when a boat of them on the River does move. The common motion of those boats are, at the times of flood and ebb, when the Current carries them easily to the places they are bound to, and at that time there is a sufficiency of water for the largest Keel Boat, to pass and repass the Bridge. If those boats had not water to let them pass, two of the next Arches might be left deep enough for that purpose, but I see no occasion even for that.

" The place, now made use of for Graveing of ships, must give place to the building of the Bridge. But there is a good strand a little below the City; and near where a dry Dock had been erected, but now filled up: Here, as I am informed, was the place formerly for Graveing of Shipping and it is very easy to remove it there again.

" Another objection hath been observed and looked upon as a material one: That a Bank and a Bridge, according to the Construction I have offered, will cause a considerable fall at the Bridge; or more properly,

throw the water out of level by several feet, and what is called Shooting of London Bridge, has been made use of as an example.

" I have already mentioned, that the Tides will keep their level in their progress, up and down the River. Indeed, if the Bank was to be raised above low-water, there would be reason sufficient for this objection, but as that is not the case, it must obviate every doubt about it. At flat low water, there is a stillness on the surface that at times scarce the winds do ruffle. The fluid motion ceases; unless what the freshes give: and even they lose a great part of their Velocity by the stagnation of the other; how then can this great fall be at either ebb or flow, when the water is no way pent up in its course, but has a passage (unless what the Piers of the Bridge may obstruct) from High to Low-water, in which time the whole force of the current is run, without a leap or bound in the water, so much as to throw it any way out of level. Rivers or streams that run free, by the uppermost part of the water, go faster than that at the bottom. By this the Chief Velocity of the Current is above low-water, and being weaker towards the bottom cannot affect the surface so, as to unlevel it by any resistance it meets with below."

It may be an objection, that there is no precedent for founding a Bridge on a Bank. I answer, nor is there a precedent for founding a Bridge in near seventy feet deep of water. It is a question, whether there is a Bridge in that depth of water in the known world. Yet I have been well assured that the Pier of Malaga, of an extensive length into the sea, and in about fifty feet of water, is founded on a Bank made after the same manner, to secure the shipping in that Port, and keeps firmly off a weighty and rolling sea that beats against it. If such a Bank can bear such a resistance, with' the weight of a solid Pier of Stone laid on it, what is there in nature can disturb another of the kind made in a quiet water, in comparison to that, sheltered with high lands near three parts round, and above thirteen miles from the seas? A lambent tide, with respect to the tide at the Harbour's mouth, and a constant passage for the water over it, through the Arches of the Bridge. View the one, and view the other in idea, and there can be no doubt for the security of this, for our Bridge. If there was a natural Bank there, it could not be objected against, but if an artificial one can be made as secure, where then lies the difficulty? I am well informed that there are several other Piers or Moles in the South of France, and in other parts of the Mediterranean, in deep waters, built and founded on this principle, and what the French call a 'Fond Purdue.'

Having, he contends, demolished all possible objections to his project, considered from the engineering or commercial point of view, Mr. Covey enters into a detailed description of the proposed structure. The Bridge was to be of nine arches fixed on eight piers and two butments. Its entire length was to be six hundred and one feet, four hundred and eighty-five feet of which would be " its solid or water way." The centre arch would be sixty-five feet, the next on each side sixty feet, the next adjoining fifty feet, and the smaller arches forty-five feet.

" At each end of the Bridge," he says, " I have placed a small building for the convenience of Watchmen and Pontage-gatherers, as well as for the beautiful termination of the Bridge. On the City end thereof, between the Shore and the Butment, being on the ground between high and low-water, may be built two small Arches of plain Masonry, to discharge the eddie water near the Shore; they will be dry at Low-water. No Arch of this kind can be fixed on the other side, as the deepwater comes close to the Rock, that lies happily there for an Abutment.

"Mr. Covey's estimate of the entire cost of the structure (allowing for all contingencies) was £36,745.

He suggests that the best way of obtaining this sum: would be by applying, in the first place, to Parliament for sanction, and then to raise the necessary capital by " Subscriptions, Loans, and by Lottery Schemes, as is practised in other parts of the Kingdom for raising money for Public Works. And he adds: " This Bridge in time may become a Free Bridge to the public well reimbursed for the expense and disappointments they have met with there some hundred years past for the want thereof."

"Mr. Covey's scheme fell through, apparently through lack of local support. In the course of his appeal to the citizens he declared emphatically that it would be impossible to build a wooden bridge, as timber of adequate size for such a project could not be found in Ireland or in England. We shall see how, thirteen years later, Mr. Lemuel Cox, of Boston, dealt with the difficulty which Mr. Covey declared to be insurmountable.

## **LEMUEL COX'S BRIDGE**

The fame of Lemuel Cox as a builder of bridges reached Ireland from the other side of the Atlantic towards the close of the 18th century. In the year 1789 he was invited to make a proposal for a bridge at Londonderry. He submitted his plans, and estimated the cost of a wooden bridge across the Foyle at the modest figure of £ 10,000. Instructed to proceed with the work, he returned to his native New England, and from Sheepscott (State of Maine) he shipped a load of oak piles and brought with him twenty skilled workmen. The construction of the bridge at Derry was commenced at the end of the year 1789, and the work was completed in the spring of 1792.

The success of the enterprise and the comparatively low cost of building the bridge at Derry stirred to action some of the leading citizens of Waterford. A company was formed locally in 1793 and Cox was engaged to span the Suir with a wooden bridge. The company (incorporated by Act of the Parliament at Dublin) subscribed £30,000 for the building of the bridge and the purchase of the ferry rights. The money was raised by debentures of £ 100 each, the interest on which was to be paid out of the tolls of the new bridge.

Lemuel Cox selected a site about 150 yards above the site which had been indicated by Thomas Covey, and the work was started on April 30th, 1793, and on the 18th January, 1794, the bridge was declared open for traffic. Two wooden tablets placed about the centre of the bridge at each side had the following inscriptions : -

IN 1793  
A YEAR RENDERED SACRED  
TO NATIONAL PROSPERITY  
BY THE EXTINCTION OF RELIGIOUS  
DIVISIONS<sup>5</sup>  
THE FOUNDATION OF THIS BRIDGE  
WAS LAID  
AT THE EXPENSE OF ASSOCIATED  
INDIVIDUALS  
UNITED BY PARLIAMENTARY GRANTS  
BY SIR JOHN NEWPORT BART.  
CHAIRMAN OF THE COMMITTEE.  
MR. LEMUEL COX,  
A NATIVE OF BOSTON, IN AMERICA,  
ARCHITECT.  
ON THE THIRTIETH DAY OF APRIL 1793  
THIS BRIDGE WAS BEGUN  
ON THE EIGHTEENTH OF JANUARY 1794  
IT WAS OPENED FOR THE PASSAGE  
OF CARRIAGES  
IT IS 832 FEET IN LENGTH, 40 IN BREADTH  
CONSISTING OF STONE ABUTMENTS  
AND FORTY SETS OF PIERS OF OAK  
THE DEPTH OF WATER AT LOWEST  
EBB TIDES 37 FEET.

Mr. William Friel says:-

The old timber bridge had a length, when constructed, of 832 feet, but owing to quay extensions the length was reduced to 734 feet, consisting of 38 spans varying in width from 9 to 22 feet. It appears strange that the spans should vary so much in width, but I think the explanation is that timber piles composing the supports for road were not driven in the ordinary sense by a driver and each pile separately, but each pier or bay which consisted of seven vertical piles, assembled on the shore and braced together with two sets of longitudinal walers bolted to piles, one set about the level of L.W.O.S.T. mark, and one about 8 feet above same. Above, below and between these horizontal walers there were double diagonal braces notched into and between the piles, the lowest set being, when in position, 7 feet below L.W.O.S.T. Each bay consisted of the seven vertical oak piles, all braced together, and many of the piles were made up of various lengths halved and bolted together, the average length of each piece composing the built up pile being twenty feet. When the braced structure was ready for placing in position it was run out from the shore and up-ended, and sank of its own weight to an average depth of 6 feet into the river-bed. The inclined cut water piles, one on the up and one on the down-stream side, were then placed in position, and probably driven by a pile driver, and braced in position to their respective bays. As the bays were placed in position, rubble stone from Bilberry and the Dunkitt quarries was then dumped round the pile bases to an average depth of 4 feet. This rubble sank into the soft mud about 2 feet, and left its top surface about 2 feet above the adjoining natural bed of the river. The original size of the piles varied from 13 to 13½ inches square, and owing to the erosive action of the silt-laden water many of the piles, when removed in 1913, were found to be reduced to 9 inches square just above the bed of the river and for about 18 inches above same. The wearing surface of this bridge was oak planking 2½ inches thick. The width of the roadway was 26 feet, with two 7 foot wide footpaths.

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<sup>5</sup>This is a reference to an Act passed by the Irish Parliament permitting Catholics to exercise the franchise.

When the original piles were examined after removal it was observed that the iron bolts joining the portions of the piles together which had been below low water level had almost entirely rusted away, and the pile lengths were being held together by treenails of oak which had been used in addition to the iron bolts, and these treenails were in good condition.

." When the bridge was completed," writes John J. Fleming, Waterford's Borough Surveyor, " there was no opening. In or about 1800 a drawbridge was made near the south side to admit the passage of small vessels. This opening was 20 feet in width, and at first was worked by teackles, afterwards by ratchett quadrants made by Messrs. Graham and Son, of Waterford. This drawbridge<sup>6</sup> is shown in a watercolour sketch by Thomas Sautelle Roberts dated December 19th, 1805. Later it was found that paddle steamers could not pass through the opening, and a drawbridge was made near the centre of the river in the year 1854. The name of Messrs. Graham and the dates were on the old castings used for operating the drawbridge. The width of the new opening was 40 feet.

"In the middle of the 19th century the citizens began to display evidence of strong antipathy to the tolls demanded by the proprietors of the bridge. Public bodies held meetings expressing their anxiety to see the tollage swept away and the bridge made free. Under the auspices of the Mayor, a meeting was held in the Court House on January 6th, 1852, for the purpose of getting a free bridge. It was argued that the existing bridge had done its work. Counsellor Walsh said, " it should have been swept away long since, for it was unfit for the present day-its cost of £1,000 a year for repairs was only a waste of public money." Mr. Clarke, T.C., called attention to the views entertained by the Town Council before the present bridge was made. He read a resolution passed by the Council in 1706 approving of the project of erecting a bridge across the Suir. The Council agreed that the builders of such bridge should be allowed to levy tolls in order to repay themselves but that the tolls should not be greater than had been levied on the Ferry, and that as soon as the amount expended on the erection of the bridge; with legal interest thereon, had been received the bridge should be free. Mr. Edmund Power, Tramore, described the bridge as " old stick-in-the-mud," and declared that it was not a bridge at all only a bundle of sticks.

The matter was hotly debated at a meeting of the Town Council held on February 13th, 1852. Dr. John Mackesy proposed a resolution that city should not be taxed more than 4d. In the £1 for the proposed Free Bridge Mr. Samuel Grubb said the wooden bridge had cost originally £13,000, and that the Committee was prepared to give the proprietors £45,000 for it and the ferry rights. In the month of March the Free Bridge Bill presented to the British House of Commons was thrown out in consequence of a technical error.

After this the Free Bridge protagonists seem to have lost heart. Nothing further about the bridge was discussed in the local Press until the following September, when it was announced that the proprietors of the bridge were contemplating a reduction of the tolls.

In December 1852, an amended List of Tolls was published.

## THE TOLLS, OLD AND NEW

For every Coach, Breslin, Cal-Ash, Chariot, Chaise, or Chair Drawn by 6 or more horses Or other beasts of burden....	Old 3s. 0d.	New 2s. 0d.
Do. Drawn by less than 6 or More than 4 horses.	2s. 6d.	
Reduced to with 4 horses Or other beasts		2s. 0d.
With 3 horses or other beasts ...		1s. 6d.
For every Coach, Breslin, Cal-Ash, Chariot, Chaise, or Chair Drawn by 2 or more horses Or other beasts of burden....	1s. 0d.	10d.
For every Waggon, Wain, Cart or Car or other Carriage, With four wheels, drawn by 4 or more horses or other beasts...	1s. 0d.	11d.
Same by less than 4 horses or Other beasts	10d.	9d.

<sup>6</sup> Mr. J. Ernest Grubb says: - "I remember this opening and drawbridge, which was, I think, of one leaf only, hinged on the south side."

For every Waggon, Wain, Cart or Car or other Carriage, With two wheels, drawn by 2 or more horses or other beasts...	8d.	7½d.
For every Cart, Car or other Carriage drawn by 2 horses Or other beasts of burden, Including driver. ...	7d.	6d.
For every Carriage commonly A Chaise or Chair, with two Wheels, drawn with one or Other beast	6½d.	3d.
The same if with 4 wheels	10d.	6d.
For every Sedan chair	4d.	3½d.
For every Cart, Car, or other Carriage drawn by one horse Or beast, including driver, Unladen .....	3d.	2d.
For every Cart, Car, or other Carriage drawn by one horse And laden except with hogs, Including driver ....	6½d.	7d.
For every Sledge, Slider, or Other Carriage without Wheels drawn in any manner	1s.	11d.
For all Carriages whatsoever Drawn in or by any other Means than aforesaid ....	6½d.	6d.
For every Horse, Gelding, Mare, Mule, or Ass, or other Beast of burden laden and Not drawing ....	2d.	1½d.
For every Horse, Gelding, Mare, Mule, or Ass unladen	1d.	1d.
For every Drove of Oxen or Neat Cattle, per score ....	3s. 4d.	3s. 1d.
And so in proportion for any Greater or less number.		
For every Drove of Calves, Hogs, Sheep, or Lambs, and So in proportion for any Greater or lesser number, per Score ....	10d.	9d.
For every dead hog	1d.	1d.
For every person carrying or Conveying a kish or basket, Sack or load or package of any Kind ....	1d.	1d.
Provided such parcels do not Exceed 14 lbs. ....	1d.	1d.
For every drove or flock of Fowl whatsoever, per dozen	3d.	2½d.
And so in proportion for any Greater or lesser number.		
For every Passenger passing Over said Bridge except such persons as shall be Drawn in such Coach, Chariot, Breslin, Calash, Chaise or Chair and The driver or drivers thereof, And the footman or footmen, Stewart or servant thereof,		



Standing behind same ....	½d.	½d.
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"The Waterford News" commenting on this amended Toll Table in its issue of 3<sup>rd</sup> December 1852, says: "The above is a poor reduction. But what about the tolls on vessels, for the enforcer of which, we are told, there is no Act of Parliament?"

The custom of the bridge proprietors was to demand a total of 2s. per mast for any ship passing through the drawbridge. Sometimes a spirited shipmaster raised violent objection to this demand, and on more than one occasion the master steamship notified the bridge authorities that he would put his ship full speed ahead through the bridge if the drawbridge was not lifted free for his accommodation

Another interesting custom was to permit people attending funerals to pass over the bridge with the funeral procession free. The time honoured privilege was contested in the seventies by some English contractors for the bridge tolls, but they were obliged to give way to popular clamour. It is hardly necessary to say that many of those who joined a funeral procession across the bridge were not genuine mourners

In "The Waterford News" dated 11<sup>th</sup> November 1853, there is an advertisement of a Waterford Improvement Bill, which was to be laid before Parliament in the ensuing session. Amongst the powers sought for in the Bill was the power for "the Mayor, Aldermen and Burgesses to purchase by agreement from the Bridge Company their rights and interests, tolls and dues, enjoyed by them under an Act passed in the Parliament of Ireland in the 26th year of the Reign of His late Majesty, King George III, and upon such purchase to open same to the public free of toll."

The Improvement Bill apparently fizzled out; but from that date onward numerous efforts were made from time to time to acquire the wooden bridge and make it free of tolls, or to build a new free bridge across the Suir. Indeed A Free Bridge became a sort of slogan with most of the candidates for the office of Mayor and with other citizens voicing the will of the People

On January 20<sup>th</sup> 1854, an advertisement appeared in "The Waterford News," from Mr. Thomas F. Carroll, Secretary to the Free Bridge Committee, in which it was set forth that an eminent engineer had assessed the value of the bridge at £15,000, and the ferry rights at a similar sum. It was pointed out that the bridge proprietors had no rights whatever beyond the two points named in their Ferry Charter, and that the public had a perfect right to build a bridge outside the limits of these ferry rights. The demand of the bridge proprietors of £60,000 was described as preposterous.

Amongst the Mayors who worked energetically in order to secure a free bridge for the citizens were Cornelius Redmond (1869), Laurence A. Ryan (1880-2), Richard Power (1886-7), and W.J. Smith (1895-6). Messrs. Ryan and Smith propounded schemes which had the merit of sound common sense and equity, and which were based on sound financial principles; but one Mayor after another failed to accomplish his purpose. During the late stages of the controversy the lawyer for the Bridge Commissioners advised that the Corporation were free to erect a new bridge close to the west side the existing bridge without paying compensation to anybody. This was also the contention of Mr. James J. Feely, who was Town Clerk of Waterford from 1892 to 1917, but apparently the Corporation was timorous of making the plunge and erecting a bridge of their own. However, it may be fairly said that it was mainly owing to Mr. Feely's exertions Lemuel Cox's bridge was purchased by the Corporation of Waterford in 1907 for the sum of £63,000. Nor should it be forgotten by the citizens of Waterford that Mr. John Allingham, B.L.,<sup>7</sup> for many years the valued Secretary to the Harbour Board, took the keenest interest in the Free Bridge project, and his accurate knowledge of portal affairs and his legal training was fully availed of and greatly appreciated by the promoters of the many plans put forward.

About 9 o'clock on the night of December 31st, 1907, some two hundred citizens sat at supper in the City Hall, guests of Alderman Maurice Quinlan, Mayor of Waterford. At his Worship's right hand was the Most Revd. Dr. Sheehan, Lord Bishop of Waterford; Sir William Goff; James Hackett, Esq., High Sheriff; James J. Phelan, Esq.; and Sir James Power: at his left hand were Timothy Harrington, Esq., M.P.; A. E. Graves, Esq.; H. J. Forde, Esq.; and Joseph Walsh, Esq.

The Bishop, in responding to the toast of "The Free Bridge," said he congratulated the Mayor upon having during his year of office enjoyed the privilege of declaring the old wooden bridge to be toll free. He added that the citizens generally would agree that the lion's share of obtaining the boon had been done by Mr. James Feely, who had laboured incessantly for this object. The city owed the Town Clerk an everlasting debt of gratitude. Other speakers paid tribute to Mr. Feely's labours.

Shortly before midnight the party broke up, in order to be present at the ceremony of formally unlocking the gates of the toll bridge.

Before midnight an immense crowd was assembled on the Quay and in all the streets in the neighbourhood of the bridge. As the clock struck twelve there was prolonged cheering from the assembled

<sup>7</sup> It was Mr. John Allingham who, in the columns of The Waterford News, first dubbed the bridge by its popular title, "Old Timbertoes".

thousands; guns were fired, bells were rung, sirens shrieked, torches blazed. At seven minutes past midnight the Mayor, at the southern gates of the bridge, received the keys from his predecessor, Mr. James Hackett, and declared the Lemuel Cox's bridge was free from tolls. The gates were then thrown open. The citizens had assembled in such large numbers, and were so enthusiastic and so eager to march across the bridge that it was with difficulty the Royal Irish Constabulary could maintain a clear space for the passage of the Mayor, Aldermen, Councillors, and private citizens who were to drive in state across" Old Timbertoes."

## **VARIOUS BRIDGE PROPOSITIONS**

From time to time proposals were submitted to local authorities for the construction of a new Bridge to replace Lemuel Cox's structure. Of these proposals the following -the particulars of which are furnished by Mr. William Friel- are the principal ones: -

### **MR. TARRANT'S REPORT ON THE WOODEN BRIDGE, AND HIS PLAN FOR A NEW STRUCTURE**

In 1877, at the request of the Bridge commissioners, Mr. C. Tarrant, County Surveyor of Waterford, reported upon the wooden bridge, and submitted a plan for constructing a new bridge .The following is a copy of his report: -

9th March 1877.

To the Chairman of the Waterford Bridge Commissioners.

**Sir,**

In compliance with your instructions of the 12th ult., I have caused a thorough examination to be made and measurements taken of the Waterford Bridge, and have within the past few days made a close inspection of this work.

This bridge, opened for Public Traffic in 1794, has been 83 years in use, and during the memory of the present generation I am creditably informed that not a single dangerous accident has occurred to anyone passing over the bridge, and although during the same period thousands of barges have passed under it, accidents to them have been very few, three or four may have been sunk through the carelessness or neglect of those in charge, by letting them come in contact with the cut-water piles, still such collision has on no occasion been attended with loss of life. The barges being, many of them, laden with limestone, the loss of property was inconsiderable, and the injury caused the bridge was quite immaterial; such never for an instant affected its stability in the slightest degree.<sup>8</sup>

When first constructed, the length of the bridge and its approaches was 832 feet, it was 40 feet wide in clear of parapets, and had footways on each side of some 7 feet wide, and a carriage road in the center of 26 feet, and near the Waterford side there was a Portcullis opening in it of 29 feet, quite sufficient to admit the passage of the masted vessels then used in the navigation of the port.

In process of time it was found expedient to widen the quays on the Waterford side and contract the width of the bridge on the Kilkenny side, and this operation has reduced the bridge to its present length of 734 feet, all other dimensions remaining the same, except that of the Portcullis, which in 1853 was placed more in the center of the bridge, and the width increased from 29 feet to 40 feet, having a carriage way provided of 23 feet.

The number of openings or bays in the bridge is 38, the widths are various. Four of them vary from 9 feet 9 inches to 14 feet 3 inches, and the last bay on the Kilkenny side was originally 21 feet 7 inches, but it is now only half this width, having had a vertical pile driven near its center and a horizontal beam placed above level of low water, for the half space.

There are five bays having widths which vary from 13 feet to 22 feet These openings cannot be used for the purposes of navigation in consequence of span bracing being driven into the bed of the river and secured to the capping of the piers, these braces, being placed across the flow of the water, occupy nearly the full width of the bays in which they are, and most effectually obstruct the passage of barges through these bays. This, however, can be remedied by removing the braces, for means can be devised to strengthen the piers after the braces are taken away; doing this will give increased facilities for barges passing under the bridge.

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<sup>8</sup> Mr. J. Ernest Grubb writes:- "I know to my cost that grain, flour, salt, coal, iron, etc., were submerged in boats which collided with the bridge; some of these goods were recovered by diving operations.

"In 1881, on November 25, at 7 p.m., the Waterford and Limerick Railway Co.'s screw tug 'Sea Gull' struck one of the north piles of the main span and sunk. The 'Express' paddle tug of the Waterford Steamship Co. tried to assist the 'Sea Gull' and failed to do so"

In 1853 the Bridge Commissioners, at the solicitation of the Admiralty, changed the site of the Portcullis to the position it now occupies, increasing at the same time the width of the opening to 40 feet in the clear, which is quite ample for the class of vessels passing through the bridge, even including steamers using the port. Since the width of the Portcullis was enlarged, from the increased number of vessels passing through there is some interference with the ordinary traffic passing over the bridge, but the manipulation in the opening and closing of the Portcullis is so well arranged, and the times for vessels passing so fixed, that little inconvenience is experienced by the public from this cause.

The number of the remaining bays are 27, with widths which vary from 15 feet to 26 feet 9 inches. Six of these are of less width than 16 feet. The average of the remainder would be 20 feet, not one of them is under 17 feet wide, giving waterway for barges to pass through if those in charge wish to do so. The width of the barges does not exceed 16 feet, and for the past 50 years I am informed that the breadth of beam of these barges has never exceeded this.

The Piers which form the openings or bays in the bridge consist of oak piling. In each pier, with the exception of two near the Waterford side, there are seven vertical piles. The two mentioned above have six. All the piers are strengthened by having cut-water piles, or spur shores, driven on the up and down-stream side of the bridge, and secured at the top into the capping pieces which take the head the piles, and further secured by ledger pieces bolted to the pile and spur shore braces. All the piles forming the piers are braced with capping pieces at top, into which the tenons cut in the heads of the piles are securely mortised. Three rows of diagonal bracing is placed between the piles, two of these are over the level of low water and one under it. Ledger pieces and cills are secured and bolted to the piles, giving additional stiffness to each pier. The piles are braced in conformity with the original design, no change has been made in this respect, and this mode of construction is not that which an Engineer would now adopt, still, unless there was a thorough change made in the mode of bracing the piles, I would not recommend any departure from the original design.

The condition of the timber in the piles is the next subject to which I wish to direct your attention. All the piles under the level of low water, the greatest depth of which is 33 feet, may be considered sound and serviceable. Nearly all the piles used in the original structure are still in existence, they were driven about 9 feet into the bed of the river, and any that have been taken up and examined areas sound as when first used, and present no appearance of decay. There are some piles over low water shakey, one split, a few of the cut-waters defective, but all this does not affect the safe-working of the traffic over the bridge nor impair its stability, when the very efficient maintenance of the bridge is taken into account. I have also examined closely the piles connected with the Portcullis, but could not detect any rotten piles as stated in a memorial reflecting on the stability of the bridge.

The dimensions of the piles originally used were 13½ inches square, the waste and wear from attrition during 83 years has been inconsiderable, ½ inch would represent the greatest loss any one pile has sustained, and ¼ of an inch may be taken as the reduction of the greater number of the piles, clearing showing that at no period since the bridge was built has the action of floating ice in any way injuriously affected the structure. <sup>9</sup>The original bracing of the piles was defective, and has weakened to some extent the strength of the piers, but all this is more than compensated, and the evil effect from it counteracted, by the great quantity of timber used in them, and which is so much more than what is actually required, there remains an excess of strength in the structure more than sufficient to support any traffic that can be brought over it.

The piles in the piers over the level of low water, to the under side of the roadway, are oak. They are properly scarfed on to the original piles, and are well secured with suitable wrought iron bolts, nails, and straps. Constant attention to this portion of the structure is given by your very efficient Superintendent of Works, Mr. George McClelland, who with the assistance of the ample and competent staff of artificers and workmen under him permit no defect to remain longer than it can be fairly attended to and made good.

The superstructure resting on the piers is for all practical purposes thoroughly sound. It consists of oak and Memel beams. Pitchpine as, I am told, substituted in some cases for Memel. These beams are 13½ inches in depth by 10 inches, 12 of them being under the roadway planking. They are about 16 inches apart, and add very considerably to the strength of the bridge. More than half of these beams are oak. The roadway planking is nearly all oak, 2½ inches in thickness, securely spiked down to the longitudinal beams underneath.

In estimating the strength of the bridge, this is governed by that of the Portcullis, which is admittedly the weakest part of the structure. This is formed in two parts, worked by machinery at the ends for raising and

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<sup>9</sup> Mr. J. Ernest Grubb writes: -" In December, 1878, the Suir was frozen from 14th to 25th December. (See Clonmel Chronicle of 28th December, 1878.) Masses of ice for days formed small icebergs 4 to 10 feet in height and 20 to 30 feet across. The ebb tide brought down against Waterford bridge immense masses of thick ice with serrated edges, completely covering the river from the bridge to above the Dungarvan railway terminus. The Bridge Commissioners ineffectually endeavoured to ward off injury with chains and planks; when these failed, they employed the 'Father Mathew' steam tug to ram the ice before it reached the bridge, and by breaking it into small pieces it floated harmlessly through, thus probably saving the bridge from the fate of New Ross wooden bridge, which was destroyed by ice-floes."

lowering each. The machinery is fully up to its requirements, and in opening or closing the Portcullis no unnecessary delay occurs, and it is done expeditiously and with despatch. Each leaf of the Portcullis is formed with nine oak beams projecting 22 feet. These are 14 inches by 6 inches at the point of support, and 10 inches by 6 inches at the ends. Balance weights are suspended from the beams, and for the roadway a double planking of oak is used. The breaking weight of each leaf of the Portcullis is 30 tons, distributed over its surface. One-fifth of this, or about 6 tons, may be considered a safe working load, but considerably more than what I have mentioned has, I have been informed, passed over the bridge. Loads of six tons are not usual, but when passed over the bridge proper precautions should be taken to prevent injury arising therefrom, and such precaution I would recommend to permit no load to pass over the bridge which exceeded four tons.

The strength of the remaining portion of the bridge is equal to more than double that which could be passed with safety over the Portcullis, but as this portion of the bridge regulates the weight of traffic over the remainder, the weights I have indicated above may be considered the safe loads that may be permitted to pass.

Considerable care is taken to insure the safety of the Public by keeping the bridge at all times in a thorough state of repair. At night an ample number of watchmen are placed in charge, and the whole is, besides, well lighted up, so that even barges navigating the Suir are protected while passing under the bridge.

The constant supervision, repairs and renewals amount to a considerable sum each year, and has been steadily increasing since 1853, and an increased and increasing traffic has caused a corresponding outlay to maintain the structure in its present state. Upwards of £20,000 has been expended in maintenance during the last 23 years, and adding to the expenditure for the last nine years the cost of lighting the bridge and the cost of yard and storage for materials, it will be found that this has amounted in round numbers to £9,722, thus showing the cost of maintenance alone to be upwards of £1,000 per annum, and may be taken for the future from £1,100 to £1,200 for annual maintenance alone. A considerable portion of this sum is expended on timber and materials required for the bridge.

It might be worth the consideration of the Committee how far they might deem it advisable to capitalise this outlay, and secure a structure that would not require for repairs more than one-sixth of the present expenditure. Such could, in my opinion, be accomplished, and thus place their valuable property in a position that none could cavil at. In conclusion, I have to record with thanks the information and assistance given by your Superintendent, Mr. George McClelland, to my assistant and myself.

I remain, Sir,

Your obedient Servant,

CHARLES TARRANT, M.I.C.E.

County Surveyor, and Engineer to the Waterford and Tramore, and Water-ford, Dungarvan and Lismore Railways.

In order to elucidate this report, I forward a Plan, Elevation and Section, of the bridge, the timbers of which are coloured brown; and to show how the structure may be reconstructed in a permanent manner with iron, I submit a design which is distinguished by red lines and color placed on the Plan and Elevation of the existing bridge.

The following is a summary of the plan submitted by Mr. Tarrant. No estimate of cost was furnished.

Proposed bridge centre line coincided with centre line of Timber Bridge. The width of pathways and roadways was similar to old timber bridge, viz: two 6-foot wide footways and a 26-foot roadway. The opening portion consisted of a double opening swing bridge supported on five cylinders, the width of each opening being 40 feet in the clear. The centre line, up and down stream, of the opening next the south shore was 84 feet to the north of the centre line of the 40-foot opening in the old bridge. Between this opening and the south shore there were to have been four clear spans of 85 feet; between the opening to the north and the north shore there were to have been three 85-foot clear spans. The supports for these 85-foot span girders were 5-foot diameter cylinders, two to each bay. The swing or opening spans, and the cluster of cylinders on which the swing span revolved, measured from north to south 103 feet, and for this 103 feet the roadway was contracted to a width of 16 feet and the footways to 3 feet each. The main feature of this bridge was that the bottom of the girders and the roadway were level from the south to the north shore, the height of bottom of girders above H.W.O.S.T. level being only 3 feet 9 inches.

#### **BRIDGE PROPOSED BY CHARLES GALWEY AND JAMES OTWAY, 1879.**

Proposed bridge centre line coincided with centre line of Timber Bridge. The width of roadway was 25 feet, and each pathway 7 feet. The wearing surface of roadway was timber blocks, and for the footways timber planking. The opening portion consisted of a double opening swing bridge supported on central cluster of 5 cylinders, the width of each opening being 48 feet in the clear. The centre line, up and down stream, of the opening next the south shore coincided with the 40-foot opening span of the old timber bridge. Between the opening and the south shore there were to have been two spans of 130 feet. Between

the opening to the north and the north shore there were to have been two spans of 130 feet and one of 66 feet. The supports for the fixed spans were 7 feet 6 inches diameter cylinders, two to each bay. The swing or opening spans and the cluster of cylinders on which the swing span revolved measured from north to south 123 feet, and for this 123 feet the roadway and pathways were similar in width to the remainder of bridge. The headway over H.W.O.S.T. level to bottom of bridge girders corresponded, practically, to the headroom given by the old timber bridge.

No estimate of cost is given in this proposal, nor is it stated for what body the bridge was designed.

#### **BRIDGE PROPOSED BY JAMES OTWAY, 1893.**

Proposed bridge centre line coincided with centre line of Timber Bridge. The wearing surface of roadway and footpaths was asphalt. The width of roadway portion 25 feet, with two 7-footwide footways, which contracted at swing portion to pathways 4 feet wide. The opening portion consisted of a double opening swing bridge supported and revolving on central cluster of eight 7-footdiameter cylinders, the clear waterway width of each opening being 50 feet. The centre line, up and down stream, of the opening next the south shore was 27 feet to the north of the centre line of the 40-foot opening in the old timber bridge. Between this opening and the south shore there was to have been three clear spans of 92 feet each, and between the opening span to the north and the south shore a similar number of 92 feet clear spans. The swing or opening spans and the cluster of cylinders on which the swing span revolved measured from north to south 142 feet. The supports for the fixed spans were 7 feet diameter cast iron cylinders, two to each bay. The headway over H.W.O.S.T. level to bottom of bridge girders corresponded, practically, to the headroom given by the old timber bridge.

No estimate of cost is given in this proposal, nor is it stated for what body the bridge was designed

#### **COMBINED ROAD AND RAILWAY BRIDGE PROPOSED BY E. P. SEATON, 1897.**

This bridge centre line coincided with the old timber bridge centre line. The public vehicular road bridge was 25 feet wide, and was on the low level. Two 6 feet wide pathways were provided. The double-track railway bridge was overhead, 20 feet above the road bridge. The wearing surface for the roadway was timber blocks, and asphalt for the footpaths. The opening portion consisted of a double opening Swing Bridge supported and revolving on a solid 40-foot diameter concrete cylinder. The clear waterway width of each opening was 50 feet. The centre line, up and downstream, of the opening next the south shore was 33 feet to the north of the centre line of the 40-foot opening in the old timber bridge. Between this opening and the south shore there was to have been two clear spans of 130 feet each, and between the opening span to the north shore a similar number of 130 feet clear spans. The supports for the fixed spans were 12-foot wide cut water shaped piers. The headway over H. W.O.S.T. level to bottom of bridge girders corresponded practically to the headroom given by the old timber bridge.

No estimate of cost is given in this proposal, but it formed a link in the Fishguard and Rosslare Railways and Harbours Scheme for joining the North and South side of the river together for road and railway traffic.

#### **BRIDGE PROPOSED BY SIR Wm. ARROLL**

In 1902 Sir Wm. Arroll and Co., Bridge builders, submitted a plan to the Corporation on somewhat similar lines for a site between Bilberry Rock point and the present site. The proposal embodied a double swing opening span, with 80-foot clear openings, two girder spans of 85 feet and two of 135 feet, with four short girder spans over the railway, north side, joining up to the public road at Ferrybank at a point 750 feet to the north of the existing bridge.

#### **BRIDGE PROPOSED BY MESSRS. SCULLY AND FRIEL.**

During 1901 and 1902 schemes were proposed for building a bridge at Bilberry Rock point. In 1901 Messrs. Scully and Friel submitted a plan to the Corporation of Waterford which embodied raising the road from the end of Grattan Quay to Bilberry Rock point, and from thence running a bridge across the river and railway, north side, and descending by an inclined roadway to the existing Ferrybank road. This scheme had a double swing opening span of two 60-foot clear openings and two girder spans of 168 feet each, with three small spans over the railway portion. Its estimated cost was £60,000.

#### **BRIDGE PROPOSED BY M. J. FLEMING, BOROUGH SURVEYOR, WATERFORD, 1902.**

This plan was for a bridge situated 900 feet on the up-stream side of the timber bridge, opposite portion of Messrs. Davis, Strangman and Co.'s brewery premises. The width of roadway was 30 feet, with two 7-foot

footways and a central double opening swing bridge giving a clear waterway width for each opening of 54 feet. The feature of this bridge proposal was that the road surface commenced on the level of the road on the Southside and rose with a continuous grade, so that the bottom of the girders on the North side cleared the railway traffic; the road then linked up to the Ferrybank existing roadway.

It was during the year 1902, in the Mayoralty of Alderman Richard Hearne and the Shrievalty of Councillor David MacDonald, that the scheme was initiated which made it possible to purchase the old bridge and build the new bridge.

### **GRANAGH RAILWAY BRIDGE.**

In the year 1900 the Fishguard and Rosslare Railways and Harbours Co. decided to span the Suir with an iron bridge which would connect the new railway line from Rosslare to Waterford City with the Great Southern and Western Railway Co.'s system on the south side of the Suir.

Mr. J. Otway, Engineer to the Fishguard and Rosslare Co., forwarded to Mr. J. Allingham, Secretary to the Waterford Harbour Commissioners, a plan of the proposed "Suir Viaduct" at Greenbank. Mr. William Friel, Engineer to the Waterford Harbour Commissioners, reported up on this plan on 7th August 1900. While approving of the drawings, he raised an objection to the manner in which it was proposed to spring the bridge from the Co. Kilkenny side, on the grounds that that end of the viaduct would project nearly fifty feet on the foreshore, and would thus materially augment the deposit of silt at the upper berths of the railway wharf. He suggested an additional short span over the foreshore in substitution for the proposed solid work. Mr. Friel mentioned that the Harbour Master, Captain Nicholas Parle, had also examined the plans and had approved of the position of the piers and their inclination to the river current.

The Fishguard and Rosslare Railway Co., in reply to Mr. Friel's report, agreed to alter their engineer's original plan and to see that the face of the abutment on the Co. Kilkenny side was kept back to the line of the existing retaining wall, and they also proposed to increase the waterway space.

The southern end of this proposed viaduct was to be about three hundred yards above the terminus of the Waterford and Dungarvan Railway.

The Greenbank project was subsequently abandoned, as it was found that the depth of water at high water at this particular part of the Suir was feet, and it was decided to cross the river further up the stream, at Granagh, where the water was shallower.

The Suir is now crossed at a point a mile and a half above the city by a steel bridge carrying a line of railway of 5 feet 3 inches gauge. The superstructure of this bridge is similar to that of the viaduct which spans the Barrow River opposite Cheekpoint, and the construction of the foundations and piers is alike in both bridges. The Granagh Bridge is 1,205 feet long, made up of six spans of 148 feet, one of 133 feet, and the opening span of 102 feet 9 inches. The opening span is of the rolling lift type and gives a clear opening of 50 feet.

This bridge, like the Barrow bridge, was de-signed by Messrs. Baker and Hurtzig, and was constructed by Sir William Arroll and Co., who are, respectively, the most eminent Engineers and Con-tractors engaged in bridge work in various parts of the world.

### **THE FERRO-CONCRETE BRIDGE.**

Controversy raged for some time over the question, what class of bridge should be erected to take the place of Lemuel Cox's trestle bridge. Some were in favour of a steel bridge, others of a bridge of steel and stone, others of a stone bridge, others of a reinforced concrete bridge, others of another wooden bridge.

The Mayor for the years 1907-8-9, Alderman Thomas Whittle, took a prominent part in the discussions.

On 2<sup>nd</sup> October, 1908, a Viceregal Commission, consisting of Denis B. Sullivan, K.C., Chairman; John P. Griffith, Engineer, Dublin Port and Docks; A. M. Burden, County Surveyor, Kilkenny; W.E. L'Estrange Duffin, County Surveyor, Waterford; and Edward A. Hackett, County Surveyor, Tipperary South Riding, issued plans and specification which they had prepared for the building of a steel bridge across the River Suir at Waterford. The site chosen corresponded with the site on which the timber bridge, then in existence and erected in 1793, stood. Borings for the foundations of the proposed new bridge were made by Messrs. John Henderson and Sons, of Glasgow.

The proposed steel bridge had two main spans, one on each side of the 80-foot clear waterway, double-leafed Bascule opening spans. The girders of the main fixed spans were of the Pepit type, 288 feet centre of beams and 36 feet centres apart, 40 feet deep in the centre, tapering to 30 feet at each end. The width of roadway was 30 feet, with two 7 foot 6-inch wide footpaths. The wearing surface for roadway was stone setts, and asphalt for the opening spans. The pathway wearing surface was reinforced concrete. The main spans on their shore ends rested on ashlar face stone abutments supported on timber piles driven to the hard, and on the river ends on concrete piers carried down to rock bottom, each pier being 91 feet 6 inches long by 29 feet wide. These piers also formed the supports of the Bascule spans and provided space for housing the engine and hydraulic accumulators for operating the opening and closing of the lift spans. This

bridge was estimated to cost £114,500, which figure included the cost of erecting a temporary wooden bridge, engineering and law expenses, etc.

An appeal was made to the Privy Council on behalf of the contributing counties, viz.,

The County Borough of Waterford,

The County of Waterford,

The County of Kilkenny,

The County of Wexford,

The County of Carlow,

The County of Queen's County,

The County of Tipperary, S. Riding,

The County of Tipperary, N. Riding,

To have the steel bridge plans cancelled, and that the bridge be erected in reinforced concrete with a steel opening span, all to approved design and specification. Allocation of the cost for the building of the new bridge was apportioned in the following manner to the contributing bodies: -

Borough of Waterford to pay 25 %

County of Kilkenny to pay 22 %

Waterford County to pay 15 %

County Wexford to pay 15 %

County Tipperary, South Riding to pay 15 %

County Carlow to pay 3 %

Queen's County to pay 3 %

County Tipperary, North Riding to pay 2 %

A plan was submitted by Sir Wm. Arrol and Co. to the Corporation for an alternative steel bridge design. The opening span in this bridge was 80 feet in the clear, and was of the double-leafed Bascule type, each leaf resting on solid concrete and masonry piers carried down to rock, and in which were the necessary spaces for powerhouse and operating machinery. The centre line of the opening span was approximately the centre of the river, and the space between the solid piers and each shore was divided into three equal-lengthed girder spaces supported on cast-iron cylinders, two to each bay. The roadway width was 30 feet, with two 7-footwide footpaths, and it was considered that this bridge would be more suitable and less costly than the Viceregal Commission bridge. On Monday, April 5<sup>th</sup>, 1909, the Privy Council Committee heard the appeal and decided not to force the Viceregal Commission's bridge design upon Waterford. Various designs were submitted to the Waterford Corporation, and that body eventually passed a resolution declaring that a steel bridge was the proper structure." However, the final and unalterable decision of the Privy Council was that the bridge should be of ferro-concrete, and in December 1900, they ordered that a bridge constructed on the Hennebique system should be erected. Messrs. L. G. Mouchel and Partners, Ltd., of Westminster, who represented the Hennebique patents in the British Isles, had designed and submitted to the Corporation of Waterford a plan of a bridge to be built in reinforced concrete with steel opening span. The Privy Council requested the various contributing bodies to obtain independent engineering advice as to what alterations should be made in the plans submitted by Messrs. L. G. Mouchel and Partners, Ltd. As a result, various experts' criticisms were obtained, and in some cases the suggestions made were acted upon. The approval of the plans, as revised, having been obtained, the following representatives from the contributing bodies were duly appointed to act as members of the Waterford Joint Committee of Management: -

FOR THE CITY OF WATERFORD: - The Mayor (James Hackett, T.C.); the High Sheriff (Matthew Cassin, T.C.); Patrick W. Kenny, T.C.; Michael MacDonnell, T.C.

FOR THE COUNTY WATERFORD: - P. O'Gorman, J.P. (Lismore); Thomas Power, J.P. (Dungarvan); Thomas Whittle, Alderman (Waterford); Matthias Walsh, J.P. (Rathgormack, Carrick-on-Suir).

FOR THE COUNTY KILKENNY: - Joseph Walsh, J.P. (Gowran); James G. Dooley (Rosbercon); P. Grant, J.P. (Slieverue); Edward Phelan, J.P. (Newrath).

FOR SOUTH TIPPERARY: - J. F. O'Ryan, M.D., J.P. (Tipperary); J. Ernest Grubb, J.P. (Carrick-on-Suir); F. Heffernan, J.P. (Ardfinnan); Nicholas Ryan (Cashel).

FOR CARLOW: - Walter Kavanagh, J.P., D.L. (Borris); Patrick Kinsella, J.P. (Bagnalstown); Patrick Hanlon (Carlow); Edward Hughes, J.P. (Carlow).

FOR NORTH TIPPERARY: - John Hackett, M.P. (Thurles); T. Duggan (Thurles); A. Callanan (Thurles); R. P. Stakelum (Thurles).

FOR WEXFORD: - John S. Hearne, J.P. (New Ross); C. H. Peacocke, J.P. (Wexford); John Bolger (Ferns); James J. Stafford (Wexford).

FOR QUEEN'S CO: - John Byrne, J.P. (Maganey); James MacMahon, J.P. (Abbeyleix); Patrick A. Meehan, M.P. (Maryborough); Arthur MacMahon (Abbeyleix).

This body held its first meeting on 21<sup>st</sup> June, 1910, and appointed the Mayor of Waterford, Councillor James Hackett, Chairman of the committee; Mr. James J. Feely, Secretary; Mr. Alexander Burden, A.M.I.C.E., Co. Surveyor, Kilkenny, Engineer-in-Chief; Mr. William Friel, A.M.I.C.E., Engineer, Waterford

Harbour Commissioners, Resident Engineer. Tenders were duly invited, fourteen being obtained, that of Messrs. Kinnear, Moodie and Co, of 126 St. Vincent Street, Glasgow, being accepted on the 1<sup>st</sup> September 1910. The contract sum was £64,311 13s. 7d. with two years' free maintenance after completion of contract, four years' further maintenance at the option of the Committee, at £100 per year, to include painting of opening span and general upkeep, but no operating or ordinary administrative work, nor lighting. When the contract deed with Messrs. Kinnear, Moodie and Co. had been completed, material and plant for the erection of the temporary bridge began to arrive, the first pile being driven on the 19<sup>th</sup> November 1910, in the presence of the Mayor and Corporation. The temporary bridge was a timber pile structure giving a 20-foot wide roadway and one 8-foot footpath. The pile bays were spaced about 20 feet centre to centre, and consisted of five piles, three vertical and two raking piers, securely braced together. The three vertical piles were driven from a cantilever pile frame having three pile frame heads on it, the centre lines of heads corresponding with the distance apart of the piles. After the three piles were driven, the cross-heads and bearers were fixed and the entire pile frame run out 20 feet, ready for pitching" the piles for the next bay. The piles were driven to an average depth of 19 feet into the riverbed. The opening span was 40 feet in the clear, and was operated by gearing wheels of similar design to those used on Lemuel Cox's trestle bridge, the pattern for the cog-wheels being in the possession of Mr. Ben Graham, Foundry, Waterford, whose firm had cast those fixed years before. The temporary bridge was completed and opened for traffic on the 27<sup>th</sup> March 1911. By this date 109 of the reinforced concrete piles and the first of the cylinders had been cast at the moulding yard, which was a site obtained from the G.S. and W. Railway Co. at their premises on the south bank of the river, at the one-time Waterford terminus of the Waterford, Dungarvan, and Lismore Railway. The work of providing the timber pile foundations on the down-stream side of the old bridge for receiving the derrick cranes had also advanced. The contractors had now to ascertain how far the existing trestles of the old bridge could be used for the false work and staging for the new bridge. It was found after inspection that none of it could be utilized, and entirely new false work had to be provided. On 5<sup>th</sup> June 1911, the cranes and false work having advanced sufficiently, the driving of the rein-forced piles was commenced. The Mayor, Mr. James Hackett, T.C., pulled the trigger, which caused the steam pile driver to deliver the first blow. The specification provided that "the set of the piles not exceed half-an-inch as a total set for the ten blows of a 2 1/2 ton monkey with a fall of 4 and that in no case were the piles to be driven 20 feet into the bed of the river (water set used if necessary), and every endeavour made to get them to the rock." Records were made of pile driven, the number of blows each pile with their final sets. The average depth at which rock bottom was found under the riverbed was 25 feet. The first pile in each cluster of three reached rock bottom, while of those subsequently driven it was found that when the set had been obtained the pile points were within two or three feet of the rock. The piles in the bays on the north side of the opening span required much fewer blows per pile to drive them to rock, or the sett, than those on the south side of the opening span. The total number of piles used was 208, the longest being 65 feet, and the shortest 42 feet, and their size 16 inches x 16 inches square.

The length of the bridge is 700 feet, and the width between the parapets 48 feet, which gives a roadway of 32 feet, with two footpaths of eight feet each. There is a central opening for navigation, 80 feet in width, spanned by a rolling lift bridge in two leaves. The height from high-water level to the underside of the bridge at the opening span is 10 feet, and the gradient of the bridge roadway is approximately 1 in 31 on either side of the opening span, the roadway at the opening span itself being level.

On each side of the opening span there are six reinforced concrete girder spans, 46 feet 4 1/2 inches in length, measured from centre to centre of piers. Each of these piers consists of a group of four cylinders spaced 13 feet 10 inches centre to centre. Each cylinder is 5 feet 6 inches external diameter by 4 inches thickness of shell and surrounds a cluster of three piles. These cylinders were formed in lengths of about 8 feet, were heavily reinforced with steel, were lowered over the pile clusters in sections and carried down to a depth of 6 feet below the normal bed of the river, the ground being excavated by grabs for the purpose. When the cylinder rings reached about half-tide level they were filled in with concrete carried up to the level of the top of the piles, in one operation. The pile top levels were on the average 3 feet above L.W.O.S.T., and from this level the cylinders were continued as columns, the hearting being specially reinforced. Braces, 36 inches deep and 18 inches wide, fixed one above L.W. mark and one at high-water mark, connected the cylinder columns together.

Each reinforced concrete span includes four girders, one over each cylinder of the river piers. The outside girders are 5 feet 6 inches in depth by 16 inches wide, and the two inside girders 4 feet 2 inches deep by 16 inches wide. These girders, in their turn, are connected by 14 inch x 7 inch transverse beams, spaced 3 feet 9 inches centre to centre, and a 5/2 inch thick reinforced decking slab. Over the decking slab three-quarters of an inch of asphalt is laid, then a layer of concrete to receive the wearing surface of 4 inch cube stone setts obtained from the Long stone Quarries in Limerick.

The piers for the opening span differed from the river span piers in that there are two rows of four cylinders for each side, and spaced 12 feet 10 inches centre to centre, instead of 46 feet 4 1/2 inches centre to



centre, and that the cylinders are 7 feet in diameter and enclosed clusters of eight and five piles, the eight pile clusters being directly under each main steel girder of the opening span.

The piers are braced together, the top bracing being cantilevered out to form the supports for the houses which contain the operating, generating, and storage battery houses. One house is constructed at each of the four corners of the opening span. The concrete for all the reinforced work on the bridge was composed as follows: - 2.6 cubic feet of Portland cement;  $3\frac{3}{8}$  cubic feet of sand;  $6\frac{7}{8}$  cubic feet of aggregate.

The stone used was obtained from a portion of the quarry owned by Mr. G. Nolan, builder, adjoining the moulding yard site. The sand was obtained from the bed of the Nore and Barrow rivers, New Ross and St. Mullins, and conveyed from these by barges. It was all screened and washed before use. Waterford's Bridges The opening span was designed and supplied by the Cleveland Bridge and Engineering Co., Ltd., of Darlington, and erected on the foundations pre-pared for them by the contractors, Messrs. Kinnear, Moodie and Co., Ltd. It is built on the cantilevered Schertzer principle, and was then the widest roadway of any Schertzer bridge in the world.

The motive power for opening and lowering is electricity, generated by a 20 h p. gas engine, stored in a 55-cell battery. A single charge of the battery will open and close the bridge 35 times. The opening or closing of the bridge, when worked electrically, occupies 2 minutes, and with the hand-gear 28 minutes on a windy day. The operating gears and switchboard interlocking arrangements are the most automatic of any yet erected, and are considered the last word in safety appliances, This portion of the work was designed by Mt. Claude W. Hill, 19 Old Queen Street, Westminster, S.W.

To open the bridge the controlling handle is pushed over, the electric current then automatically switches itself on in increasing volume as required to open the leaves, and again automatically switches itself off when the bridge is open. Pushing the handle the other way reverses the operation, and the bridge closes itself. The speed at which the bridge moves in its different positions is automatically controlled by cutouts, and the possibility of an accident is reduced to a minimum.

Approximately, the total weight of the opening span is 500 tons.

The wearing surface of the opening span is Baltic timber wood blocks 9 inches x 4 inches x 5 inches deep, all dowelled together. Early in 1913 the following tests were carried out in accordance with the obligations set out in the specification: -

1st. A dead load of 210lbs. per square foot was to be placed on the footways.

2nd. The roadway was to be tested by a moving load. Firstly, two lorries, each of 32 tons total weight, on four wheels (wheel base 12 feet by 7 feet), were to be run in a single line on the centre beams. Secondly, these two lorries were to be drawn abreast over the bridge. The lorries were to be started and stopped at any point at the engineers' direction. A further obligation was that when these tests had been made there should be no permanent set in the beams, and that the deflection should not exceed more than  $1/600$  of the span when the full load was on.

All these tests were satisfactorily carried out.

## **PROCEEDINGS OF THE JOINT COMMITTEE**

At a meeting of the Committee held on August 10th, 1910, it was resolved, on the proposal of the Mayor, seconded by Mr. E. Phelan, that Mr. P. A. Murphy be appointed Law Agent to the Committee.

At the meeting of the Committee held on September 1<sup>st</sup>, 1910, already mentioned, Messrs. J. H. Waller and P. J. Rice were elected Clerks of Works.

On 13th October, 1910, it was resolved, on the proposal of Mr. P. W. Kenny, seconded by Mr. J. E. Grubb, that the contributing bodies be requested to lodge their respective proportions of the total estimated costs and expenses of the construction of the bridge (£71,000) to credit of an account to be opened by the Joint Committee in equal quarterly payments, the first payment to be made by 1<sup>st</sup> December. It was also resolved that the contract with Messrs. Kinnear, Moodie and Co. be approved and signed. At the same meeting it was proposed by Alderman Whittle, seconded by Councillor McDonnell, that the contractors be ordered to commence the construction of the bridge on November 1<sup>st</sup>.

On November 10<sup>th</sup> the National Bank was appointed Treasurer to the Committee. On 9th February, 1911, Mr. Grubb proposed, and Councillor Cassin seconded, that a Certificate, prepared in accordance with Section 20 of the Bridges (Ireland) Act, 1867, be signed by three members the Council, the three members signing being Councillor Hackett (Mayor), Councillor Cassin, and Councillor E. Phelan.

The following is a copy of the Certificate: -

## **THE BRIDGES (IRELAND) ACTS**

In the matter of a new bridge over the River Suir at Waterford, and of the Orders of the Lord Lieutenant in Council dated, respectively, 29<sup>th</sup> March 1910, and 2nd April 1910.

Grey Robertson and Robert Robertson, the contractors for the said bridge and the works in the said Orders in Council mentioned, having claimed to become entitled to payment of the sum of Seven Thousand Pounds, being an instalment of the sums payable to them under their contract, dated 13<sup>th</sup> October, 1910, for the construction of the said bridge and other works, and having given notice accordingly to the joint Committee of Management appointed in that behalf pursuant to the said Acts, the said Joint Committee referred the said claim to Alexander M. Burden, Esq., the County Surveyor, duly appointed pursuant to Section 19 of the Bridges (Ireland) Act, 1867, and it appearing from the Report of the said Alexander M. Burden, dated 8th February, 1911, that the said contractors having properly performed portion of the said contract so as to become entitled to the sum of £7,000 in respect of their aforesaid claim, we, the under-signed, hereby certify that the said contractors are duly entitled to the payment of this £7,000.

Further payments to the contractors were paid from time to time under same form of certificate. The temporary wooden bridge which ran along-side Lemuel Cox's bridge was completed and opened for traffic on 27th March 1911, and three days later both of the wooden bridges were cleared to allow the river traffic through.

On August 8th it was proposed by Mr. Grubb, seconded by Councillor Cassin, that Mr. Burden take the necessary steps to obtain a suitable man to inspect the preparation of the steel for the opening span at the Cleveland Iron Works, Darlington, during the construction of the work. Mr. T. Wight was appointed inspector.

On 7th September Mr. Ronayne Jennings was appointed additional Clerk of Works.

On 12th September Messrs. Kinnear, Moodie and Co., the contractors, gave notice that they proposed arbitration in connection with claims of theirs for extras, the principal claims being for having to drive the piles of the temporary bridge to a greater depth than the 12 feet depth to which it was represented they had to be driven; and for excavation of the bed of the river to receive the bottom length of cylinders beyond what was shown in the plans, which they alleged were wrong and misleading. An arbitration was subsequently held and a satisfactory arrangement arrived at.

On December 7th, 1911, it was resolved that the Waterford Gas Co. be at liberty to lay the gas-pipes and make all necessary arrangements with the contractors, the Cleveland Bridge Co. and Mouchell and Partners, and that the Bridge Engineer direct the contractors to provide a six-inch gas-pipe across and under the River Suir instead of the four-inch gas-pipe specified, provided the Waterford Gas Co. pay all additional costs and expenses in connection with same.

On 4th January, 1912, Mr. Waller's position was changed from Clerk of Works to Assistant Engineer, and it was agreed that he be paid a bonus of £100 for diving work he carried out inspecting the cylinders.

On 4th April it was resolved that the contractors be paid a sum of £288 14s. for erecting a railings along each footway for the protection of foot passengers, and on 6th June it was resolved to pay the contractors £152 0s. 8d. for erecting gangways to the dolphins.

On 1<sup>st</sup> August it was resolved that chains be substituted for gates on the bridge.

On 7th November Mr. Burden reported that, if no hitch occurred, the bridge would be practically completed by the middle of December, and he asked that a decision should be arrived at as to the memorial tablet and the arms plate which were to be placed on the bridge. At the same meeting Councillor Cassin proposed, and Mr. Grant seconded, that the Member for Waterford City, Mr. John Redmond, should be invited to open the new bridge.

On 1st December a letter was read from the Engineer stating that the bridge would not be ready to be opened until 1<sup>st</sup> January 1913. But some further delay arose in connection with the construction of the drawbridge, and Mr. Burden, in a letter dated 5th February 1913, stated that the bridge was now complete, with the exception of some minor works, and he named 10<sup>th</sup> February as the opening day.

## **THE OPENING CEREMONY**

The following account of the ceremony of declaring the Bridge open is taken from 'The Waterford News of 14<sup>th</sup> February 1913: -

At 3 o'clock (on the 10<sup>th</sup> inst.) a procession, headed by, the Erin's Hope band started from the Town Hall towards the bridge, amidst general enthusiasm. Motorcars conveyed the members of the Corporation, the Chamber of Commerce, and the Reception Committee, and a number of prominent citizens in their own cars joined in line. Mr. Redmond was accompanied by the Mayor (Councillor Michael Kirwan), Alderman Maurice Quinlan, and the Town Clerk. At about 3.30 the party arrived at the bridge. There was loud cheering as they ascended the platform erected at the bottom of Bridge Street. The Most Rev. Dr. Sheehan, Bishop of Waterford and Lismore, was on the platform.

Councillor Hackett, as Chairman of the Joint Committee, formally handed over the bridge to the Mayor and said he thought it ought to be named after the city's representative. He then read a short history of the old bridge and of the events that led up to its purchase, and to the building of the new structure. Mr. John Redmond then rose and said that it was a memorable day for the citizens. He referred to the inscription on the tablet on the old wooden bridge which mentioned 1793 as a year sacred to national prosperity, and he said that if the spirit which animated the country in 1793 survived this country would long ago have been conceded its national claims. He hoped the new bridge would mark the commencement of a new era in the prosperity and happiness of the city, and that it would bring a great wave of commercial activity into the Urbs Intacta.

At the conclusion of his speech Mr. Redmond pressed an electric button near his right hand and the portcullis was lowered.

His Lordship the Most Rev. Dr. Sheehan, accompanied by the members of the Corporation, went with Mr. Redmond to the opening span on the city side, where Mr. Redmond cut a tape, and the concourse of people assembled at the entrance passed over the new bridge.

In the Council Chamber the same evening a public banquet was given by the Mayor. The principal citizens of Waterford attended. The first toast on the list was "The King," proposed by the Mayor. Following this was "Our Guest, Mr. R Edmond." The Mayor, in proposing the toast, said he need hardly tell them that it was mainly through Mr. Redmond's exertions that a sum of £38,000 had been received by the Corporation from the Treasury as a grant towards the purchase of the old wooden bridge.

Mr. Redmond, in responding, expressed his pride and gratification at having been able to advance the interests of Waterford City. He spoke of the old days when Waterford was known as "the Harbour of the Sun," and later when it became a great trading centre, when ships came from all parts of the world - from France, Spain, Portugal, from the Florentine Republic, from the Netherlands - to land, or take away merchandise. It was famous, this old city, for its linens, its woollens, its cloaks, its rugs, its yarns, its shipbuilding, its leather, its grain, its provisions, its livestock. As recently as the time of the Union its cotton industry was famous, and all over the civilised world its glass was known and appreciated by connoisseurs. Many of its industries had been crushed by the brutal policy of the English Parliament, while other industries languished owing to the general atmosphere of depression which spread over the land like a poisonous miasma. That atmosphere, he was glad to say, had disappeared, and there was an unlifting in the hearts of Irishmen all over the country. Mr. Redmond concluded by expressing the opinion that the new bridge over that noble river will mark the dawn of a brighter day for the old city, of which he was proud to be the representative.

The Most Rev. Dr. Sheehan proposed the toast of "The Corporation of Waterford and the Joint Committee of Management," and paid a high tribute to these two bodies. This toast was responded to by Alderman Richard Power (Mayor-elect), Councillor James Hackett (Chairman of the Bridge Committee), Dr. J. J. O'Sullivan (City High Sheriff), and Mr. John Walsh (Chairman of the Kilkenny County Council).

Dr. J. F. O'Ryan proposed, "The Trade and Commerce of Waterford," which was responded to by Mr. H. J. Forde, J.P., Chairman of the Waterford Harbour Board, and Mr. J. A. Watt, Manager of the Clyde Shipping Co. The toast of "The Engineers and Contractors" was proposed by the High Sheriff, and responded to by Mr. A. M. Burden, Mr. William Friel, Mr. A. Robertson (one of the partners of the firm of Kinnear, Moodie and Co.), Mr. Radcliffe and Mr. Hill (representing the Cleveland Iron Works).

## **CONSTRUCTION OF THE BRIDGE DESCRIBED**

In the course of a lecture on Reinforced concrete delivered to the engineering students of the National University, Mr. Charles S. Downey (who was for a short time on the engineering staff during the construction of the bridge) gave the following particulars of the new bridge over the Suir. He set out by stating that he proposed to deal only with the reinforced concrete portion.

"The distance from shore to shore is about 700 feet, and this is covered by reinforced concrete spans of 40 feet on either side of an 80-foot opening span constructed in steel. The abutment span, south side, is 12 feet, and is designed as a cantilever so as not to be dependent on the old masonry abutments of the demolished wooden bridge.

"The foundation is obtained by piles (16 inches x 16 inches) driven to a specified set of half an inch for the last ten blows of a 2½ ton monkey having a drop of four feet. The piles are driven in clusters of three at each pier, but at the opening span there are seven piles in the two corner clusters in each row, and five in the back row of cylinders. At the opening span there are two rows of piles on either side. The reason for having this extra number of piles in the outer cluster is to carry the weight of opening span and machinery houses for working the bascules, which rest on these clusters.

"The longest piles used went up to 65 feet."

"All these groups of piles are surrounded by ferro-concrete cylinders which penetrate about six feet into the river-bed. These cylinders have reinforcing bars placed in them, and are afterwards filled up with

concrete so as to form a solid table from which the main beams and cantilevers spring. These rows of cylinders are braced together with bracing beams, rectangular holes having been left in them in order to allow the beams to be inserted afterwards before the cylinders are filled with concrete. Between the main beams, of which there are four in the cross section of the bridge, there are intermediate floor beams which carry the floor in between the main beams. These floor beams are about four feet centres, and the main beams are about nine feet centres.

"The cylinders are reinforced with vertical bars and hoops made in from seven to nine feet lengths, and vary in diameter from about five to eight feet. Some of the larger ones weigh about eight tons apiece. These can just be handled by the ten-ton cranes which are used on the work. The bracing beams, cylinders, piles, coping for cylinders, and concrete footpath paving flags were constructed on shore, and were placed during the construction of the bridge. The rest of the work was cast in situ and is for the most part monolithic."

The footway is carried out on short cantilever brackets which correspond to the intermediate floor beams, and are really a continuation of them. The posts of the parapet rest on these brackets."

There is a machinery house on each side of the four corners of the opening span, which (as mentioned before) is carried on a cantilever bracket about 20 to 25 feet out from the main work." The main beams are continued over supports, and are designed to appear like flat arches, but they are really continuous beams.

## **FURTHER PROCEEDINGS OF THE JOINT COMMITTEE**

On 3rd April 1913, the Joint Committee held a meeting at which Councillor Hackett presided.

Mr. Burden reported that the bridge had been opened for traffic on 10<sup>th</sup> February, and had since been working satisfactorily. He said it was desirable that the tablets to be placed on the bridge should be put in hand. He also stated that the work of removing the temporary wooden bridge was proceeding rapidly.

Alderman Whittle proposed, and Councillor McDonnell seconded, that the Inscription Tablets, at the price of £80, and that the arms panel, in painted enamel, at the price of £97, should be procured.

At a meeting held on 1st June, 1913, at which Councillor Hackett presided, it was resolved that eight seats should be placed on the bridge, and Mr. Friel was requested to submit a specification and estimate for the consideration of the next meeting

Alderman Whittle proposed, and Mr. Grubb seconded, that the words "Replaced by the old wooden bridge erected in 1793"<sup>10</sup> should be added to the inscription of the tablet.

At a meeting held on 3rd July, 1913, at which Councillor Hackett presided, it was decided to accept the tender of Messrs. Moir for eight seats on the bridge at £35 4s.

At a meeting held on 5th February, 1914, at which Councillor Hackett presided, a report was read from Mr. Burden in which it was stated that all the outstanding works were now practically completed by the contractors, and that the inscription tablet and arms plate had been fixed on the bridge. At a meeting held on 7th May 1914, at which Alderman Hackett presided, it was resolved to procure four dolphin lamps for the dolphins on the bridge, at a cost of about £6 per lamp.

At a meeting held on 11<sup>th</sup> February 1915, a letter from Mr. Burden was read in the course of which he stated that the two years' term of free maintenance of the bridge by the contractors had expired, and that he found the bridge and works connected therewith in good order and repair.

At a meeting held on 5th August, 1915, at which Alderman Hackett presided, a report was read from Mr. Burden stating that the contractors, Messrs. Kinnear, Moodie and Co., had faithfully and properly completed their contract, and that they were entitled to receive the outstanding balance off £100 due to them.

At a meeting held on 2nd September, 1915, at which Alderman Hackett presided, it was resolved, on the motion of Mr. Grubb, seconded by Mr. Kenny, that Messrs. Burden and Friel should continue to act as Engineers and Joint Secretaries during the four years' period of maintenance of the bridge.

At a meeting held on 1<sup>st</sup> March, 1917, at which Mr. T. Whittle presided, it was proposed by Councillor McDonnell, and seconded by Councillor Cassin, that an expression of regret on the death of Alderman James Hackett, the late Chairman of the Committee, should be passed, and that a message of sympathy should be sent to the bereaved family. Mr. John Hearne was appointed to fill the place of the late Alderman James Hackett.

Mr. E. Phelan proposed that Mr. Whittle should be elected Chairman, but Mr. Whittle declined to act, and it was then proposed that Councillor Cassin should be appointed Chairman, a proposition which was carried unanimously.

At a special meeting held on 22<sup>nd</sup> March, 1921, at which Mr. J. Ernest Grubb presided, followed by the Chairman, Councillor Cassin, Mr. Burden re-reported that the contractors had completed some repairs to which he had directed their attention, and he recommended that the outstanding balance be now sent to

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<sup>10</sup> This was not carried into effect. The only lettering on the tablet is a line under the arms of Waterford City – "Urbs Intacta Manet Waterfordiæ" – and at the apex of the shield are the numerals "1913". The "Waterfordiæ" should be "Waterfordia".

them. The repairs mentioned were of minor importance, and he had pleasure in informing them that the contractors, Messrs. Kinnear; Moodie and Co., had carried out their work satisfactorily. The Secretaries were instructed to notify the Waterford Corporation that the work of the Joint Committee of Management had been concluded, and that the bridge was now handed over to the Corporation.

### **THE FISHGUARD-ROSSLARE RAILWAY COMPANY'S CONTRIBUTION**

In addition to the contributions from the British Treasury and the amounts subscribed under the Bridge Act, 1906, by the various contributing bodies, the Fishguard and Rosslare Harbours and Railway Company agreed in 1903 to pay to the Corporation a sum of £ 15,000, provided the new bridge to replace the old wooden bridge was constructed on the site of or at a distance not exceeding fifty feet above the existing toll bridge, and if the bridge was constructed at any other site between Bilberry Rock and the existing toll bridge the Company was to pay £10,000. By a subsection of the clause in the Bridge Act it was set out that the said [Railway and Harbours Co.] pay to the joint Councils [the Corporation of Waterford and the Kilkenny County Council], or the Corporation or the County Council, as the case might be, the sum to be contributed as aforesaid within one month after the production to the Secretary of the Company of the certificate of the engineers of the Company that the new bridge had been completed to their satisfaction, or, in case of difference between them and the Joint Councils or the Corporation or the County Council, as the case might be, to the satisfaction of an engineer to be appointed by the Board of Trade, and that, if the sum contributed were £15,000, £5,000 thereof should be paid to the Corporation [of Waterford] and applied by them in relief of their proportion of the cost of the new bridge.

### **THE HARVEY BEQUEST**

Further, there exists what is known as the "Harvey Bequest."

The Bridge Act contains the following clause:

"Whereas, under the will of Thomas Newenham Harvey, deceased, dated 11th February, 1898, and a codicil thereto dated 11<sup>th</sup> October, 1901, the Corporation are absolutely entitled to a sum of £5000, and to the residue (after payment of the debts, funeral and testamentary expenses, of the testator) of his property of every kind, real, free-hold and personal (except as therein mentioned), subject to a certain annuity of £200 to his wife for the term of her natural life, and to certain prior interests in such property during the lives and life of the persons in the said will mentioned. The proceeds of such estate (the Act Continues) are to be paid to the Corporation of Waterford for the purpose of being included in the fund for the freeing of the bridge from tolls.

In the event of the bequest not being required for the freeing of the bridge, it was directed that Mr. Harvey's bequest should nevertheless be paid to the Corporation and devoted by them towards the extension of the Free Library at Waterford or for any purposes rightly considered to benefit the citizens of Waterford.

A clause in the Bridge Act (1906) provides that nothing therein shall affect the right of the Corporation of Waterford at any time to collect tolls from passengers crossing the Ferry established between Bilberry Rock and St. Catherine's Pill. The Act further declares that when the Bridge Commissioners shall have discharged their debts, that all books, maps, plans, and documents relating to the bridge undertaking shall be delivered to the Corporation of Waterford and retained by the Corporation in safe custody.