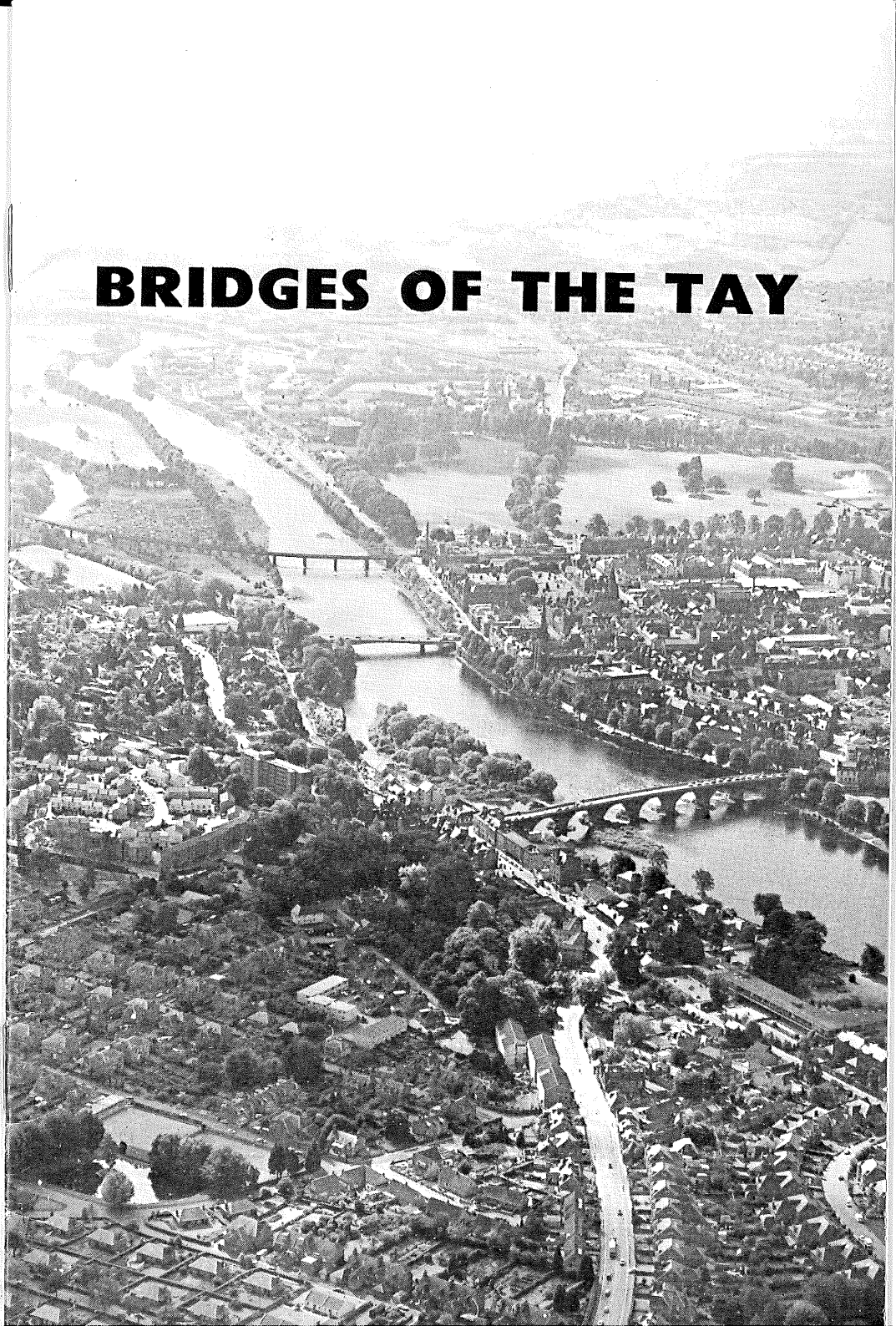
BRIDGES OF THE TAY



FOREWORD

This booklet is part of a project by pupils of Primary VII, Caledonian Road School, under the supervision of Miss R. Fothergill. A study was made of the construction of Friarton Bridge, Perth, but was extended to include the other bridges at present spanning the River Tay. The project included geographical studies and historical research and acknowledgment for help given in research is due to Mr. H. Binnie, Resident Engineer of Freeman Fox; Messrs. Baptie Shaw & Morton; Rev. F. Routledge Bell; Rev. K. MacVicar; The Manager, British Rail, Perth; and Perth and District Council. We are deeply grateful to the Perth and Perthshire Mental Health Association for financial assistance in publishing the booklet.

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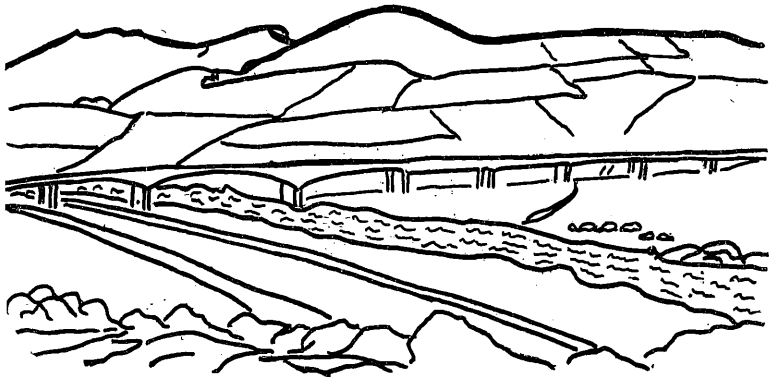


Friarton Bridge.

BRIDGES OF THE TAY

FRIARTON BRIDGE

Today with modern developments and techniques bridging the Tay presents to the bridge designer no insurmountable task and the latest bridge now spanning our river at Friarton is proof of his great ability and skill.

Friarton Bridge began to be constructed in April 1975. It spans the River Tay just south of Perth and carries the carriageway of the M85, forming part of the northern leg of the Craigend Interchange. Eight pairs of reinforced concrete pillars carry the deck of the bridge which has a navigation clearance of 25 metres as it crosses the Tay. The nine spans of the bridge vary in length from 63 metres to 174 metres which is the measurement of the river span. The bridge is of the box girder type and these girders which were manufactured in sections in Darlington and Chepstow vary from 10.5 metres to 25 metres in length. The width of the box girders is 4.3 metres. The girders form parallel lines and by means of supporting brackets each girder carries a carriageway of 7.3 metres. Each section of girder weighs approximately 40 tonnes and was raised into position by crane and lifting beams. Access manholes are in each girder. The girders were welded into position by welders in welding gantries. The piers of the bridge were constructed by sub-contractor Miller Construction but the main contractor was Cleveland Bridge Company. The consultant engineering company was Freeman Fox whose resident engineer was Mr. H. Binnie. The bridge of 831 metres length has a deck of 200 mm. thick reinforced concrete, 20 mm. of mastic asphalt and 45 mm. of rolled asphalt. Below the deck of the bridge there are continuous rails for a maintenance gantry. Longitudinal movements of up to 380 mm. are catered for by roller bearings at the expansion joint. Friarton Bridge which finally cost approximately £8 million was opened in Summer 1978.

Friarton Bridge is the most recent of Perth's bridges but there have been many in the past. The earliest structures would be of wood and appear to have been far too slightly built to withstand the onslaught of flood waters. There are few definite recorded dates for these early bridges.

OUR EARLIER PERTH BRIDGES

It is recorded that after their conversion to Christianity the Picts dedicated the church and the bridge at Perth to St. John the Baptist. We know that there was a bridge across the Tay at Perth at the beginning of the 13th Century. This bridge appears to have crossed the Tay at the foot of the High Street. It was this bridge that was swept away by floods in 1210. The castle of Perth suffered a similar fate at that time.

Bruce, after his struggle for Independence, became secure on the throne of Scotland. He granted a charter to Perth in 1317 and in this

the Bridge of Perth is mentioned. In 1328 the king requests the Abbot of Scone to allow stones to be taken from Kincarrathie Quarry to repair the Bridge of Perth and the Bridge of Earn. During the occupation of Perth by the English, burgesses of Perth had sent a petition to Edward I complaining that one of his officials had misappropriated money intended for the upkeep of the bridge at Perth. King Robert III granted to the citizens of Perth the right to have a Sheriff of their own. It was also stipulated that all fines from the Sheriff's Court should go towards the maintenance of the Bridge at Perth. James IV continued to take an interest in the Bridge of Perth and confirmed the grants of fines and amerciaments to upholding of the Church and Bridge.

On a stone pillar beside the River Tay in Tay Street there is an inscription which reminds us that older bridges built across the Tay at Perth were not very permanent structures, suffering the repeated onslaught of river floods.

> "The old Perth Bridge, destroyed by a flood in 1621, spanned the river near this point and in the neighbourhood was fought the 'Battle of the Brig', A.D. 1547."

The Battle of the Bridge of Perth took place in 1547 and was brought about by an attempt on the part of Cardinal Beaton to depose the Provost of Perth, the Master of Ruthven, and replace him by John Charteris of Kinfauns. The Master of Ruthven was known to give support to the spreading Reformation and Cardinal Beaton desired him to be replaced by a devout supporter of the Catholic Church, namely John Charteris. Lord Gray and Norman Leslie, son of the Earl of Rothes, were to attack the city. Lord Gray brought his men to the east end of Perth Bridge and seeing no opposition attacked before Leslie had reached the south fort. The Master of Ruthven and his men lay in wait at the west end of the bridge in the Fish Market and caught Lord Gray unawares. Lord Gray and his men were routed.

The Provost and Bailies of Perth continued to receive the fines of the court but this money could do no more than patching repairs to the bridge and every spate of the river threatened it anew. Record has it that during the winter of 1589 there collapsed "twa tree-pillars" of the bridge. Towards the end of the sixteenth century John Ross of Craigie and John Murray of Tibbermuir allowed the Magistrates of Perth to take stones from Pitheavlis Quarry to repair the Bridge. By the turn of the century it was obvious that the building of a new bridge could not be longer delayed.

In 1603 King James VI of Scotland succeeded to the throne of England and in the following year representation was made to him concerning a new Bridge of Perth. The King apparently ordered £7,000 Scots to be paid to the project in annual instalments of £1,000 The King's Master Mason in Scotland, John Mylne, who was one of the outstanding architects of the day was engaged for work on this new bridge of Perth. Mylne decided to place his bridge slightly to the north

of the older site. It appears that Perth was to be exempt from paying taxation due to the Crown in order that this money should go towards the building of the new bridge. The building of the bridge proceeded but the river frequently froze and parts of the new bridge were borne away by flooding. Despite repeated snow, ice and flooding during the years of building the bridge, the keystone of the last arch appears to have been laid in 1616. This bridge may have had eleven arches. It, however, appears to have been low and there was little room for the water to rush through in time of flood.

In October 1621 there occurred a tremendous flood and people living in Castle Gavell and West Port were "wet in their beds". They were rescued by boat. This great inundation swept away the new bridge. Apparently the storm of rain and wind lasted for three days. People were left homeless and meal and flour stored in the city was destroyed by the flood waters.

There is a prophecy:

"Says the Shochie to the Ordie
Where shall we twa meet?
At the Cross o' bonny St. Johnstoun
When a' men are fast asleep."

Perhaps this prophecy had its fulfilment in 1621 in that great flood. The River Almond flooded into the Tay as did the two burns the Shochie and the Ordie. It is said that when the old bridge was built the Cross of Perth was taken down and built into the central arch of the bridge to try to keep the prophecy but at the same time keep secure the people of Perth. There is no evidence to prove that the Cross of Perth was taken down and built into Mylne's bridge at Perth.

For nearly 150 years travellers crossed the Tay by means of ferries. It is a sad tail-piece that in the years following the great flood of 1621 the money received by the magistrates of the town by royal decree for the building and repair of the bridge was used to remove the ruins of Mylne's bridge and build up the river bank!

These early bridges appear to have crossed the Tay from the foot of the High Street to the east bank. One cannot blame the citizens of Perth for losing heart and indeed no bridge crossed the Tay at Perth until the eighteenth century. In 1766 the Perth Bridge designed by John Smeaton began to be built. The public-spirited Thomas, Earl of Kinnoull, took up the fight for a Bridge of Perth. The Government gave about £4,000 from annexed estates and yearly payments of £700 for fourteen years. There was also a public subscription list containing donations from many of the noble Scottish families. The Earl of Kinnoull gave £400. Smeaton's Bridge at Perth has nine arches and is 880 feet long. On its completion, copper tokens were struck in commemoration. On one side was a view of the bridge with Kinnoull Hill in the background. Below this was "Perth Halfpenny. Tay Bridge

finished 1770". On the reverse side was a fisherman standing at the side of the river with a coble anchored near him.

The winter of 1773-74 proved very severe. Great sheets of ice covered the Tay. There was flooding as the snows melted and record tells that five ships were thrown up on the quay. Smeaton's bridge stood firm and unharmed passing this test with flying colours—much to the relief of the citizens! If Smeaton's Bridge had a fault at all it was that it was too narrow and in 1869 the stone parapets were removed and a footpath was projected on iron brackets. There was a Bazaar held in the City Hall to raise money for the cost of this work. However, it is not to the discredit of John Smeaton that his bridge proved too narrow in time, for how was he to foresee the development of vehicular traffic of the nineteenth century and the increase in its use of the roads. It is indeed more to his credit that his bridge has proved so strong and lasting. John Smeaton well deserves the name of the Father of British Civil Engineering.

There is an inscription on the Perth Bridge:

> "Bridge built 1766 — William Stewart, Lord Provost; John Smeaton, Engineer. Bridge widened 1869 — John Pullar, Lord Provost; A. D. Stewart, Engineer."

An iron and plate railway bridge spanning the River Tay was built in 1863 at a cost of £27,000. It carried the single track of the Perth to Dundee railway line and was designed by Engineers of the Caledonian Railway Company. There are five iron girder spans south of Moncrieffe Island and seven spans to the north side of the island with ten stone arches on the island itself. The span nearest to the Tay Street bank of the river was made to open to allow shipping to pass through upriver. This span was last used in the 1880s. From the footpath of the bridge there are fine up-river views. This iron bridge replaced a wooden one which was first proposed in 1845 and opened on 1st March, 1849. One of the piers of this bridge was to straddle the river pipe which took water to the reservoir of Dr. Anderson's waterworks in Tay Street. The Water Commissioners insisted that the Railway Company lay a new pipe to ensure the continued supply of water. The Railway Company regarded this as a scandalous waste of money but apparently it was a justified demand as a large part of the old pipe was broken during the construction of the bridge.

In 1960 Queen Elizabeth opened the new Queen's Bridge which replaced the Victoria Bridge. The steel framework of the Victoria Bridge was raised nearly six feet by jacks to support the new pre-stressed concrete structure which was constructed below it. Reinforced concrete piles were driven into the river to support the new piers. Four hundred and twenty-seven high tensile steel cables are incorporated in the Queen's Bridge.

In the early part of the Second Word War yet another bridge spanned the Tay at the North Inch of Perth. It was constructed of

timber trunks and erected by a company of the Royal Engineers as a training exercise. It is also of interest that during World War II Smeaton's Bridge was drilled in readiness for explosives should the enemy invade our land.

LOCH TAY AND THE RIVER TAY

The River Tay has its real source in the mountains lying to the west of Loch Tay. There it begins as a tiny mountain stream at Ben Laoigh. It trickles down the hillside among the mountain mosses, the saxifrages and alpine plants, beginning its journey of 120 miles to its estuary waters at Dundee. From the highlands of mica-schist it flows at Dunkeld through a strip of clay slate which crosses Scotland and then into the lowland area of old red sandstone. As the river makes its course the vegetation too changes. The birch and rowan found growing on the hills are replaced by hazel and alder which border the river in its lower reaches.

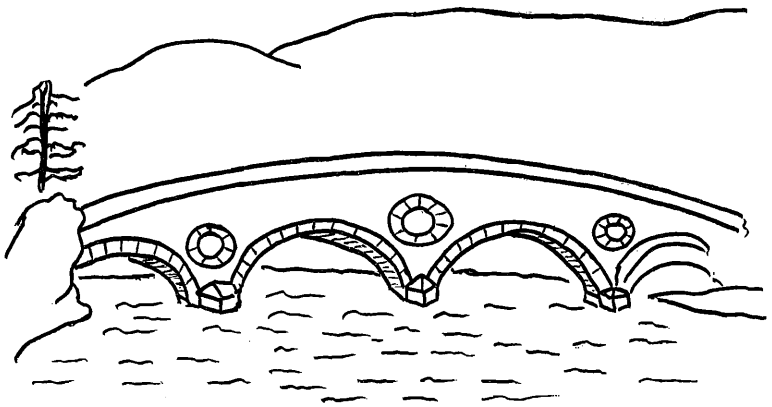
The River Tay receives many tributaries as it flows seawards and on its banks in centuries past there have been many settlements and villages the people thereof depending upon the river for food, water and communication.

Loch Tay is a magnificent Highland loch at 355 feet, surrounded by mountains. Ben Lawers, 3,984 feet, is on its North-West side. It receives the Dochart and Lochy at the South-West and discharges itself by the River Tay at Kenmore. Its length is fifteen miles and its breadth is half a mile to one mile. Its greatest depth is 508 feet.

The name of the River is derived from ancient times when the root aa signified running water and beside the Tay one may consider the names of other rivers, for example, the Thames, the Taw, the Tagus in Spain and the Aar in Switzerland.

The River Tay was indeed a great asset to the earlier people who settled along the banks but a river is also a barrier of a kind, something that impedes movement, the easy passage from one place to another. Fording places and ferries were established at suitable points on the course of the river but more permanent crossing ways, bridges in fact, have for centuries challenged the skill and ingenuity of man.

Let us consider now the other bridges spanning the Tay to-day. As the river flows from Loch Tay it passes under the bridge at Kenmore. This is a finely built stone bridge with five arches and perforated spandrels. The picturesque village of Kenmore nestles at the eastern end of Loch Tay as its name implies, Kenmore meaning at the end of the water. Originally there was no village but just a ferryman's house where travellers could request the services of the ferry. This ferry became obsolete when the bridge was erected in 1774. The King, George III, gave towards the cost of the bridge the sum of £1,000 from the estates annexed after the '45 Rebellion. Queen Victoria was the guest of the Marquis of Breadalbane at Taymouth Castle in 1842.



Kenmore Bridge.

During the visit Queen Victoria proceeded under the arch of Kenmore Bridge in the Royal Barge to sail on Loch Tay.

The bridge at Kenmore was initiated by the 3rd Earl of Breadalbane whose home was nearby in Taymouth Castle. The bridge greatly helped communications between the north and south sides of the River Tay. The bridge took two years to build. As the village of Kenmore with the market held in Kenmore Square was on the south side of the river there was probably a cattle ford downriver from the early ferry.

This inscription is to be found on the bridge at Kenmore:

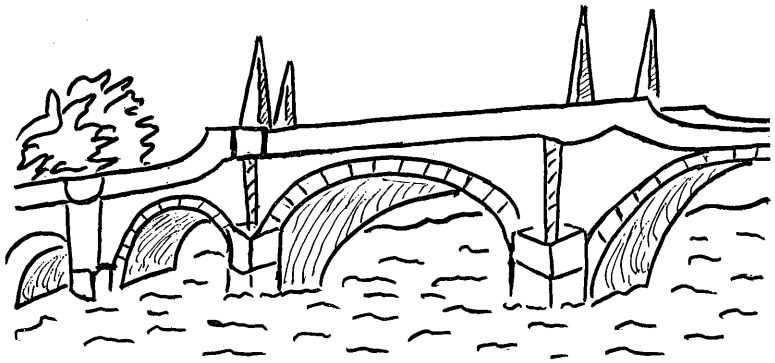
> "This building erected A.D. 1774—His Majesty gave in aid out of the annexed estates £1000 Str. Viator tuti transeas sis memor regii beneficii."

From Kenmore the River Tay flows through the estates of Taymouth Castle and two smaller bridges were built within the grounds.

The Chinese Bridge is now unsafe and is closed. It is about a mile downstream from Kenmore Bridge and it was built by the 3rd Earl of Breadalbane about the middle of the 18th century. It was a private bridge for the use of the estate. The bridge gets its name from the eastern design. About three-quarters of a mile downstream from the Chinese Bridge is Newhall. It was also privately constructed. At this point on the river there was another ford, an inn and another ferry. Probably the bridge dates from the end of the 18th century or the beginning of the 19th century and therefore would date from the same period as the houses and stables at Newhall. The bridge is only used by walkers and fishers now. In the description of Queen Victoria's visit to Taymouth Castle in 1842 there is an account of a drive which the Royal party took via the Chinese and Newhall Bridges.

The River Tay next flows under one of the most historically interesting bridges in the region namely the Tay Bridge at Aberfeldy.

It was built in 1733 by General George Wade who later became Field Marshal Wade and Commander-in-Chief of the King's Forces in North Britain. In its construction Wade had the help of William Adam, the architect, father of the famous Robert Adam. Between 1725 and 1740, General Wade with 500 men built 250 miles of roads. The bridge at Aberfeldy formed part of General Wade's Crieff to Dalnacardoch military road. Over the years General Wade built up a good system of communications in Scotland but mainly for purposes of domination.



General Wade's Bridge, Aberfeldy.

When it was built in 1733 it was the only bridge spanning the River Tay, earlier bridges built further downriver at Dunkeld and Perth having been destroyed. For its construction Wade used chlorite schist from a quarry between Aberfeldy and Kenmore. The advantage of this stone is that it hardens on exposure. For two years masons worked at the quarry hewing, marking and numbering the stones before they were conveyed to the site of the bridge where they were laid in their respective places. The bridge is hump-backed and 370 feet in length. There are five arches with the central arch and obelisks which are distinctive features of this bridge. The cost of the bridge was £4,095-5-10. There is a tablet on the parapet of Wade's Bridge which has this inscription:

> AT THE COMMAND OF HIS MAJESTY KING GEORGE THE 2nd THIS BRIDGE WAS ERECTED IN 1733: THIS WITH THE ROADS AND OTHER MILITARY WORKS FOR SECURING A SAFE AND EASY COMMUNICATION BETWEEN THE HIGH LANDS AND THE TRADEING TOWNS IN THE LOW COUNTRY WAS BY HIS MAJESTY COMMITTED TO THE CARE OF GENERAL GEORGE WADE COMMANDER-IN-CHIEF OF THE FORCES IN SCOTLAND WHO LAID THE FIRST STONE OF THIS BRIDGE ON 23rd APRIL AND FINISHED THE WORK IN THE SAME YEAR.

It is believed that General Caulfield said of Wade: "Had you seen these roads before they were made, you would lift up your hands and bless General Wade."

The village of Grandtully is situated beside the River Tay and this rapid stretch of the river is spanned by a wrought iron girder bridge. Unfortunately the bridge is very narrow and can no longer adequately cope with modern traffic. Indeed the rule is one vehicle at a time only. There is one large girder and two smaller girders resting on stone piers. A new part of the road carrying traffic from Ballinluig to Aberfeldy was constructed in 1976. The line of this new road crossed the Tay and a concrete beam bridge was constructed then.

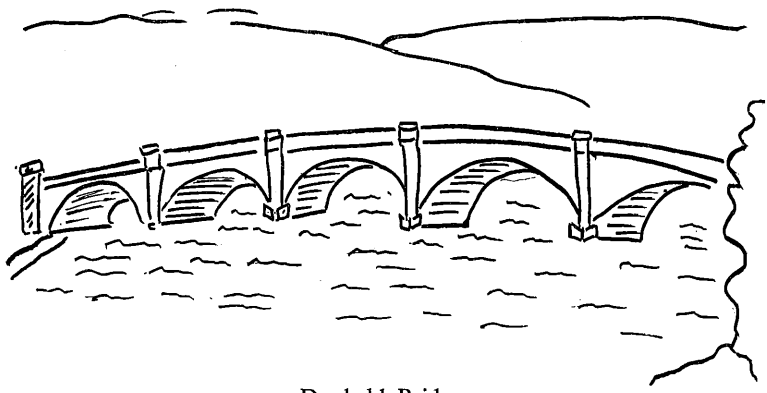
In older times Logierait was a place of some importance. The seat and centre of the Celtic Earldom of Atholl had a Royal castle and court house which was the seat of the regality courts of the Atholls. The village nestles now beside the Tay and crossings here for centuries were accomplished by ferry, the local innkeeper being the ferryman. In 1861 it was decided to build a branch railway line from Ballinluig on the Highland line to Aberfeldy, a distance of nine miles. There were two bridges to carry this line, one crossing the Tummel and the Logierait Bridge crossing the Tay. The bridge was opened in 1865 but was closed on 3rd May, 1965, when the branch line ceased to function. Nowadays it can be used by pedestrians. It is a handsome Victorian structure of three pairs of cast iron columns on wrought iron cylinders with two lattice girder spans.

Onward flows the Tay to Dalguise Bridge which is a railway bridge still in use. It carries the Highland line which came into being in 1865 after the amalgamation of the Inverness and Aberdeen Junction and Inverness and Perth Junction Railways. It is a lattice girder bridge with five stone piers surmounted by crenellations. The bridge, which cost £21,000 to build, is 515 feet long and was known officially as Bridge No. 1 of the five built between Dunkeld and Blair Atholl. It was also the most expensive. From the bridge one can see the gravel beds in the River Tay which in summer are blue with the flowers of lupinus nootkatensis.

In mid-July 1975 a short length of the River Tay north of Dunkeld was diverted from its normal course into a new man-made channel. This work was necessary for the construction of the embankment for the new road. This was a bold undertaking because the River Tay has the largest flow of any river in Britain. Before any works were considered a scale model of the proposed diversion was made and tested out by the University of Strathclyde. During excavations for the new channel a very old dug-out canoe 5 metres long by 0.8 metres wide was unearthed from the gravel. Just north of Dunkeld the Dunkeld by-pass required the construction of a new bridge over the River Tay. This bridge is an impressive structure 225 metres long. It crosses the river in three spans and has twin steel plate girders. There are four concrete piers, two on each bank. The structure was assembled on the

north bank and launched out to the piers by two 10-tonne winches. The first launch was made at the end of August 1976. There was a launching nose, an upward tilt, at the leading end of the bridge. The deck of this bridge was formed by placing 224 precast concrete units and further concrete was added to these to make a composite reinforced concrete deck. The bridge cost approximately £1.3 million and was opened in 1977. The Consulting Engineer was Babtie Shaw & Morton.

The older route to Inverness came north from Perth to Dunkeld where the traveller of the 17th and 18th centuries could cross the River Tay by one of two ferries. In 1809 the bridge designed by Thomas



Dunkeld Bridge.

Telford across the Tay at Dunkeld was opened and travellers crossed the Tay with ease. The bridge is indeed a credit to its Dumfriesshire engineer, Thomas Telford, who was responsible for so many new roads and bridges in Scotland in the 19th century. The main traffic on his roads were the drovers taking cattle to the lowland markets. Dunkeld Bridge is 685 feet long and 26½ feet wide. There are seven arches, five of which are over the river. The central span of the bridge is 90 ft. and at its greatest height above the wide waters of the Tay is 54 feet. The cost of the bridge was £34,000. On her visit to Perthshire in 1842 Queen Victoria crossed the Dunkeld Bridge. In her honour a Gothic arch was erected on the bridge. It was composed of heather and juniper with a crown of blackcock and eagle. Above the arch were two deer and the sincere greeting "Welcome to Atholl".

Dunkeld Bridge was a toll bridge with a toll house at the south end of the bridge. The tolls helped to pay for the cost of the bridge but were objected to by the citizens of Dunkeld. Indeed in 1868 there were toll riots in Dunkeld and a detachment of the Black Watch were in the town. On several occasions previously the toll gates had been torn down and cast with contempt into the river but matters came to a head in 1856. In that year the Dunkeld Railway was opened but the

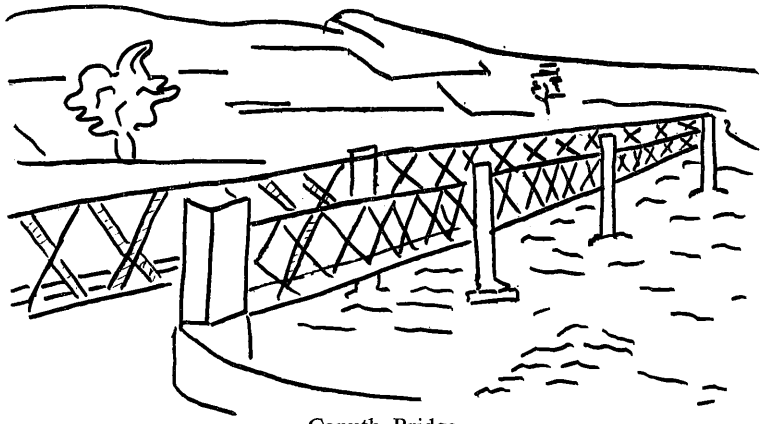
station was on the other side of the river from Dunkeld. The tolls demanded for crossing the bridge were additional costs to the railway travel for the citizens of Dunkeld. Many angry voices were raised and the trouble was only resolved in 1879 when the bridge was taken over by the county authorities.

One of the prime protesters against the charging of tolls on Dunkeld Bridge was Alexander Robertson. When churchgoers from Birnam attended church in Dunkeld they had to add the toll bawbees to their Sunday costs. Alexander Robertson dying in 1893 and being buried in Dunkeld Cathedral did indeed live long enough to see his aims achieved. It is a point of interest that when the new bridge was opened the route through Dunkeld altered the main road which had previously run east to west by the Cross.

An old print of Dunkeld in 1693 shows an unbroken sweep of the river with no bridge across it. However fording or ferrying the River Tay was dangerous. It is recorded that Robert Burns on his visit to Perthshire used the Inver Ferry. A bridge was much needed but it was a need that had been recognised by Bishop Lawder who laid foundations of a bridge of wood and stone about 1461. Later Bishops continued this work and a bridge was completed for foot passengers in the sixteenth century. This bridge was situated upstream from Telford's bridge and appears to have gone by the time of the 1693 print. It is interesting to note that it was originally the intention of General Wade to bridge the Tay at Dunkeld but, being coolly received by the Duke of Atholl, Wade went in anger and built at Aberfeldy. In 1729 General Wade started his road from Inver on the south bank of the Tay and crossed the river by the old west ferry.

Ever widening now the Tay is in the vicinity of Dunkeld, well-known for its fine fishing, and many fishermen cast their lines beside Victoria Bridge at Caputh. Here, indeed, Miss Georgina Ballantyne caught and landed the record salmon of 64 lbs. The Victoria Bridge was a great boon to the people of Caputh and the surrounding district and a number of reports about its construction and the opening ceremony appear in newspapers of that date. The report in the "Perthshire Courier", 1888, writes that on Friday, 31st August, Sir Alexander Muir Mackenzie of Delvine opened the Caputh Bridge Bazaar. There was a large and fashionable attendance headed by the Dowager Duchess of Atholl. On the Saturday the bazaar was again opened by Lord Provost Whittet of Perth. The total realised for the two days was £810 and Mr. Cox of Snaigow was thanked for the use of the engine for driving the electric light.

In an old copy of the "Perthshire Courier" dated Tuesday, 4th September, 1888, there is a report about Tay Bridge, Caputh, about four weeks before it was due to open for traffic. The new bridge was to supersede the old Ferry at Caputh. The bridge verged on £5,000 in cost. The bridge consists of three spans, each of the landward ones being 137 feet and the centre 140 feet long. The roadway has a breadth



Caputh Bridge.

of 20 feet. When the river is at summer level the space from the girders to the water surface is 15 feet. The girders are lattice type. The piers are hollow cylinders filled with concrete and rested on gravel 10 feet beneath the channel of the river. The girders stand 11 feet 6 inches high and a light handrail runs along each side to prevent passengers slipping through the interstices. Mr. Thomas Arrol of Messrs. William Arrol personally supervised the work, which began in November, 1887. In the report of 4th September, 1888, it stated that Rev. Theodore Marshall, minister of Caputh, helped to organise the project of having a bridge built across the Tay of Caputh. Mr. William Cox of Snaigow gave a subscription of £1,000 and also guaranteed the unsubscribed balance of the cost. This generous man simplified any financial difficulties.

The "Perthshire Courier" dated November 27th, 1888, reports that on the previous Saturday afternoon in dull threatening weather the ceremony of the formal opening was performed in presence of farmers and residenters. Among those present were Sir Alex. and Lady Muir Mackenzie of Delvine, Mr. Cox of Snaigow and the Rev. Theodore Marshall. A white silk ribbon was tied across the bridge from parapet to parapet, while a bottle of wine was affixed to the south parapet by a blue ribbon.

Rev. Theodore Marshall made some introductory remarks. Mr. Cox of Snaigow cut the ribbon with a silver knife provided for the occasion. In his speech, Mr. Cox said that he thought that the bridge should be at once a benefit to the district and a fitting memorial of the completion of fifty years of Her Majesty's reign. The bridge was named Victoria Bridge by Lady Mackenzie who walked across the middle of the bridge and broke the bottle of wine against the parapet.

This newspaper report also relates that in his speech at the opening ceremony Sir Alex. Mackenzie quoted the couplet about General Wade.

"Had you seen these roads before they were made
you would lift up your hands and bless General Wade."

Sir Alexander paraphrased it in this way:

"Had you seen this road when the river was big
you would lift up your hands and bless Caputh Brig."

Mr. Blake of Glendelvine asked Sir Alexander Mackenzie to relinquish his rights to the ferry of the Tay at that point. The boat ferry had been worked by chain. In the report of November 1888 it tells that a silver salver was presented to Rev. Theodore Marshall for all his efforts in the affair. It had been decided that Jubilee year was a good year to build the bridge. Mr. Magnus Jackson of Princes Street, Perth, took views of the bridge and the old ferry boat with his camera. Mr. Jackson presented a large framed photograph of the old ferryboat of Caputh to be hung in the Young Men's Hall at Spittalfield. The report adds that the company were entertained to cake and wine by Sir Alexander and Lady Muir Mackenzie after the opening ceremony.

There is a very fine bridge of six red standstone arches across the Tay at Kinclaven. The ferry which existed at this point of the river was worked by chains but when the bridge costing £7,577 was opened in 1905 the ferry ceased to exist. The ferries at Logierait, Caputh and Kinclaven were chain ferries. These were invented by Mr. Fraser of Dowally and greatly used in the district.

There is an inscription on Kinclaven Bridge:

"This bridge was opened on 22nd April, 1905, by Colonel Home Drummond, Convener of the County, the cost being met by public subscription and partly by grants from the Perth and Eastern District Committee, both being got through the exertions of Colonel Richardson of Ballathie."

In 1845 the construction of Cargill Railway Bridge was authorised and it was opened for traffic in August, 1848. This bridge has five spans of steel lattice girders on red sandstone piers. For many years it carried the Perth to Aberdeen line but it was closed to passengers in September, 1967. The Cargill Bridge is still used by freight trains to and from Coupar Angus and Forfar which is now the end of the line. Downstream from Cargill Bridge the Tay flows through pleasant wooded countryside where is situated Stobhall Castle now the home of the Earl of Perth. The castle consists of groups of buildings placed at different levels because of its broken and uneven site above the river. There is a fine chapel in the castle with a painted ceiling showing the kings of the world mounted on horseback. The castle dates from the early 17th century and the building was begun by John Drummond, 2nd Earl of Perth.

Below Stobhall the Tay forces its way through a narrow gap in what might have been a natural bridge across the river. Here can be seen standing twenty feet high out of the river bed the remains of a dolerite dyke. This basalt seam was left upstanding in very early geological times and being extremely hard it has not through time been eroded. These reaches of the River Tay from Campsie Linn to Thistle

Brig and Hell's Hole are used by canoeists frequently and here on the banks are the large red-brick buildings of Stanley Mill which was a cotton mill founded by the Arkwrights in 1785 at the time of the Industrial Revolution. This mill is similar to the factories he was erecting in England at that time. A meeting was arranged in the King's Arms Inn in Perth, between Mr. Arkwright, Mr. Sandeman, Mr. Penny and the Duke of Atholl. The new cotton muslins were shown and it was decided to build a cotton mill at Stanley. The Duke of Atholl tended to see it as a Manchester beside Perth! Boys and girls were sent to Manchester for training in cotton spinning and weaving.

Now we have reached the broadest part of the estuary of the River Tay and the last of the two bridges to span the great river which will soon merge its waters with those of the North Sea. In 1863 Sir Thomas Bouch undertook the task of constructing a rail bridge at Dundee. He was an engineer of considerable experience in building railway bridges and also in building tramways. His bridge carried a single line and was 10,700 feet in length. The bridge was begun in July 1871 and opened in May 1878. In December 1879 the thirteen high girders collapsed during a violent storm and nearly 100 passengers and crew of a train crossing at that time perished in the Tay Bridge Disaster. The findings of an enquiry into the disaster seem to attribute the catastrophe to certain weaknesses and imperfections in the work, making the bridge unable to stand the pressure of wind. Possibly also to be considered is the fact that trains frequently exceeded the speed limit of 25 miles per hour! Bouch's bridge having a single track was carried mainly on single piers.

William Henry Barlow was a member of the three man Court of Inquiry which investigated the collapse of the Tay Railway Bridge and it was he who designed the second Tay Railway Bridge which was opened in 1887 and which has stood now for over ninety years of railway traffic.

Undaunted by the disaster, plans were made for a second railway bridge. In 1882 the North British Railway Company commenced the construction work which was entrusted to Messrs. William Arrol and Company, Glasgow. The engineer was Mr. W. H. Barlow. There was a suggestion to use the piers of the old bridge but this was abandoned. The second bridge was constructed sixty feet upstream from the first site. Some of the piers of the first bridge were removed but some remain and can be seen from the train. The length of the bridge is nearly $2\frac{1}{4}$ miles long. Seventy-six of the eighty-six piers are in the river. There are two iron arches central but the other girders are of the lattice type. The piers are octagonal and some of the girders of the first bridge were used in the second but the central high girders which collapsed in the disaster were not. It is a point of interest that girders from the first Tay Railway Bridge were used in the construction of Victoria Bridge, Caputh.

It is of interest to note that before the railway bridges across the Tay at Dundee the journey was accomplished in the following manner.

The train travelled from Edinburgh to Granton where a train ferry took it to Burntisland. The train travelled by railway line from Burntisland to Tayport where again a train ferry crossed the Tay to Dundee.

The Tay Road Bridge is overall one and a half miles long. It is a simple construction of concrete piers and box girders. The box girders form two parallel roadways linking Dundee to Newport. The consulting engineers and bridge contractors were the firm of Duncan Logan, Muir of Ord. When this bridge was being built a temporary bridge was constructed. From this temporary bridge the caissons for the piers of the Road Bridge were sunk. The temporary bridge had two sets of rails and the box girders were run out on these rails. The two carriageways are each 24 feet wide, and there is a ten foot wide pedestrian walk in between. The Tay Road Bridge was opened in 1965. There are 42 pairs of pillars. They increase in height from the Dundee side as the bridge is 32 feet above water level at the Dundee end but rises to 124 feet above water at Newport. The bridge cost over £6,000,000.

If the piers of the Road Bridge are viewed from the river the columns taper towards the top but if viewed from the shore they taper towards the bottom. This is an unusual feature of their design.

Now the River Tay has reached the waters of the North Sea and this short account of the nineteen bridges spanning our River Tay is concluded.