SESSION 1912–1913

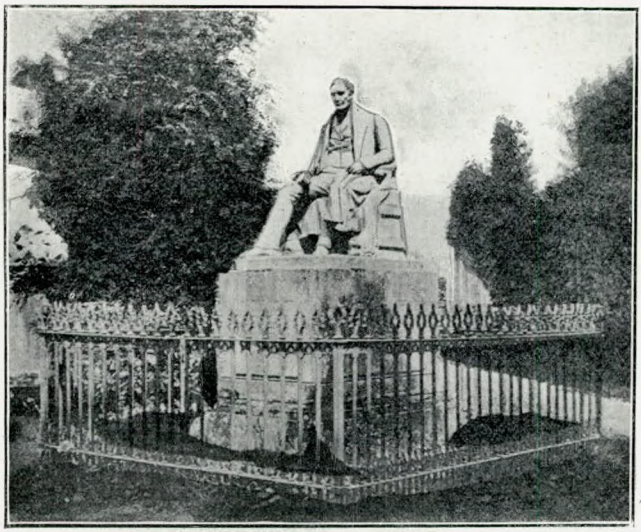
President: Summers Hunter, Esq.

Vol. XXIV.

The *Comet* Centenary Celebrations on the Clyde, August 30 and 31, 1912, also Notes on the Introduction of Steam Navigation.

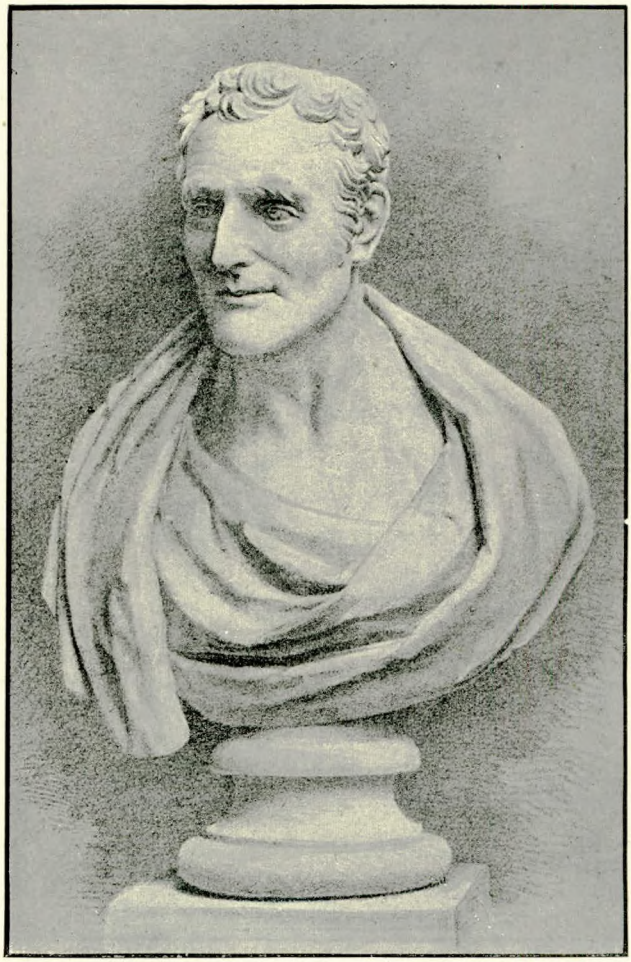
By the Hon. Secretary.

The celebrations on the Clyde were of an appropriate character and were amid surroundings which added a charm to



Henry Bell's Monument in Row Parish Churchyard.

them. The background of the hills, purple tinted with heather, and the undulating coast line reaching away inland up

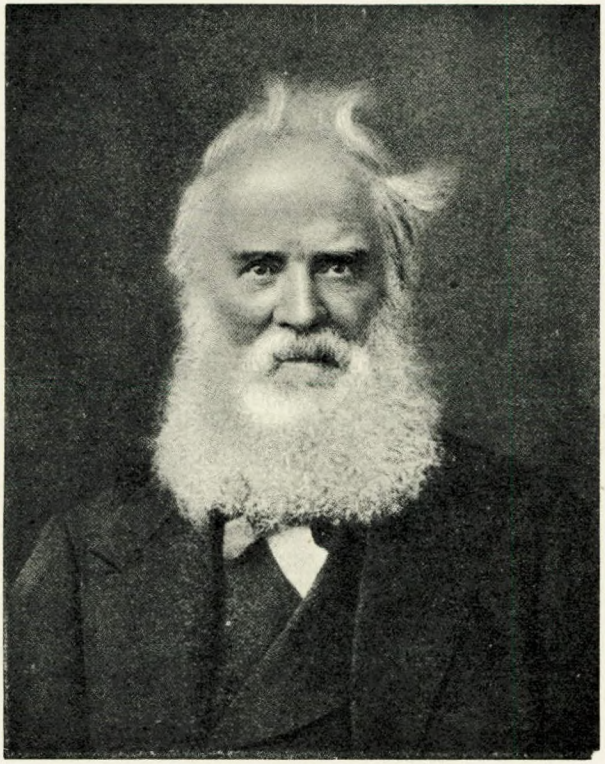


Bust of Henry Bell.

the various lochs on the northern bank of the Firth, gave the sightseeing visitor an exhilaration meet for the occasion.

At Port Glasgow a procession through the streets and an

announcement on the bank of the river indicating the site whereon the *Comet* was built, marked the appreciation of the authorities for the event which was fraught with so great results. Greenock—the birthplace of James Watt—decorated and beautified by flags by day and by fireworks at night—looked

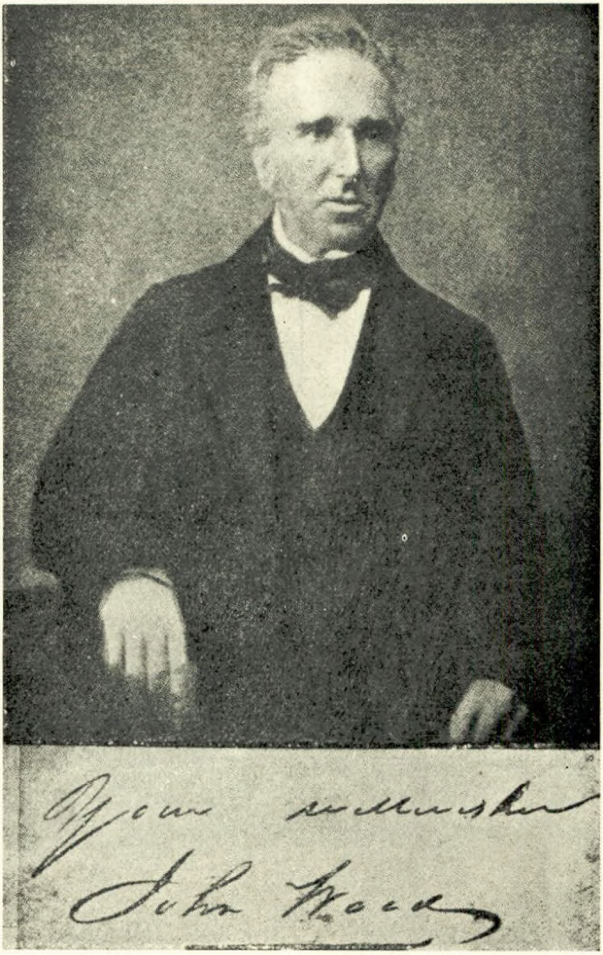


DAVID NAPIER,

Who made the boiler and castings for the engine of the *Comet*.
(From a photo belonging to David Dehane Napier, Esq.)

on with indulgent eye, and as we glance towards the old Custom House quay we are reminded of the unhappy bursting of the boiler of the *Earl Grey* in 1835 when getting up a full head of steam to race the *Clarence*, and in the next year the boiler of the *Telegraph* burst at Helensburgh, accidents warning those con-

cerned of the need for caution in dealing with the generation of steam pressure. Off Gourock *Comet II* was wrecked in 1825,



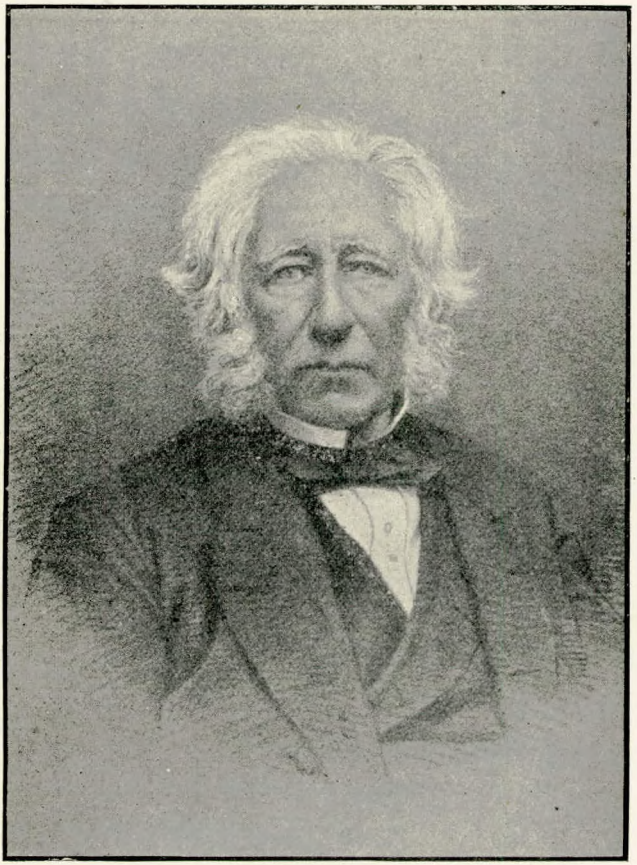
JOHN WOOD,

Who contracted to build the hull of the "COMET."
(From original, in possession of James Reid, Esq., Port Glasgow.)

due to a collision with the *Ayr* in the early morning, when sixty to seventy persons were drowned. The case was brought

before the Court and the master of the *Comet* convicted of negligence for having no light.

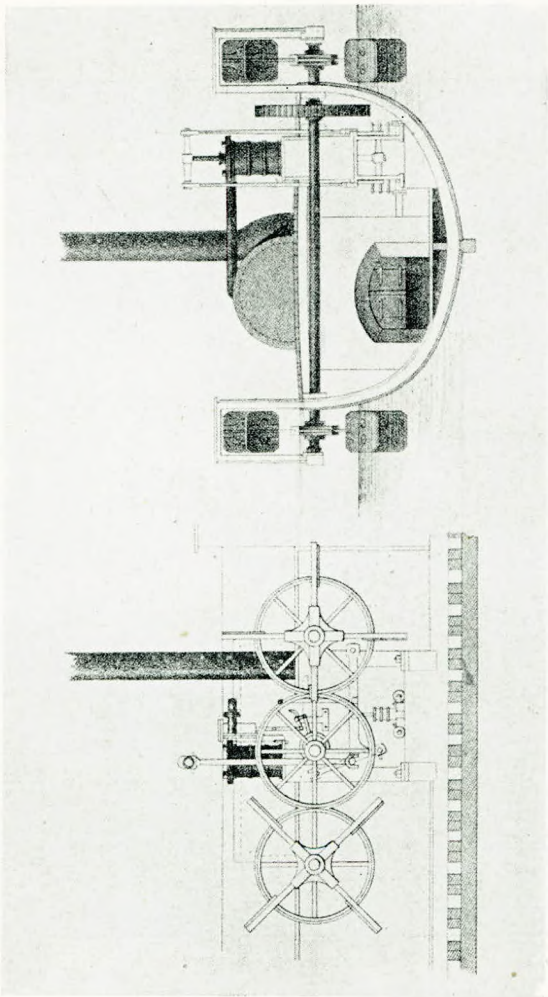
At Helensburgh the monument to Henry Bell, on the esplanade, was tastefully decorated, while all along the front and



ROBERT NAPIER.

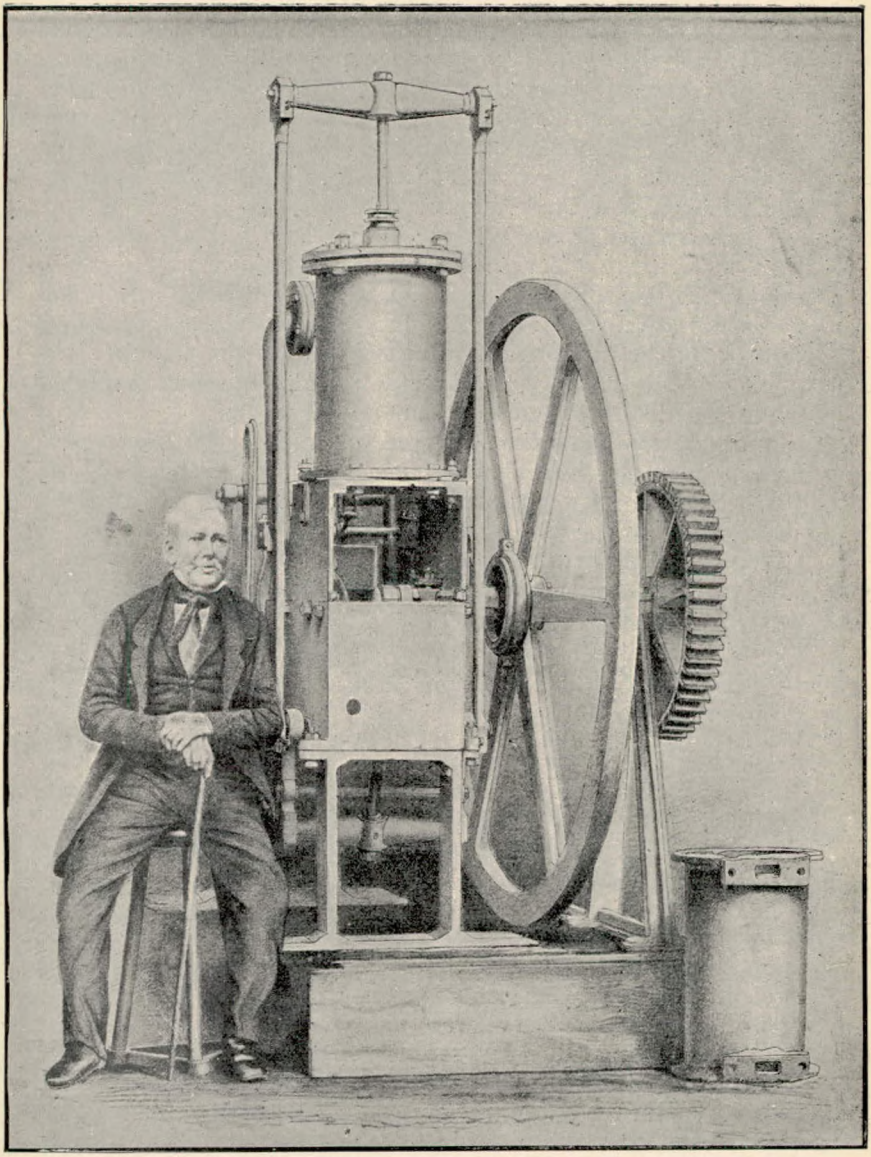
down the pier bunting fluttered gaily, making a festive show in honour of the memory of their first Provost, whose determination and energy had surmounted many obstacles in the way before he was able to announce the advent of the *Comet*

and advertise her sailings with passengers from Glasgow to Greenock at 4*s*. each 1st class and 3*s*. 2nd class. The display



"COMET'S" ENGINES (FROM WOODCRAFT'S *Origin and Progress of Steam Navigation*).

of fireworks was excellent at night and had a very fine effect, witnessed from the bay, enhanced by the reflecting sheen on the waters. On the side of the Gareloch opposite Roseneath,



*Original Engine of the "Comet" with John Robertson, its Maker, Alongside.

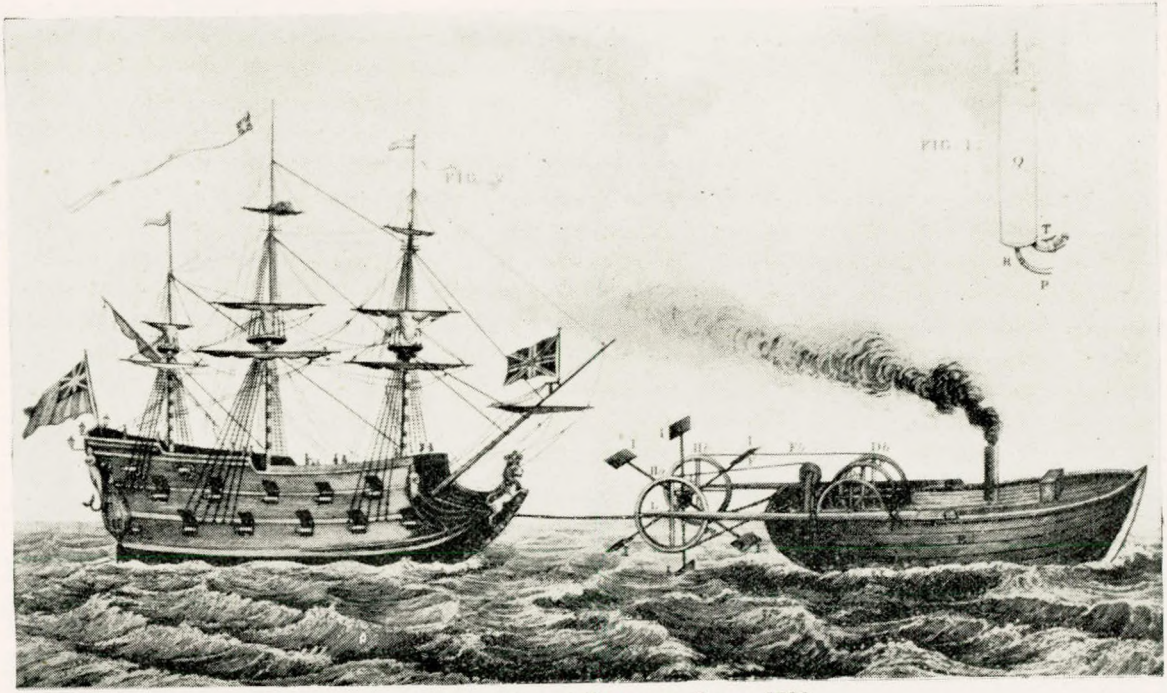
*We are indebted to *The Marine Engineer and Naval Architect*, for this and previous blocks.

under the shade of the trees in Row churchyard, lie the remains of Henry Bell, whose grave was memorized by David Napier, the life work of whom was made fruitful by his association with the pioneer. The hotel advertised in the way-bill of the *Comet*, along with the baths and carried on by Mrs. Bell after her husband's death—is still to the fore on the bay between Helensburgh and Craigendoran.

Dunoon and Rothesay shared in the desire to duly celebrate the occasion, which has contributed so largely to make these popular resorts readily accessible, and the crowds assembled to witness the display of fireworks justified the expectations formed by the authorities. Rothesay Bay from the opposing point presented a very fine spectacle under the illuminations ; while the display from Dunoon, added to by the flashes of the searchlights from the anchored war vessels, with occasional flashes over the hills from Helensburgh, as witnessed from the esplanade between Kirn and Dunoon, made an effective show.

The assembly of vessels between Helensburgh and Greenock was an interesting sight from the bridge of the *Dandie Dinmont*—a privilege enjoyed by the grace of Captain McArthur. H.M.S. *Orion* and *Agamemnon*—off Dunoon—*Hercules*, *Colossus* (built by Scott, Greenock), *Monarch*, *Bristol* and *Falmouth*, and several torpedo destroyers, represented the National Navy, while the Mercantile Navy was represented by vessels of the Anchor, Allan, City, Clan, Direct, Donaldson, Henderson, Houston, Laird, Lines, and of Messrs. Burns, Bruce, The Clyde Shipping Co., Hay, Maclay & McIntyre, Miller, Robertson, Steel and Bennie. Amongst the yachts were the *Emerald*, *Hebe*, *Stratherrick*, *Psyche*, *Marie*, *Iris*, etc. The Clyde Trust was represented by the dredger *Rosslyn* and several hopper barges, while the ancient tug *Clyde* showed itself still able to keep the course, and by contrast a more modern tug showed itself in the lines. The motor vessel was not represented by one of any size, yet there were many small craft about. The *Jutlandia* having sailed but recently had left a memory of what has come at the end of the century of steam navigation, to assert a claim for adoption ; whether the claim will be generally allowed is a problem for future solution.

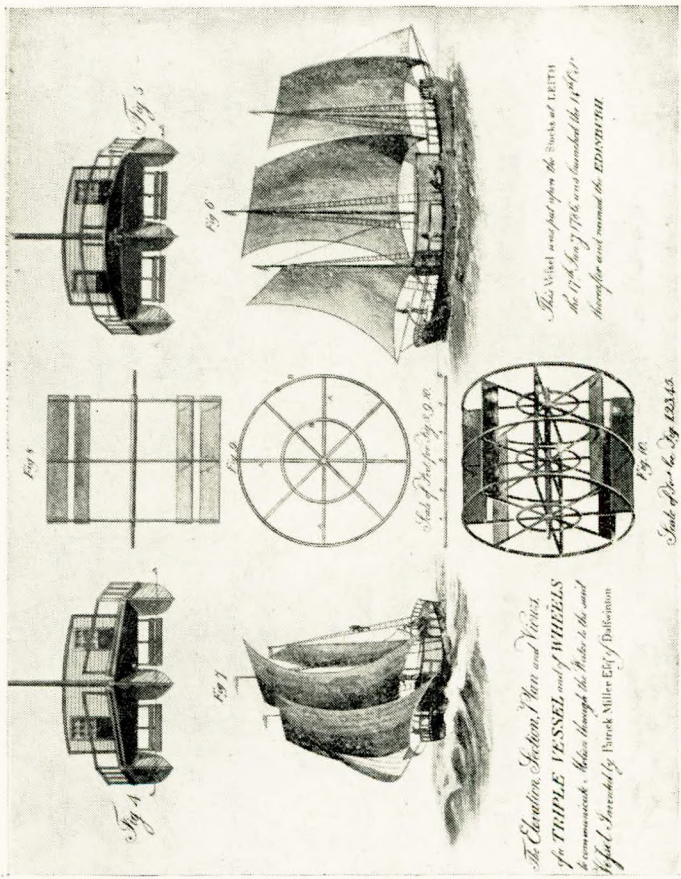
The large fleet of fine river steamers plying on the Clyde is itself an impressive sight and one which is closely associated with the *Comet*. The manœuvring to, at, and from, the different



JONATHAN HULLS' PROPOSED BOAT, 1736.

piers, the speed, the punctuality to meet the various trains, and the whole appointments with the "popular" charges, are each points of excellence—the growth of a century.

Part of the Art Gallery in Glasgow was dedicated to the



MILLER'S FIRST BOAT, THE "EDINBURGH," 1787.

centenary celebration, and a most interesting collection of relics, models, prints and portraits has been gathered together :—Portraits of Patrick Miller, Jas. Taylor and Wm. Symington, who were associated together from 1788 in experimental work, leading to the building of the *Charlotte Dundas* in 1801 ; of Henry

Bell, John Robertson, John Wood, David Napier, associated together in the building of the *Comet*; of Jas. Watt, John Reid, Thos. Wilson, Neil Snodgrass, Robt. Napier, Jas., Alex., William, Peter (LL.D.), and Archd. Denny, Robt. Barclay, Robert Curle, John Elder, each of whom contributed to the progress and advancement of steam navigation on the Clyde. We also see here the cylinder of the first engine of the *Comet*, drawings and plans, newspaper reports of the invention, notes and advertisement of sailing, and several other relics of the first steam boat to ply on the Clyde; models of vessels from 1810 to the

THE "CHARLOTTE DUNDAS," 1801.
Built by Symington.

present day showing stages of advancement in hulls and machinery, including a fine model of the motor vessel *Jutlandia* (Barclay, Curle & Co.).

The Glasgow Corporation arranged for a capital display on the tramway lines of a large model of the *Comet* on an illuminated car, showing the vessel complete and realistic, with funnel vomiting forth the products of combustion. This was seen with enthusiastic acclamation, while the weather favoured, but on Saturday night the rain somewhat spoiled the arrangements for this, as it did for the fireworks on Glasgow Green.

It may here be noted that the first steamers to ply on the "Thames" was the *Margery* in 1815. She was built by William Denny, Dumbarton, engined by James Cook.

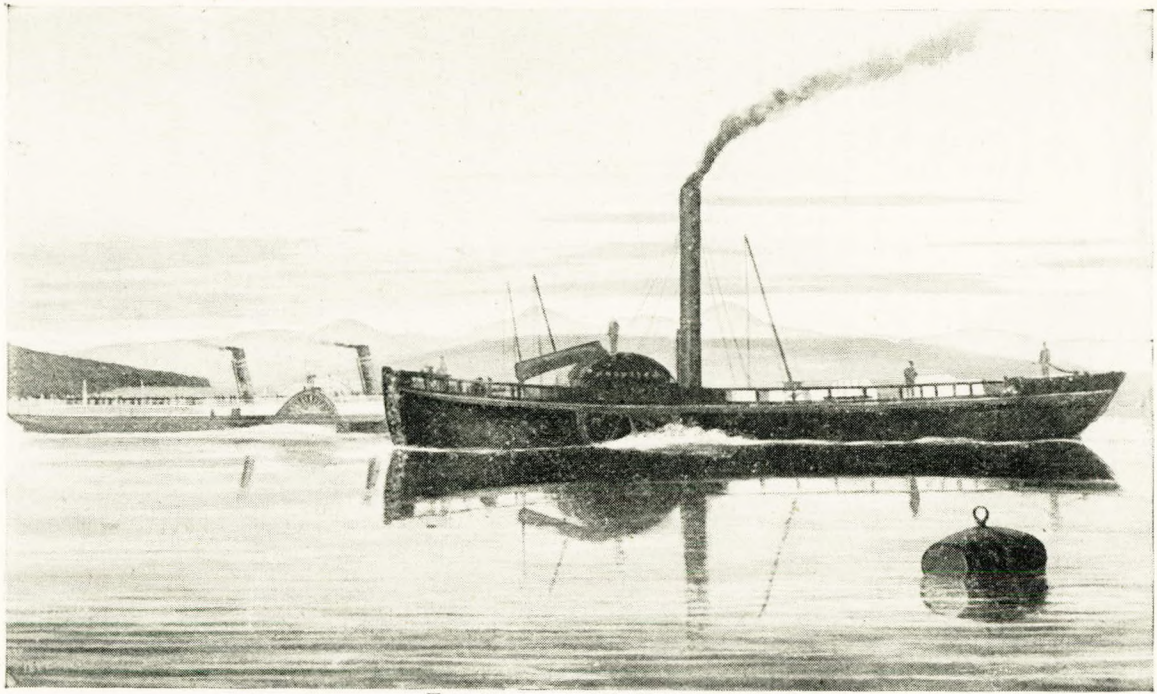
THE "COMET," 1812.
Built by Henry Bell.

On August 30, a banquet was given by the Glasgow Corporation, presided over by the Lord Provost, when the toast, "To the memory of Henry Bell," was proposed by Mr. McKinnon Wood, Secretary for Scotland. Referring to the discouragements and disappointments experienced by the pioneers who were working at the problem of the introduction of marine steam propulsion, he specially dwelt upon the energy and determination displayed by him whose memory it was desired to perpetuate. Monuments and tablets there were to remind those who visited the scenes amid which Henry Bell had lived and laboured, but it was desired to make his work and name memorable in a very tangible way, by providing a steamer for the educational training of the rising generation of students and associate this with the Royal West of Scotland Technical College, and the foundation of scholarships.

The Toast of "The City and the Clyde," proposed by the Lord Advocate, was responded to by the Lord Provost and Sir Thos. Mason (on behalf of the Clyde Trust).

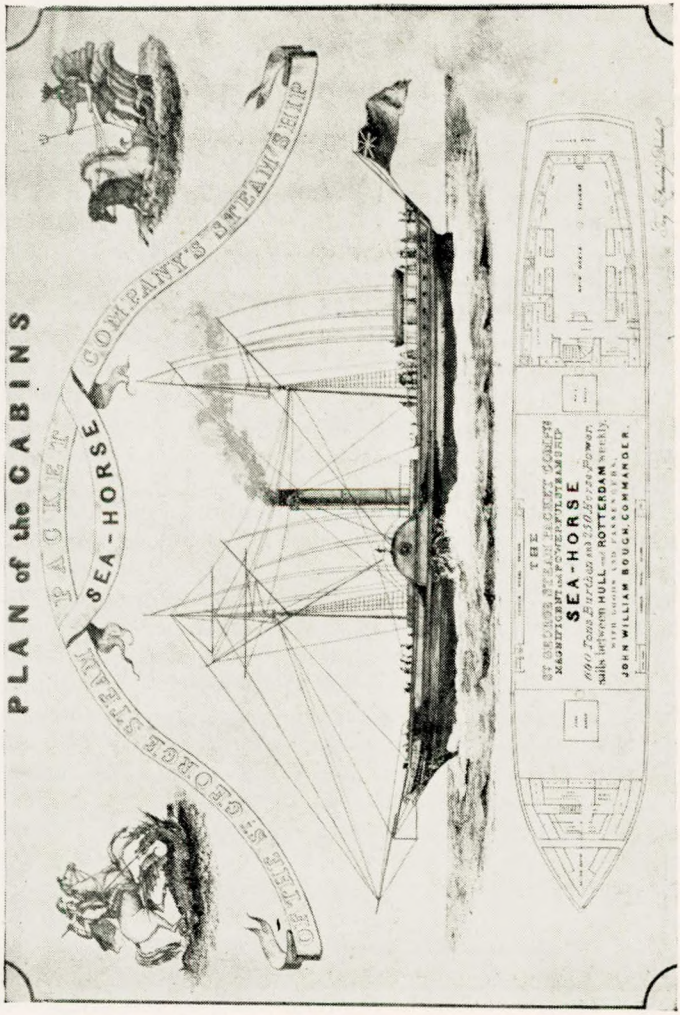
In 1906 a paper was read at the Institute by a descendant of Jonathan Hulls, whose pioneer efforts date back to 1736. This paper was suggested by a former paper and discussion on the subject of Steam Navigation (No. 68, Vol. ix) to amplify the details. The illustration given on page 143 shows the design of the intended vessel. The following extracts from the Chairman's remarks on that occasion will be of interest :—

"The first intimation we have of a steam engine proposed for ship propulsion was about 1545 by De Garay, then by Papin and Savary about 150 years later, when the Marquis of Worcester was working at steam propulsion for land carriages. To Papin appears to be due the introduction of the piston where formerly the steam was used direct for raising water after the manner of the injector or ejector. Newcomen made a further improvement in the boiler about the year 1715. If the tradition regarding the Spaniard De Garay having propelled a boat by a steam engine in the harbour of Barcelona in 1545 be a myth, then the Frenchman has the next claim, as it has been stated that he had a boat on the Seine, driven by paddles, with steam as the motive power, about the year 1690, although there was no immediate practical outcome, owing, it has been stated, to the expense involved. Dr. Allen was working in the direction of water jet propulsion, and took out a patent about 1730. Then a few years later came the



THE "INDUSTRY," 1814.
Built by Fife, Fairlie.
This view was taken while the "Industry" was running on the Clyde, with one of the modern steamers in the background.

patent of Jonathan Hulls. He proposed to propel a tow-boat by means of a stern wheel, the motive power being an



THE "SEA HORSE," ABOUT 1826.
Built by Thos. Adamson, and engined by Peter Bourie (Dundee).

atmospheric engine of the latest pattern then in vogue. The introduction of the crank about this time rendered the advance of the steam engine for many purposes much more pro-

gressive and likely than in the days of De Garay and Papin, when Watt appeared on the scene with his improvements. We have no assurance that a boat was run by Jonathan Hulls, although his proposal and idea was before the public."

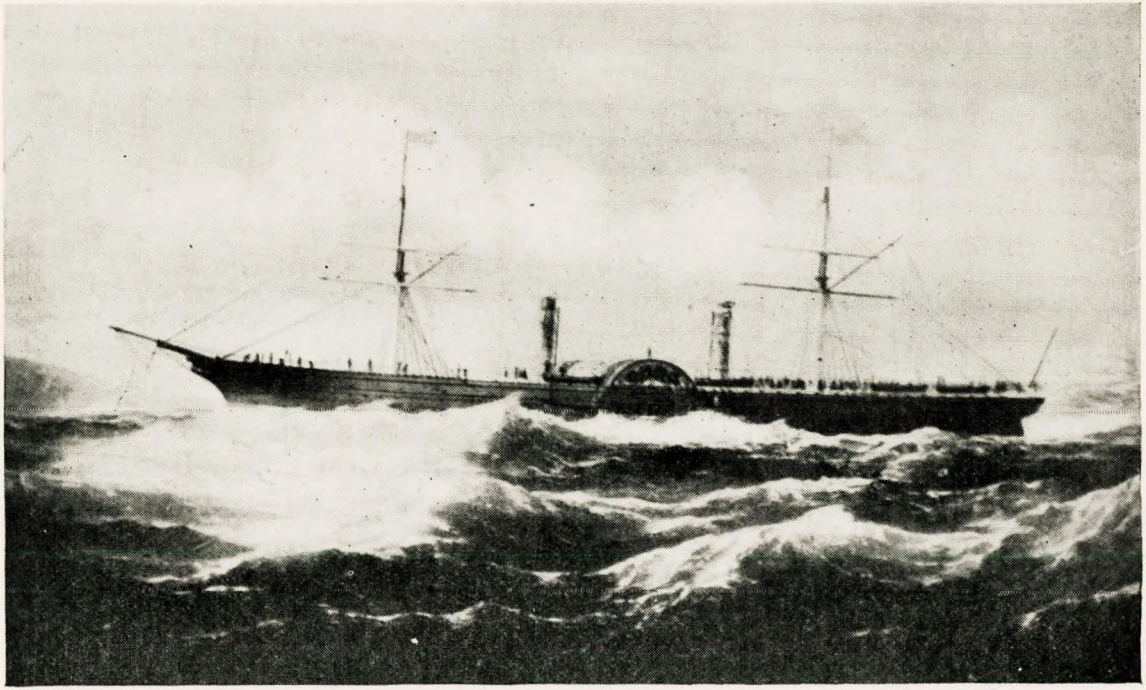
To William Symington, in conjunction with Patrick Miller, is due the actual beginning of steam propulsion, on a fresh water loch and then on the waters of the Forth and Clyde Canal. In a biography of William Symington by Messrs. J. & W. H. Rankine, published in 1862, the following is stated to be a summary of the developments leading to the building of the *Charlotte Dundas*, and, later, of the *Comet*.

"It was in the year 1786 that Mr. Symington patented his working model of a steam carriage in Edinburgh and suggested steam navigation. In 1788 he superintended the construction of steam engines of his own invention, and the fitting of them into one of Mr. Miller's pleasure boats, which boat was successfully propelled that year on Dalswinton Lake by steam power. The engines are now deposited in the museum at Kensington alongside the models of the Great Eastern's steam engines.

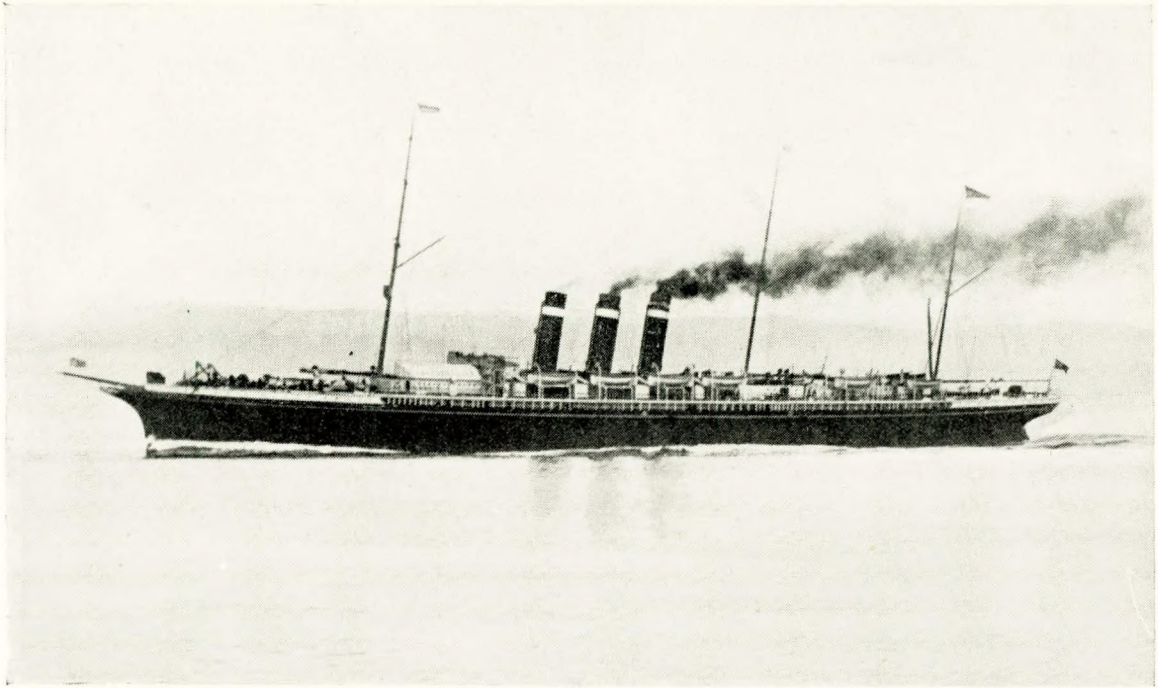
"In 1789, a larger boat, with more powerful engines of the same kind, was successfully propelled by steam on the Forth and Clyde Canal. In 1800 he was engaged by Lord Dundas to construct steam tugs on the Forth and Clyde Canal. In 1801, the *Charlotte Dundas* steam tug was repeatedly on the Canal. She towed vessels there, and up the rivers Forth and Carron into Grangemouth; and it was then that Mr. Fulton, the American engineer, was conveyed eight miles on the canal in an hour and twenty minutes. In the same year he (Symington) patented his direct-acting steam engine, already referred to, for propelling vessels.

"In 1802 and 1803, the second *Charlotte Dundas*, a larger and more powerful boat, towed vessels on the canal; and, on one particular occasion, dragged two laden sloops of 70 tons burthen each—the *Actual* and the *Euphemia*—a distance of 19½ miles in six hours against a strong adverse gale. His experiments were here ended, through the fear of the managers of the canal that its banks might be injured by the undulation caused by the wheels.

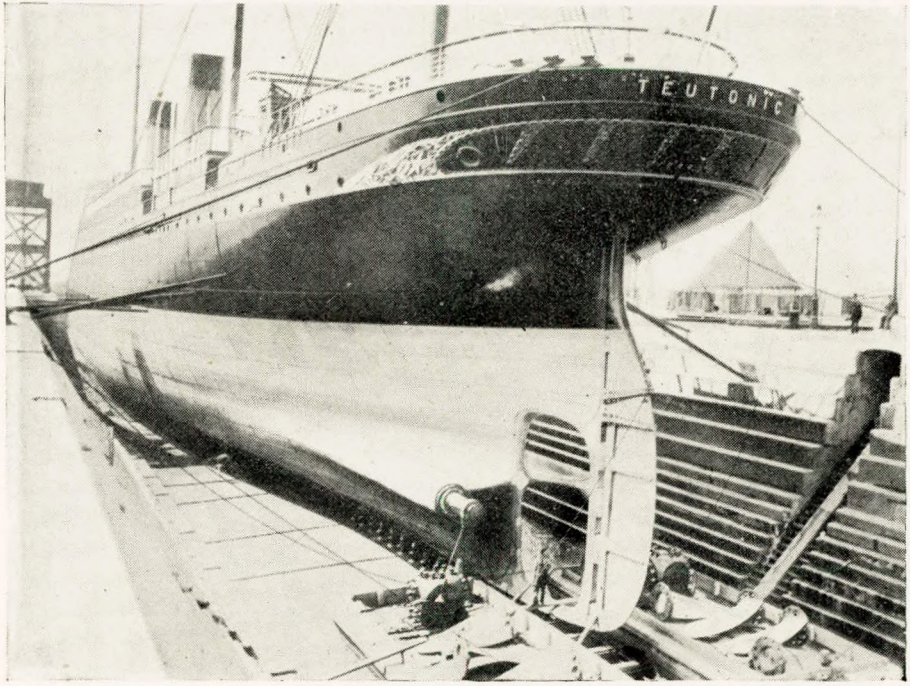
"It was not until 1807 that Mr. Fulton first succeeded in propelling a vessel by steam on the Hudson, and it was not till 1812 that Mr. Bell's first boat, the *Comet*, was tried and



THE "PERSIA," 1855.
Built by Robt. Napier, Glasgow.



THE "CITY OF PARIS," 1889.
Built by I. & G. Thomson, Clydebank, Glasgow.



THE "TEUTONIC," 1890.
Built by Harland & Wolff, Belfast.

set to work on the Clyde, Mr. Bell, as well as Mr. Fulton, having both been on board Mr. Symington's boats, and satisfied themselves of their efficiency."

Among other items in confirmation of this statement, the authors reproduce a poem extracted from a volume by Mr. Muir, of Kirkintilloch. It is headed, "March, 1802—The Steam Barge, or Nautical Novelty." "On seeing the New Steam Boat, invented by William Symington, pass through the Great Canal, dragging two vessels fully loaded." The following are some of the verses :—

Whan first, by labour, Forth and Clyde,
Were taught o'er Scotia's hills to ride
In a canal, deep, lang and wide ;
Naebody thought,
Sic wonners, without win' or tide,
Wad e'er be wrought.

To gar them trow that boats wad sail,
Thro' fields o' corn, or beds o' kail,
An' turn o'er glens their rudder tail,
Like weathercocks,
Was doctrin that wad needed bail,
Wi' common folks.

For mony a year—wi' little clatter,
An' naething said about the matter,
The horses harld them through the water,
Frae Forth to Clyde,
Or, the reverse, wi' weary splatter,
An' sweaty hide.

But lately we hae seen a lighter,
An' at her end a fanner's flighter,
May bid boat haulers a' gae dight her
Black sooty vent ;
Than half a dizzen horse she's weighter,
By ten per cent.

Wi' something that the learned ca' steam.
That drives at heughs the waukin' beam
O' huge engines to drain coal seam,
Or carry hutches ;
She in her breast swalls sic a feam
As has few matches.

By it she thro' the water plashes,
An' out the stream ahint her splashes,
At sic a rate, baith frogs an' fishes
Are forced to scud,
Like ducks an' drakes, amang the rashes,
To shun the mud.

THE "MARIA RICKMERS," 1896
Built by Thomson & Son, Sunderland.
Auxiliary Screw Engines.

When first I saw her in a tether,
Draw twa sloops after ane anither,
Regardless o' the win' an' weather
Athwart her bearin',
I thought frae hell she had come hither,
A privateerin'.

Can e'er, thought I, a flame o' reek,
Or boilin' water's caudron smeek,
Tho' it war keepit for a week,
Perform sic wonners,
As quite surprise amaist the feck,
O' gazin' hunners ?

Ere lang gae now wi' whirligigs
An' steam engines, we'll plough our riggs,
An' gang about on easy legs,
Wi' nought to pain us,
An' fit in tethers useless naigs,
That used to hain us.

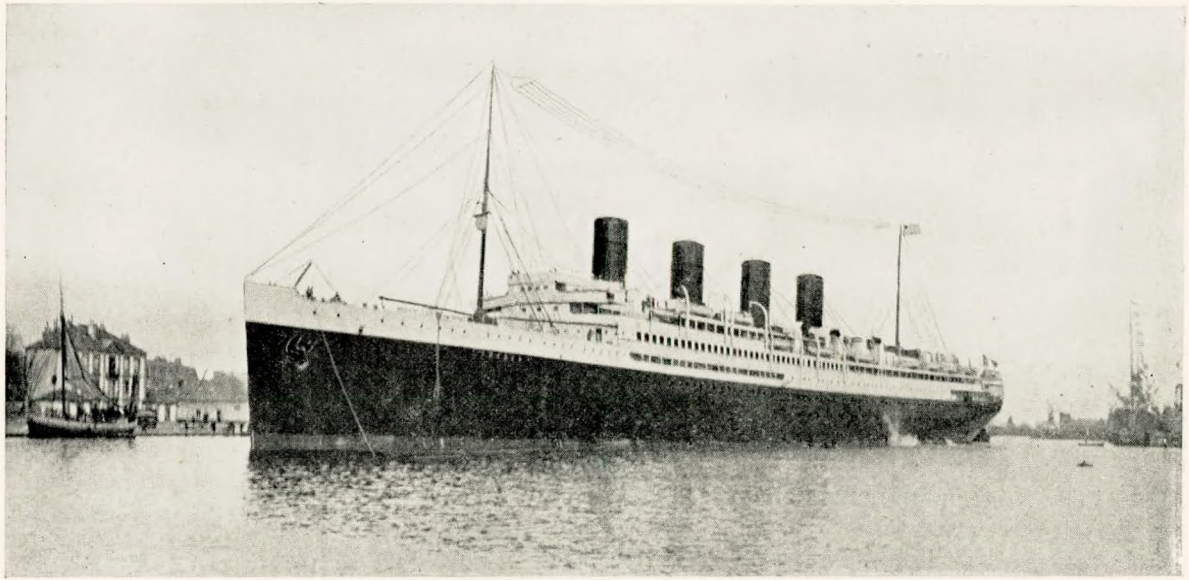
Braw news indeed for man and beast,
They'll then hae nought to do but rest.
An' on their former labours feast,
Wi' cheerfu' heart,
When thus they see warm steam insist
To play their part.

Fulton, on witnessing the attempts of Miller and Symington, was impressed with the great possibilities of steam navigation. He went to America—after some endeavours in Europe—and was instrumental in getting the *Clermont* built and engined, the engines being made by Boulton & Watt and sent to America. The *Clermont* was tried in the River Hudson in 1807, and attained a speed of five miles per hour.

*The events which gradually led up to the general adoption of steam navigation may be summarized in chronological sequence as follows :—

1545. De Garay experimented at Barcelona with the idea of propelling boats by steam.
1695. Dennis Papin and Thos. Savery experimented with steam applied to propel boats, while the Marquis of Worcester was dealing with land vehicles.
1730. Dr. Allen gave attention to water jet propulsion.
1736. Jonathan Hulls' design submitted, and a patent granted for a steam engine propelled vessel.

* The dates and data are from various sources; some from the Glasgow Art Gallery Records and Catalogue.—J.A.



"La France."

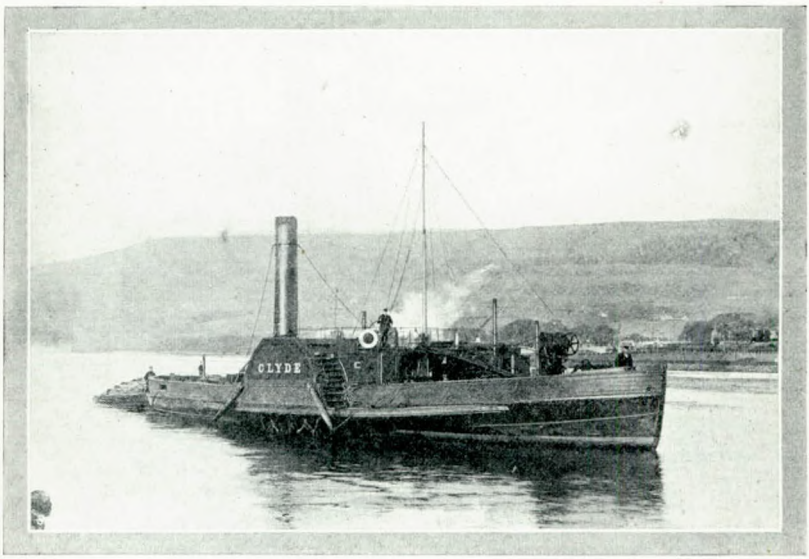
Built by Chantiers de l'Atlantique.

Reprinted from *The Marine Engineer and Naval Architect.*

1788. Patrick Miller, Wm. Symington and Jas. Taylor experimented with a boat propelled by a steam engine on Dalswinton Loch, steaming at about 5 miles per hour.

1789. Wm. Symington and P. Miller had a vessel, larger than the former one, under way on the Forth and Clyde Canal, at a rate of about 7 miles per hour.

1802. Wm. Symington, backed by Lord Dundas, whose grounds bordered the Canal near Grangemouth, had the *Charlotte Dundas* steaming on the Forth and Clyde Canal.

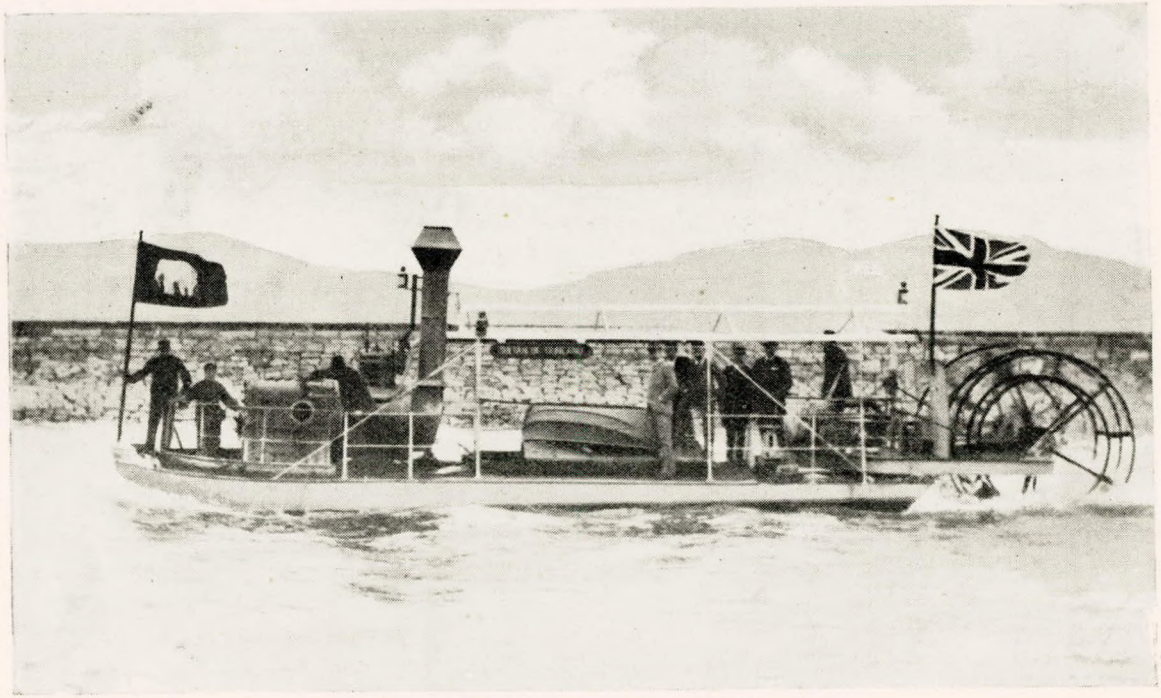


THE PADDLE-STEAMER "CLYDE."
The first vessel engined by Messrs. A. & J. Inglis, Limited, Glasgow.
(Reprinted from *The Syren and Shipping.*)

1804. F. B. Stevens had a small boat propelled by steam on the river Hudson.

1807. Robert Fulton had the *Clermont* (Boulton & Watt engines) running on the river Hudson.

1812. Henry Bell had the *Comet* launched (J. Wood, Builder, Port Glasgow), and fitted with engine (J. Robertson, Glasgow, Builder), and boiler (D. Napier, Builder). The vessel was then put on the run from Glasgow to Greenock.



"The Sultan of Trincanne."

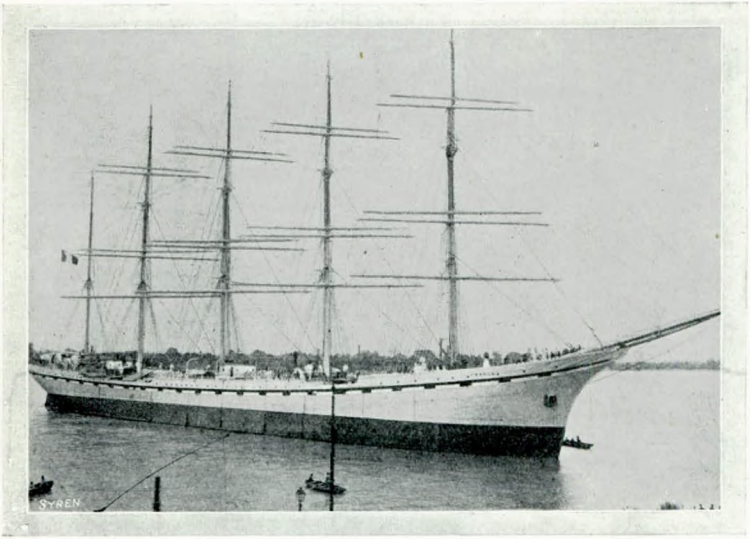
A Stern Wheeler for Siam, 1896.

1813. *Elizabeth*, built by J. Wood, Port Glasgow; engined by Jas. Cook, Glasgow. *Clyde* and others, built by J. Wood, engined by John Robertson, Glasgow.

1814. *Margery*, built by Wm. Denny, Dumbarton; engined by Jas. Cook. Steamed on the Clyde for a time.

1815. *Margery* visited England, and was the first vessel to steam on the river Thames.

1821. Henry Bell had *Comet II* built to replace the former (*Comet*) which was sunk off Craignish Point in the western highland waters.

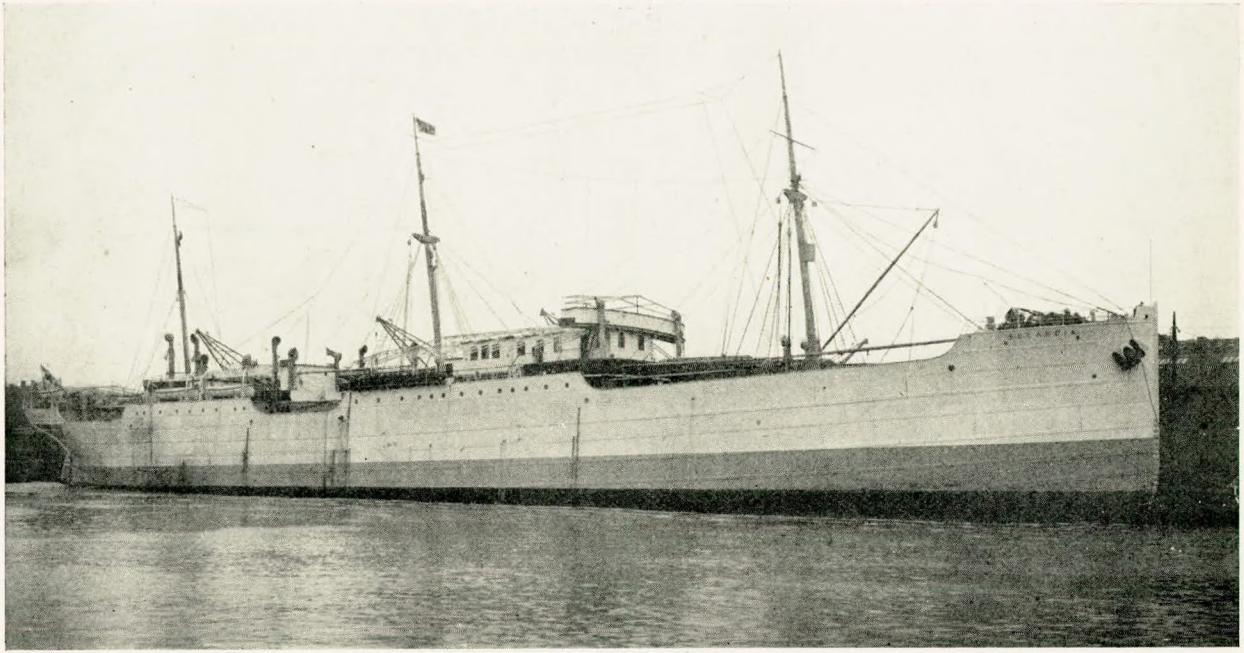


THE "FRANCE."

Auxiliary Sailing Ship with twin screws driven by two Diesel engines of 900 h.p. each.
Built by the Chantiers et Ateliers de la Gironde.
(Reprinted from *The Syren and Shipping.*)

1823. Up to this date about fifty steamers had been built on the banks of the Clyde, among them the *Industry*, which gave 60 years of service on the river before being laid aside. The *Rob Roy*, built by Wm. Denny, engined by D. Napier, was the first steamer on the run to Belfast, and afterwards from Dover to Calais. The *Robert Bruce* opened the run from Glasgow to Liverpool. The *Lady of the Lake* plied first on the Forth and subsequently on the Elbe.

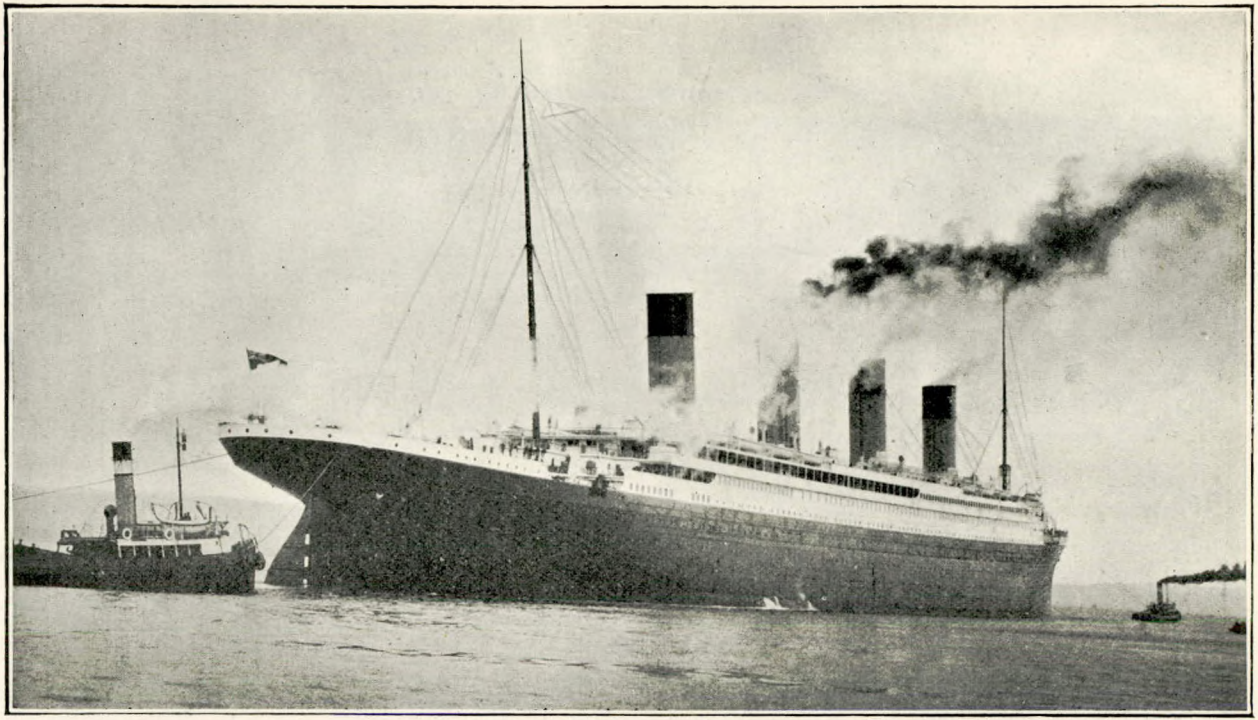
1825. *Comet II*, lost by collision off Gourock (about 2 a.m.).



MOTOR SHIP "SELANDIA."

Built by Messrs. Burmeister & Wain, Copenhagen.

Reprinted from *The Marine Engineer and Naval Architect*



S.S. "OLYMPIC."

Built by Messrs. Harland & Wolff, Belfast.

Reprinted from *The Marine Engineer and Naval Architect*

The vessel was raised and did duty for many years under sail.

1827. *Aglaia*, first steamer built of iron on the Clyde (D. Napier). The substitution of iron for wood in shipbuilding dates back to the building of the *Vulcan* on the Monkland Canal in 1818.

1839. *Royal Sovereign*, built and engined by Tod and McGregor, was the first iron steamer placed on the run from Glasgow to Liverpool.

1843. *Great Britain*, built of iron at Bristol by Paterson, and engined by Penn, Greenwich, was fitted with a screw propeller. She was on the New York run.

1850. *City of Glasgow*, built and engined by Tod and McGregor, was the first iron steamer on the Glasgow and New York route.

1851. *Phenomenon*, a vessel fitted for water jet propulsion, was tried on the Thames, and was followed by the *Enterprise*, giving a speed of 10 knots. The *Albert* built in Prussia, ran as a passenger boat for many years on the Oder.

1866. *Nautilus*, built at Blackwall by Ruthven, and fitted with water jet propulsion, served for some time as a passenger vessel, under Board of Trade rules, on the Thames at a speed of 8·8 knots.

1878. *Columba*, built and engined by J. & G. Thomson, Glasgow, with hull and boilers of steel.

1879. *Buenos Ayrean*, built and engined by Denny, Dumbarton,was one of the first large steamers (4,000 tons), built of steel.

1896. Experimental vessels tried, and the *Turbinia* fitted with Parsons' turbines steaming around the Coast, and the Fleet at Spithead on the occasion of the Review, 1897.

1901. *King Edward*, built by Denny, Dumbarton, the first steamer fitted with Parsons' turbines for commercial service. I.H.P., 3,500; speed, 21·5 knots.

1912. *Selandia*, cargo and passenger vessel of 5,000 tons, fitted with oil engines, commenced running from Copenhagen to Siam. Built and engined by Burmeister & Wain, Copenhagen. *Jutlandia*, cargo and passenger vessel, similar to above, built and engined by Barclay, Curle & Co.

1912. Electrification of the Refrigerating Machinery for Cold Storage—2,000,000 cubic feet—at Victoria Docks, London, Steam having formerly been used.

While referring to records in connection with steam navigation, it is interesting to note that to a daughter of one of our members is due the distinction of signing on the articles of a sea-going steamer as doctor.

The following letter was received on the subject of the work of pioneers, when this was under discussion in June, 1906.

MR. ADAMSON, *Hon. Secretary*,
Institute of Marine Engineers.

DEAR SIR,—

May I beg the favour of your kindness to insert a small addition to the paper read before your Institute dealing with "The Invention of the Steamboat," a report on which I have read in the *Marine Engineer* of March 2.

We, *Francs Comtois*, are proud to count a fellow-citizen amongst the pioneers of the steam shipping as we now know it—Marquis of Youffroy d'Abbans, who was born in 1751 and died in 1832, experimented on the river Doubs with one of the earliest steamboats.

The statue of the precursor erected in Besançon (Doubs) commemorates this event.

Marquis of Youffroy and Abbans, I believe, has yet lineage in Franche Comté, more qualified than I am to give accurate intelligence on the subject. With my best compliments to my British colleagues.

Dear Sir,

Yours truly,

J. GUYENOT,
Chief Engineer, s.s. *Poiton*,
Cie. Transports Maritimes, Marseille,
H. GUYENOT, Engineer,
Impasse Assani,
Josepha Cottage,
Malmousque, near Marseille.

SESSION  1912-1913

President: SUMMERS HUNTER, Esq.

Titanic Engineering Staff Memorial

The fund now amounts to over £1,900, and subscriptions are steadily coming in. The list of steamers from which contributions have been received now stands as follows :—

Afghanistan
Arabia
Arawa
Ascot
Barrow
Beacon Grange
Bellona
Beltana
Berbera
Beryl
Blackheath
Borderer
Cairngorm
Caledonia
Cambria
Camio
Canadian Government Steamers :
Aberdeen
Curlew
Druid
Earl Grey
Governor Cobb
Lansdowne
Lady Laurier
Montcalm
Stanley
Caradoc
Carpentaria
Centipede
Cervona
Ceylon
Champion
Chanda
Chiswick
China
Chyebassa
City of Corinth
City of Edinburgh
City of Poona
Cobra
Colaba
Colonia
Commonwealth
Cornelian
Crane
Culna
Delaware
Demosthenes
Devon
Devona
Durham
Eden Hall
Emerald
Envoy
Essex
Estrellano
Fremona
Geelong
Girasol
Glenlogan
Glenroy
Golconda
Guelph
H.M.S. Amethyst
H.M.S. Black Prince
H.M.S. Electra
H.M.S. Fervent
H.M.S. Implacable

H.M.S. Lightning
H.M.S. Kestrel
H.M.S. Majestic
H.M.S. Ness
H.M.S. Rattlesnake
H.M.S. Recruit
H.M.S. Ringdove
H.M.S. Zebra
H.M.T.B.D. Brazen
H.M.T.B.D. Vulture
H.M.T.B.D. Zephyr
H.M.T.B.D. Cynthia
H.M.T.B.D. Porcupine
H.M.T.B.D. Coquette
H.M.T. Boats Nos. 071, 079, 3, 6, 7, 8, 9, 10, 11, 12, 17, 18, 19, 20, 23, 30, 112, 113, 114, 115
Highland Brae
Highland Pride
Highland Warrior
Hindu
Horlington
Hurona
Hurunui
Hydra
Ilford
Inanda
India
Ingeli
Inkosi
Intaba
Insizwa
Iona
Iroquois
Jacona
Jaffa
Jelunga
Kadett
Kaikoura
Kaipara
Karonga
Katuna
Kia Ora
Kioto
Kistna
Kyanite
Lady McCallum
Lake Erie
Lunka
Magnet
Makarini
Malta
Mamari
Manitou
Marmora
Matatua
Matiana
Media
Milleped
Miltiades
Mimiro
Minneapolis
Minnehaha
Minnewaska
Moldavia
Mombassa
Mooltan
Morayshire
Morion
Muttra
Namur
Nephrite
Nile
Nore
Norfolk
Nubia
Nyasaland
Omrah
Opawa
Ophir
Orama
Orontes
Orvieto
Osterley
Otaki
Otranto
Otway
Palawan
Palermo
Palma
Patrol
Pera
Plasma
Plassy
Ploussa
Poona
Prase
Pyrope
Rakaia
Rangatira
Recorder
Remuera
Rio Squassa
Rotorua
Royal Edward
Ruby
Sagenite
Sard
Sardinia
Seldanha
Sentinel
Servian
Shenandoah
Sicilian
Socotra
Somali
Soudan
Star of Scotland
Sumatra
Tongariro
Trocas
Ula

Twickenham	Waiwera	Wiltshire
Waimana	Wallaroo	Woodford
Waipara	Walter Dammayer	Zaida
Warwickshire	Willesden	

Essay Competitions for Associate Members, Associates and Graduates.

A desire has been expressed to extend the time allowed for sending in papers for the above Essay Competitions, and the Committee have agreed to defer the date till December 2. The titles of the essays are as follows :—

ASSOCIATE MEMBERS.—"The Marine Boiler, its care and supervision at sea and in port with a view to its preservation as well as its efficiency ; including a description of the appearance of a well-kept boiler when opened up at the end of a voyage."

ASSOCIATES.—The Producer Gas Engine, its principles and its possibilities in connection with marine work."

GRADUATES.—"The Thrust Block—its function ; different types and how fitted in the ship."

OPEN COMPETITION.—"Improvements in Workshop Practice in respect to Machinery and Fitting."

The Paper to be the certified sole work of the competitor, to consist of approximately 2,000 words, to be signed with a *nom de plume* (the name and address of the writer being also enclosed in a sealed envelope with the *nom de plume* written on the outside). In the case of Associate Members and Associates or Graduates who take advantage of the option given below, the wrapper should be endorsed "Stephen Award Paper" ; in the case of Graduates "Ritchie Award Paper," the name of the Member who kindly offered this prize and hopes to continue it with the help of others, and in the case of the open competition, "Open Competition Paper." This has again been kindly offered by Mr. Robert Clark (Companion).

Associates and Graduates are allowed the option of selecting the subject and competing in the class above them, but no candidate can compete for more than one award.