

SESSION



1891-92.

REPORT OF THE PROCEEDINGS

AT THE

FIRST DINNER

IN CONNECTION WITH THE INSTITUTE,

EMBRACING

THE INAUGURAL ADDRESS

DELIVERED BY

MR. PETER DENNY, L.L.D.

(PRESIDENT).

GIVEN IN THE HOLBORN RESTAURANT,

Wednesday, May 20th, 1891.

PREFACE.

THE LANGTHORNE ROOMS,
15 & 17, BROADWAY, STRATFORD.

The arrangements made for the First Dinner in connection with the Institute were entrusted to and carried into effect by a Committee appointed by the Council, with MR. L. P. COUBRO as convener.

The labours of the Committee were brought to a most successful issue, and it is a matter of congratulation that the first public reception and recognition of the Institute has been attended by marked success.

It is to be regretted that several gentlemen whose presence would have been heartily welcomed were unavoidably absent; the warm and sympathetic letters received have however encouraged the Council, and have served to show that the useful work of the Institute is recognised as manifest.

The Report which follows is made up, partly from Reports and partly from manuscript notes. It is hoped that the publicity given to the requirements of the Institute in connection with the Dinner, will be a means of furthering the views of the Council and Office-bearers towards obtaining a Building to carry on the operations of the Institute.

JAS. ADAMSON,
Hon. Secretary.



REPORT

OF

DINNER AND INAUGURAL ADDRESS.

The first dinner in connection with the Institute of Marine Engineers was held on Wednesday, May 20th, in the Holborn Restaurant. The new President (Mr. Peter Denny, LL.D.) occupied the chair, and the company included—Sir Edward Reed, M.P., Mr. A. Giles, M.P., Mr. Durston, (Admiralty), Mr. B. Martell, (Lloyd's Register), Mr. T. L. Devitt (Devitt and Moore), Captain Angove (P. and O. Co.), Captain McKirdy (Shaw, Saville, and Co.), Mr. Milton (Lloyd's), Mr. Ward (Denny and Co.), Mr. Garland (Gellatly and Co.), Mr. W. Milburn (W. Milburn and Co.), Mr. E. C. P. Hull, Mr. McGregor (Glen Line), Mr. Williams (Williams, Torrey, and Feild), Mr. R. Cattarns (General Steam Navigation Company), Mr. P. A. Denny, Mr. Neal (Editor *Marine Engineer*), Mr. John Corry, Mr. Carlisle, Mr. Strickland, junr., Mr. G. W. Manuel (Past President), Mr. J. M'Farlane Gray (V.P.), Mr. F. W. Wymer (V.P.), Mr. H. M. Rait (V.P.), Mr. J. H. Thomson (V.P.), Mr. J. P. Hall (V.P.), Mr. A. W. Robertson (V.P.), Mr. W. J. Craig (V.P.), Professor Elliot, D.Sc. (V.P.), Mr. E. John, Mr. G. E. Fownes, and other Members of the Bristol Channel Centre, Mr. R. Leslie (Hon. Treasurer), Mr. James Adamson (Hon. Secretary), &c., &c.

The HON. SECRETARY presented letters expressing regret at being unable to attend from Lord Arm-

strong, Marquis of Hartington, Lord Brassey, Sir Wm. Mackinnon, Lord Ravensworth, Marquis of Lorne, Sir E. Harland, Sir Wm. Gray, Sir Donald Currie, M.P., Sir Thomas Sutherland, M.P., Mr. A. B. Forwood, M.P., Fleet Engineer Thos. W. Traill, Mr. W. R. Anderson (Orient Line), Mr. W. R. Bright, Mr. Walter Brock (Dumbarton), Mr. G. E. Bromage, Mr. J. A. Burness, Mr. Patrick T. Caird, Mr. Geo. Clark, Mr. Eden Colville (West India Mail and Hudson's Bay Co.), Mr. Archd. Denny, Mr. John M. Denny, Mr. J. Dickinson (Sunderland), Mr. R. S. Donkin, M.P., Mr. R. Dundas, Professor Elgar, Mr. Frank Evans, Mr. Samson Fox, Mr. J. Glover, Mr. Archd. Gray (Gray, Dawes, & Co.), Mr. E. A. Hart (Union S. S. Co.), Mr. T. Henderson (Anchor Line), Mr. A. F. Hills (Thames Limited), Mr. Arthur Holland, Mr. S. Gordon Horsburgh, Mr. Frank W. Jenkins, Mr. D. King, Mr. W. Lund, Mr. Edward Martin, Mr. D. Mackinnon, Mr. W. J. Pratten (Harland & Wolff), Mr. Reid (China Mutual S. N. Co.), Mr. T. Richardson, Mr. Wigham Richardson, Mr. Peter Samson, Mr. Savill (Shaw, Savill, and Albion Co.), Mr. T. Scrutton, Mr. Sennett, Mr. Alfred Suart, Mr. W. H. Tindall, Mr. J. Tomlinson, Mr. Tritton, Mr. J. B. Westray, Mr. C. H. Wilson, M.P., the Editors of *The Engineer*, *Engineering*, *Fairplay*, *The Shipping Gazette*, &c.

The following named gentlemen intended to be present but were unhappily prevented: Sir William Lewis, Mr. F. B. Barnes (P. & O. S. N. Co.), Mr. W. L. Bright, Mr. E. S. Dawes, Professor Elgar, Mr. W. D. Ellis, Mr. C. Furness, Mr. E. Gellatly, Mr. J. P. Haquoil, Mr. Becket Hill, Mr. J. D. Jamieson, Mr. John Potter (China Mutual), Mr. A. E. Seaton, Mr. O. R. Strickland, Mr. Cornelius Thomson, Mr. Geo. Weir (Glasgow), Mr. Jas. Weir, Mr. W. H. White (Admiralty), Mr. Fred. Woods, and others.

After an excellent dinner, the CHAIRMAN introduced the customary Royal toasts; and that of the "Navy, Army, and Reserve Forces," which followed, was responded to by Mr. DURSTON for the Navy, and

Captain M'KIRDY, R.N.R., for the Reserve Forces. In the course of the replies it was said that lately the Royal Navy and the Royal Naval Reserve had been drawn together in a most gratifying manner, and rightly so, in-as-much as such splendid vessels were being built for the mercantile marine in point of size and speed that they must be reckoned with in the event of hostilities; and, as they were in a great measure manned by Reserve men, they could be counted upon to aid the fighting fleet by trusting to them as troop, store, and coal ships, and that it would be in this fleet that the Reserve man of the future would find his true sphere of action, when it was to be hoped he would not belie the good impressions formed of him.

Mr. G. W. MANUEL (the retiring President) then proposed the health of Dr. DENNY, the new President, and on behalf of the Council and members of the Institute tendered unto him a very hearty and cordial welcome. He said he was satisfied that the members of the Institute of Marine Engineers had made a very wise selection in appointing Dr. DENNY as their president, not only on account of the long and satisfactory experience which he had as an employer of ship-builders and engineers, or on account of the large number of vessels which he had built, and which were now traversing all parts of the world, that was not enough, the great point for which they had special regard was, that while building ships and adding to the commerce and enterprise of the country, Dr. DENNY had also had a very careful and fostering regard for all the employés who laboured under him in his workshops and factories. In short, not only Dr. DENNY, but all the members of his firm, had taken up a position in this respect which had resulted in an intelligent, a satisfied, and a happy class of workmen. The members of the Institute therefore regarded the introduction of Dr. DENNY with great satisfaction, because they felt that he would introduce the same energy and spirit to assist them in their enterprise and in their intelligence as marine engineers. During the last 50 years there had been a vast stride in the science of engineering, so much so that it required all the intelligence of even the best of them to cope with it, and to carry out the

application of that science in a practical manner to the greatest advantage for the benefit of the country at large. If JAMES WATT and HENRY BELL could come among us now and witness the growth that has taken place, they would, indeed, be very much surprised. It was to keep pace with this remarkable growth that the Institute of Marine Engineers had been established. Marine engineers were drafted principally from the artizan and middle classes, who had a fair education, but it was after leaving school that their practical and scientific education really began; and it was necessary that during their apprenticeship as engineers, and during their period of servitude as junior engineers, which was the best time for the mind of the young engineer to embrace those higher branches of education which could not be acquired at school, that the practical aid which this Institution was capable of affording should be furnished. The Institute of Marine Engineers was composed of practical men, who happily combined the science with the practice of marine engineering, and who could therefore the more readily explain and convey to the mind of the young engineer those truths which he was obliged to follow and appreciate before he could successfully carry out the ideas of great engineers like Dr. DENNY, whom the members of the Institute heartily welcomed as their new President, and he would find them very ready and willing to learn. Whatever success had attended the work of the Institute up to the present had not been due to any outside influence, but to the energy which the council, the officers, and the members had themselves displayed. The present was the first instance of their receiving the honour and assistance of a President from the ranks of eminent engineers and shipbuilders. They believed, however, it would prove of great value to them, and they trusted that Dr. DENNY would not be the last to place his knowledge, his experience, and his sympathy to aid the marine engineer in yet more firmly establishing the commerce of the country and the greatness of the empire.

The CHAIRMAN said he was deeply indebted to Mr. MANUEL for the kind things he had said of him, and to the whole company for the manner in which they had

received this toast. He had had very great pleasure in becoming a member of the Institute of Marine Engineers, and considered it a high privilege to be President of such a body. He thought that any person filling a position in business similar to that which he occupied would find it a source of great satisfaction, if he followed his example in this respect and joined this Institution without delay. He hoped to see many other ship-builders, manufacturers, and engineers joining a body which showed itself so ready to receive them, and which was so absolutely worthy of their support. He would not detain them further, but proceed to read what according to the programme, was his inaugural address, although he would rather call it a yarn or a few remarks.

The PRESIDENT then read the following address.

GENTLEMEN, in the first place, I have to acknowledge, with thanks, the honour you have done me by electing me President of the Institute of Marine Engineers for the coming Session. Your institution is a young one, but it has already done splendid service, and displays a vigour which has not always been characteristic of the earlier days of institutions of a similar nature. Your published transactions show this, and I did not need the testimony of gentlemen, well known in our profession, and whose opinion is beyond challenge, in order to come to the conclusion that the Institute of Marine Engineers gives promise of taking and maintaining a conspicuous place among kindred societies. In fact, it supplies a much needed want; to the many young members especially, it cannot fail to be of immense benefit. I regret my distance from you, and that changed habits in my business life makes my absence from London, now, almost a constant quantity, but my heart and services (for what they may be worth), will be always at your command. What shall I say to you in a short address? Revolving this question in my mind a thought occurred to me, why not leave aside for a time matters of practical and scientific interest, in connection with our profession, with which you are all more or less familiar, and say something general and of a gossipy, historical nature regarding my personal experiences of Marine Engineering

during the past 45 years that I have been connected with it? I do not know that there are many, (or perhaps any), such old stagers as I am amongst you. Most of our younger members were not born, and few had started their apprenticeship, at the beginning of the period of which I propose to speak; so that, while I am not going to give anything in the way of instruction or guidance; a short survey of the past, such as I have indicated, may not be uninteresting to them and to you all. In doing so I am obliged to make it very much a narrative of myself and my firm in our connection with Engineering. I begin at the year 1845, because on the 1st of January of that year my brothers William, Alexander, and I commenced business as shipbuilders in Dumbarton, where our father had carried on the same trade since early in the century. My brothers were trained under him as wood shipbuilders, but very early, became connected with ship construction in iron. For some years previous to 1845 they designed and superintended the construction of most of the iron vessels built on the Clyde. My brother William was not only in the front rank of his profession as a shipbuilder, but was also an engineer of considerable scientific and practical knowledge. In 1845, iron sailing ships were scarcely known, and we made up our minds to be builders of steamers. (In 46 years I think my firm has only built 4 sailing ships). We were not long in securing work. We built and launched in that year, the first mercantile screw steamer constructed on the Clyde, the "Waterwitch," for the Dublin and English trade. A yacht had been previously built, or at all events engined, by Robert Napier, for the late Mr Asheton Smith of Vaynel in North Wales. This vessel had beam geared engines, the pinion being driven, I think by chains. When we undertook the "Waterwitch" we knew little about screw steamers, only a few having been built in England before that time. Under these circumstances, we applied to Mr. Smith, (familiarly known as "Screw Smith,") the patentee, who supplied us with information and gave us plans for the construction of the screw aperture, &c. Viewed in the light of subsequent practice, the construction of this aperture was a curiosity, and, if it could be seen now by some of our young members, might probably be the subject of irreverent merriment. The stern post was made like that

of a sailing ship, but with an upright piece about 2 feet forged on to the keel part of it, where the forward side of the screw aperture was to be. (Screw spaces in these days were made with scrimp room for the propeller to revolve in both in length and height). This piece was scarfed to receive the inner post which was precisely like a tuning fork made in two parts. This was carried up straight the height of the aperture, and then bent back to take hold of the stern post. To the inner-outer edges of this forked post were riveted angle irons, to which was again riveted a plate through which at the throat of the tuning fork, was the hole for the propeller shaft. This plate again had angle irons riveted to it for receiving the ends of the shell plating. The after end of the propeller shaft worked in a cast iron boss bolted to the stern post. Less than a year after this, forged inner and outer posts took the place of this peculiar structure. I may mention that Mr. SMITH appointed us Agents for his patents on the Clyde district, but I am sorry to say we never got a penny of Royalty for him. He died in straitened circumstances. The "Waterwitch," and two other vessels, the "Mazeppa" and "Erin's Queen," which immediately followed in the same year, had each engines by CAIRD of Greenock. These were of the "Table" type. The "Mazeppa" was lost a month after being put on the trade between Glasgow and Liverpool, but had, up till that time, done well. The engines of the "Waterwitch," and "Erin's Queen" never gave satisfaction, were taken out and others substituted for them. In 1846 we contracted to build the "Northman" for trading between Leith and the Orkneys. For this vessel MESSRS. CAIRD also made the engines, which were of the now familiar, inverted or steam hammer type. These were the first marine engines of this description on the Clyde, or I think elsewhere. The results were most successful and this kind of engine speedily became popular, and has, long ago, become the type, for at all events the engines of the Mercantile Marine. MR. BOURNE, in his book on the screw propeller, ascribes the introduction of this engine to MESSRS. THOMSON of Glasgow. I think in this he is mistaken, as these gentlemen did not begin business as Engineers until after the "Northman" was built. In these days, and for years after, there were no brass-lined propeller shafts

or lignum vitae bearings; seldom even a donkey engine, and the use of an indicator was undreamt of. Seven lbs. per square inch, at the most, was the working pressure in the boilers, and I remember river steamers on the Clyde working at less. Everything was of the simplest and plainest kind, but, as far as my memory goes, was fit for its work, although that is possibly not saying much. As bearing on the kind of knowledge of the propeller, possessed by some Engineers at that early period, we had an amusing instance in 1847, when we contracted to build a small screw steamer of 83 tons for the Glasgow and West Highland Trade. For the engines we contracted with a Glasgow engineer. She was launched and sent there for the machinery, which was duly fitted. How long she took to return from Glasgow I do not know, but this I remember, that, on taking her out for her trial trip, we took half an hour from the quay at Dumbarton to the Castle and back, the distance being about half-a-mile. A happy thought struck the Engineer as to how he would effect a perfect cure. He riveted angle irons to the points of the propeller blades and to these riveted a rim of plate about 14ins. broad encircling the blades. The result was, if possible, worse, I believe this ring about the blades of a propeller has been patented more than once since then. My brother WILLIAM (whom I have told you of) undertook to make a propeller pattern for the Glasgow Engineer. This he did by having it sawn out of a solid log by two skilful old sawyers in our employment. I remember seeing them at it with a saw about 2ins. broad, working the twist from a training stick. The propeller cast from it was a perfect success. At this time we had a duplicate pair of engines being made by the same Engineer, for another small vessel. My brother made the propeller pattern for her also, but in this case he built it by layers of wood spread out like a fan. This may have been done before, at all events it was a plan followed by TULLOCH and DENNY, and other engineers for some years after. The first of these steamers I have referred to above is still running at 44 years of age between Dumbarton and Glasgow and she will be recognized by our Dumbarton members as the "Tammy Shop." In the year 1846 we built, as sub-contractors to CAIRD AND Co., two screw steamers called the "Osmanli" and

“Aram” for a Liverpool gentleman, who had made an arrangement with the various Levant Traders to establish a line of screw steamers between Liverpool and Constantinople, They were guaranteed to do the distance in 20 days. No great speed. He also, contracted with MESSRS. DITCHBURN AND MARE of London, to build a third the “Levantine.” MESSRS. CAIRD constructed the engines for all three. The Superintendent Engineer of the owners, who also made out specification and plans of ship and engines was a well known man in his day. He was undoubtedly a clever engineer and did much successful work, but he was a man with crochets. Now the most dangerous man I know of is a clever engineer with such. We have all I take it known them in our day. Like the poor they will be “ever with us.” Now this gentleman’s crochet in the three vessels above referred to, was the rotary engine, it was not new, it had failed before, but he thought he knew the cause. In what his engine differed from previous ones of the kind I do not know. Rotary engines were, however, fitted in the three vessels, which, when finished, were put on the intended trade. After a short time, it was manifest that they could not even face the very moderate conditions undertaken. The engines were condemned and replaced by the recently introduced inverted cylinder. The last ship MESSRS. CAIRD & Co. engined for us, after six years pleasant business connection, was the “Lady Bird” for the Newhaven and Channel Island trade. She was a nice craft for passengers and light freight and had geared inverted cylinder engines. The wheel was internally geared. A year ago this vessel was still working in New Zealand. In the year 1850 it became apparent to me that our machinery should be made in Dumbarton. I therefore proposed to my brothers William and James (who with myself were the sole partners of WILLIAM DENNY & BROS.), that I should commence engineering, and this was accordingly arranged. I took into partnership my friend the late Mr. TULLOCH and we began business under the firm of TULLOCH & DENNY, changed in 1862 to DENNY & Co. Ground could be had for next to nothing in Dumbarton at that time, and I bought the site for the commencement of what are now the very considerable works of DENNY & Co.

for £212, a freehold with right of river frontage. We had very little capital, but we made the best of it. In fact, we at once got into a good business and did not need much. Before we had any erections on the ground we got an order for a pair of 48in. cylinder engines for a vessel called the "Phœbe," the patterns for these engines were made in an outside shop by our only hand then employed, Mr. WILLIAM WALLACE, this gentleman remained with us as a leader in our works until the year 1856, when he became Superintendent of the "Allan Line," in which service he has ever since remained, and is doubtless known to many of you as a distinguished man in his position. I have said we were not long in getting into a good business, in February, 1851, we contracted with MESSRS. WILLIAM DENNY & Bros. to supply them for the Cunard Company with machinery for the steamers "Australian" and "Sydney." These engines were of the beam-gear type with 66in. cylinders by 4ft. 6in. stroke. These were rated at 300 nominal h.p., (effective h.p. was not spoken of then), the boilers had brass tubes. These vessels were intended for the Atlantic trade and were only (builders' dimensions) 216ft. by 34ft. by 25ft., but were sold for the Australian Mail Service. These engines were followed in October of the same year by repeats for the "Andes" and "Alps," also for the Cunard Company. These vessels, however, were 15ft. longer than the first two, and were their first screws on the Transatlantic trade. Think of these vessels 40 years ago as contrasted with the modern "Umbria," "City of New York," and "Teutonic." Fortunately, for stowage, in these days boilers were considered a mere circumstance on board a steamer. Seven pounds of pressure if you could get it, if not, as much as you could. I remember the boilers of that time with the splendid stalactites of salt on their fronts and elsewhere, and when under trial, the comforting assurance of the foreman boilermaker that they would soon take up, which they did in a way, often with the assistance of horse manure. It was about this time, possibly a few years later, that a well-known Clyde engineer still alive, told me that he had been asked to arbitrate in a question regarding a boiler which was complained about as defective. He said he went to

inspect it with the intention of helping a brother chip out of a difficulty, if at all possible, his remark to me as to the result was, "haud in water? it wouldna haud in sma' tatties." So far as DENNY & Co. are concerned it has been one continued progress in their business. The original shop still exists in the south-west corner, and covers an area of about 6 per cent. of the present works. From 1845 to 1860 I cannot say any very material advance was made in Marine Engineering. Pressures were gradually increased with a larger range of expansion in the cylinders and at one time it was thought that superheated steam was to revolutionise everything. Then surface condensers replaced the old jet ones, but the real advance only came with the introduction of the compound engine. Very early, MESSRS. RANDOLPH & ELDER were constructing engines on the old "Woolf" principle for marine purposes. They met with many difficulties for a long time, but perseverance and accumulating experience ultimately led to successful results. The principal factor in this success however, I think was due to the abandonment of the double cylinder "Woolf" engine in favour of the now well-known compound engine with two cylinders, and cranks at right angles and with the intermediate receiver. Who was the first to put such an engine in practical work on board ship, I do not know, nor do I know in what year this was done. About the year 1867, however, the compound engine began to attract general attention and we were frequently asked by our constituents in regard to it. We could give little information, because we knew little and could not obtain anything reliable. Under these circumstances I applied to my good old friend the late MR. RANDOLPH, but he was rather nasty and told me to find out for myself and pay for it, as he had done. Well, I did find out for myself and did not pay for it, but made money by it. Early in the year 1868, being then the sole partner of WILLIAM DENNY & BROTHERS, I laid down a ship on my own account, and contracted with my firm of DENNY & Co., to make for her a set of compound engines. Before this vessel was half finished she was acquired by the Cunard Co., and called the "Batavia." The engines were a complete success, and MR. (afterwards SIR JOHN) BURNS assured me, after

having had experience of her, that they never had a ship that had paid them better. Before the "Batavia" went to sea the compound system was established and speedily became universal. In my opinion this new departure was largely if not altogether due to the efforts of MESSRS. RANDOLPH & ELDER, pushing into notice first the "Woolf," and then the compound engine as it is known to day. Compound engines effected a large saving in fuel, and in this respect are notable as the most pronounced individual improvement that had up till that time been made in Marine Engineering since the introduction of steam navigation. From the time of their first use the marine engines and boilers had been no doubt gradually but surely improved, so that the best in use just before the advent of the compound were probably even more economical compared with their progenitors, than was the compound engine compared with them. No records as far as I am aware, exist as to the consumption of coal per H.P. of the very early marine engines. But coming to the period at which I begin my retrospect, (1845) I take it, the consumption of coal per indicated horse power cannot be put down at less than 5 lbs. per H.P. per hour. The Ocean paddle steamers of that time, at least those of the Cunard Co., had the old flue boiler working at a pressure of about 6 lbs. per square inch, and I have told you that the screw steamers built by us at that time worked with about the same pressure, although they had tubular boilers. I do not think therefore that I do injustice to the engines of those days in debiting them with the coal consumption I have named. As time went on pressures were gradually increased, which, coupled with improved design and workmanship, both of engine and boiler, were productive of a gradual increasing economy, so that I think I am not far wrong in saying that the engines at the end of the fifties consumed somewhere about 4lbs. per H.P. per hour. Early in the sixties came the re-introduction of condensation by surface for ocean going steamers, and the pressure in use had arisen to about 30lbs. per square inch. In some cases steam jacketed cylinders were used with a range of expansion greater than was then common, so that with the above named pressure the consumption of coal fell to about 3lbs. per H.P. per hour. Such I think is a pretty accurate statement as to the position of the

ordinary marine engine at the time when the compound engine began to come into use. From this it appears that in the course of years by a gradual development, the coal consumption per H P. per hour, had been reduced from 5 to 4, and in some cases even to 3lbs. equal to a saving in the former case of 20% and in the latter of 40%. The corresponding consumption of the compound engine at, and for some years after, its introduction may be put down at $2\frac{1}{4}$ lbs. This figure was improved upon gradually as still higher pressures were used. Taking it as I have given it, it represents a saving of 25% over the best previous practice. This statement, however, is possibly to under-rate the value of the new system, and I would be disposed to put the average general saving by the compound over the ordinary engines replaced by it, at not less than 40%. So that the total economy achieved since 1845, may be put at about 55%. Fifteen years or thereby elapsed and there was another stirring of the dry bones. Efforts still being made (as they are now) to effect further improvements resulted in the introduction of the triple expansion engine, about the time I have indicated, viz. : the year 1884. It is true a triple engine had appeared ten years before this. In 1874 MR. (now DR.) KIRK designed what as far as I know, was the first engine expanding steam successively through three cylinders. These engines were made by MESSRS. JOHN ELDER & Co., and fitted on board the s.s. "Propontis." They worked at 160lbs. boiler pressure, the steam being supplied by a set of the late MR. J. M. ROWANDS water tube boilers. The engines gave every satisfaction and worked with great economy, but failed to attract the attention they deserved, possibly on account of the boilers having been a source of considerable trouble ; so much so that they were removed and replaced by others for a lower pressure, and these also were again replaced by new ones for the same pressure as originally employed. With these this vessel was working a few years ago and may be still. MR. KIRK, by that time senior partner of R. NAPIER & SONS, designed and constructed a second set of triple expansion engines in the year 1881. These were for the well-known S.S. "Aberdeen," belonging to MESSRS. G. THOMSON & Co. In 1884, my firm of DENNY & Co. constructed triple expansion engines for the steamers

“Arawa” and “Tainui,” SAVILL & ALBION COMPANY, but with 4 cylinders tandem. Shortly after this, the triple expansion engine became common, and speedily took the place of the compound for all new vessels, and a considerable number of the existing vessels have had their engines altered to the new principle, and have been fitted with higher pressure boilers. With this type of engine and 160lbs. boiler pressure, the consumption of coal may be put at 1.7lbs. per H.P. per hour. In other words, with the triple, we have an engine developing one-horse power for about one-third the coal required in the year 1845. The tendency is still to increase pressures, and my firm DENNY & Co. have for some years been constructing both for new vessels, and for altering the machinery of old ones, cylinders on the quadruple expansion principle, expanding the steam successively through four cylinders, with 180lbs. boiler pressure. This is productive of a further saving, and as means are devised for employing yet higher pressures still greater economy will result. I do not enter into the system of forced draught, which is used for two purposes, for speed where saving in weight in engines and boilers is essential, and secondly, where economy in fuel and saving in space is more the object. If I am not mistaken the Admiralty used it first for the former reason. It has of late been growing into favour in the Mercantile Marine for the second reason, and in its full development by experience will be most likely another factor in economy. What next? I am now into recent years, known to the youngest amongst you as to me. My principal object in this address was to give you some old time gossip, the knowledge of which by a few survivors of us must soon pass away. I am thankful for the years of enjoyment I have had in my work, and I earnestly wish the same for my many young friends just entered into manhood. I believe the world is advancing both in knowledge and in goodness, and conservative as to old ways, as I not unnaturally am, I have always felt a pleasure in giving my sons and young friends full swing, knowing that the world will continue going round whether I will or no.

MR. B. MARTELL said he felt it a very great honour to be invited to propose the next toast, which

was that of "Success to the Institution of Marine Engineers." He should not have undertaken the duty of introducing this toast had he not felt that everything he could say of the institution would be of a gratifying character. In fact, no similar professional body had so advanced by leaps and bounds, and when they considered that it was not yet three years of age, and that it now consisted of 450 members, he thought there was ample to indicate the success of the institution. There was no doubt that this success was very largely due to the manner in which the movement was initiated and organised by its founders at the commencement, but when an institute of the kind was led by men so distinguished in their profession as MR. MANUEL, MR. BELDAM, and others, it could only be expected that the organisation would develop, and become the success it had actually proved. He quite agreed that it was a great honour for the institute that it should have enlisted the services of, as president, a man of the great commercial and professional reputation of DR. DENNY, who, in addition to his many other qualifications for the position, possessed that which commended him to all human beings, viz., a ready and practical sympathy with all who stood in need of advancement and assistance. It was this quality above all others which caused DR. DENNY to command the admiration and respect of all who came in contact with him, whether professionally or socially. He (MR. MARTELL) had read the papers discussed at the meetings of the institute with very great interest, and he had reason to believe that what had been done by the Marine Engineers in this respect would furnish a stimulus to the Engineering Members of another body with which he was connected (the Institution of Naval Architects), which would be found of the greatest service and value. He could only hope that the Institute of Marine Engineers would continue to flourish, that its library—a most valuable feature of the Institution—would increase, and that like the boilers with which they had so much to do, the Institute would be found to possess staying power, enabling it to accomplish yet further successes in the future—(cheers). He coupled with the toast the name of MR. JAS. ADAMSON, the Hon. Secretary.

The Honorary Secretary, in responding, said that in the name of the Institute of Marine Engineers, under whose auspices they were assembled, he begged to express his hearty thanks for the reception which this toast had received. He had also to thank the proposer for the pleasing manner in which he had referred to the subject of the toast as well as for the matters to which he had briefly called attention. When the responder to a toast rose amid the encircling gloom of a half-hearted reception, he was placed in a position both anomalous and unenviable. They had, however, by their grace and favour, placed him in a position far removed, nay, the very antipodes of that. He was reminded, when he considered these circumstances, of the ode which Horace dedicated to Maecenas, in which he depicted in glowing terms the pleasure, or more than pleasure, he felt in contemplating the elevation of himself to the position of a national bard. He ventured to say that the sentiments which animated the bard in his enthusiasm for the muse, harmonised with the sentiments which at that moment were stirred into action in the souls of the office bearers and council of the institute by the enthusiasm with which this toast had been greeted. The tongue was the exponent of the soul's desires and longings, but that member failed him to express all he felt in connection with this assembly. From the fact that other exponents of the soul which were allowed expression on such an occasion as this had not been wanting, he took it that the aims, objects, and desires of the institute as represented by its office-bearers, had the hearty sympathy of those present, so that the lameness of his tongue would be the more readily excused. When he looked round and saw the assembly of noble and distinguished guests, who graced their board, as well as of members and friends who had come forward to testify their appreciation of, and award a fitting reception to, their esteemed president, he could not but contrast it with the early beginning of the institute, nursed amid an obscurity which had tended to check its too rapid growth. The seed was sown in February, 1889, the root was now established, and a branch had grown from the parent stem.* The contrast was great.

* The Bristol Channel Centre.

The rise and progress of the institute had been correspondingly great. He would not say that the development had exceeded his most sanguine expectations, as no one could say that his views were pessimistic. There was no use in being less than on fire with enthusiasm in respect to any work undertaken *pro bono publico*, and the fire had not been lacking to press the movement onward and upward. Need he add that his views were still towards optimism? It would ill become the occasion, still less his audience, to show any indication of the white feather of pessimism now, when the progress made had justified the views and the very existence of the institute. Nay, he ventured to say that their early dreams should be realised, and that they would yet see, before they were called on the roll of their forefathers, a goodly pile reared on high—a fitting home for the training of young engineers, thus equipping them for their duties, and making them more valuable to their employers and the nation at large. An engineer who had, along with a mastery of his tools, a keen appreciation of the nobleness of his calling in respect to its laws and orders, would prove a more valuable officer on shipboard, and a better ally of his superintendent, whose aims were to have the best possible efficiency at the least possible outlay for repairs. The institute had that evening entered upon a new era in its history. A public and representative recognition had been given to the choice made by the members in respect to the president, who had conferred an inestimable favour upon the members by accepting the representative position which they were proud to see him occupying on that occasion. He would not occupy their time by dwelling upon the claims of the institute on all who were in any way interested in the maritime supremacy of the nation, but he might say it was the aim of the promoters to see a building erected in which might be carried on operations suited to the requirements of marine engineers, keeping in view a happy combination of social technical science, so that on the one hand there might not be too much of the iron and steel element, and, on the other, that there might not be too much of that which, when it passed certain limits, became frivolity. The report of the second annual meeting was now being published, and he would com-

mend a perusal of the contents of that report to all those who were sufficiently interested in the institute to bestow more than a passing thought upon it. He trusted that the sympathy and support of those who realised the power for good which the institute might become would not be found wanting to crown the efforts which were about to be put forth to accomplish the undertaking shadowed forth in skeleton form. They had the bones, and they wanted that which was necessary to clothe them and give symmetry to the whole fabric. It was gratifying to know that the Institute of Naval Architects already looked upon the young institute in a favourable light, and he hoped that by the friendly interchange of courtesies and friendly feeling, each would help the other towards bringing about the common good, which would tend to the general progress and the advancement of the nation as a whole. He could not but congratulate the members on the happy occasion which they were met to celebrate, and he would like to express the hope that the session upon which they had entered might prove to go far beyond the measure of success which had attended the past sessions. Might their next dinner be held on the occasion of laying the foundation stone or inaugurating a building for carrying on the operations of the institute in a fitting and becoming manner.

MR. HULL submitted "The Shipping Interest" and said it was a toast which he was sure would commend itself to the hearty good will and good wishes of the Institute. After remarking upon the magnitude of the shipping interest of this country, he said that notwithstanding the enormous increase in tonnage year after year, instead of there being a large number of steamers laid up in every part of the country, there was a tremendous increase in the amount of tonnage employed. This tonnage was working no doubt at unprecedentedly low rates of freight, but the running of ships at these rates was only rendered possible in a very great measure by the great advance which had taken place in the science of marine engineering. He coupled with the toast, the name of MR. L. DEVITT.

MR. DEVITT in responding, said he felt it a special honour to be asked to return thanks for this toast. We were living at a time when he thought we ought to help each other. They had heard a great deal that evening about a proposal to build a home for the Institute of Marine Engineers. It was the ambition of some friends of his—shipowners and others—to establish a Shipping Institute for the port of London—an institute which should embrace officers and engineers, and which should include a vast hall, where all the various branches connected with shipping could assemble for the advancement of the common good. Such a body might be made even large enough to include their friend MR. MARTELL. After a passing reference to DR. DENNY, who, he said, had done as much as most men to promote the shipping interest of this country, MR. DEVITT went on to remark that this was an age in which all connected with shipping ought to be united for the common good. Hitherto it had been matter for reproach that the shipping interest had been as a rope of sand. Last year, however, they were brought together, and he hoped they were not going to separate without accomplishing good work. He hoped that everybody who had the true interest of the country at heart, would think twice before giving countenance to some of the movements that were afloat at the present day. Speaking for a large number of shipowners, he could certainly say that their feeling was not to oppress their employees. The shipowners of this country had too much sense to attempt to oppress those who were working for them. They would rather see all of them rise in their profession, and would infinitely prefer that the sailor should be raised from the level to which he had been kept down. It greatly annoyed some of their noisy friends to find that before they had a chance of throwing stones at the Shipping Federation, the Federation had made arrangements to provide insurance money for seamen's widows and families in the event of the men meeting their death while performing their duty. These and other means were being devised for the benefit of seamen and their families; and after referring to the project for providing pensions for sailors in their old age, MR. DEVITT again strongly urged the importance of all connected with the shipping trade of the country being united in promoting its interests.

MR. MACFARLANE GRAY proposed the next toast as follows: Mr. President and Gentlemen, an agreeable duty has been assigned to me to propose the next toast, "Kindred Societies," many of which are represented here this evening. To this toast I wish you to add the name of our distinguished guest Sir EDWARD REED, who is connected with most of the Societies I shall now name, an honour to him and he an honour to them. The Royal Society, the Institution of Civil Engineers, the Institution of Mechanical Engineers, the Institution of Naval Architects, the Institution of Engineers and Shipbuilders of Scotland, the North Eastern Institution of Engineers and Shipbuilders, the Hull and District Institution of Engineers. All of these Societies have been founded for the exaltation of the interest which every man ought to take in the work of his hands, and this they seek to accomplish by means of the advancement and diffusion of knowledge. In the beginning there was only one tree of knowledge, but now every civilized nation must have an orchard full of trees of knowledge, and never a month passes but they yield a goodly crop of published transactions. We read that when knowledge was weighed against money, the decision was that in regard to material helpfulness, the one was just equal to the other, but there was still an enormous preponderance, for "wisdom is a defence, and money is a defence, but the excellency of knowledge is, that wisdom giveth life unto them that have it." That is, knowledge is the tree whose fruit is life, the only life worth having. When I regard the multitude of knowledge-growing-Institutions planted in civilised countries, both on this side the Atlantic, and on the other side, when I consider how varied are the subjects dealt with, and how important they are for the physical well being, and for the intellectual life of man, and the remarkable fruitfulness and abounding beneficence of these trees of knowledge, I am ~~thankful~~ ^{tempted} to apply to them the beautiful words of the ancient vision. "On this side the river and on that was the tree of life, bearing twelve manner of fruits, yielding its fruit every month, and the leaves of the tree were for the healing of the nations." It is the glory of the Societies I have named, that every leaf they publish has for its aim the healing of nations, and the multiplication of such Institutions is calculated to have a greater

influence upon the peace of the world than the building of armour-clads. The life that is in Marine Engineers, is an important part of the health of this maritime nation. SIR EDWARD REED has on more than one occasion given emphatic expression to this conviction, and the presence of so many influential members of other Societies here to night is very gratifying to the members of the Institute of Marine Engineers, for it assures us that they are also of this opinion. It is but little that our young Society can do in comparison with the noble work done by the elder Institutions around us, but we mean well in regard to the health of the nation, and we wish our elders also to go on and prosper, and they cannot better assist us than by holding out to us the hand of encouragement as they do to-night, and by continuing to set us a good example which we will endeavour in all friendship to follow. I ask you to join heartily in the toast, Kindred Societies and our distinguished guest SIR EDWARD REED.

SIR EDWARD REED, M.P., in responding, said it was quite true that he was connected with most of the Institutions to which MR. McFARLANE GRAY had referred, and although he believed that all those bodies, whether he was connected with them or not, would always be most glad to give assistance and encouragement by every means in their power, to such an organization as this Institute of Marine Engineers, he hoped that nothing would be done which would diminish the independence or enterprise of the Institution, or lead it to look elsewhere than to its own members for the means of increasing its importance and usefulness. The strength of the profession which this Institution represented, was at present undeveloped. It needed development and must receive development from the men that belonged to it, and from no other source. For some years it had been his misfortune to be almost the only man in the House of Commons, sensible of the importance of the Marine Engineer, and seeking to get for him a higher recognition. He had listened that night with the greatest interest to the address of the President, who was a type of the self-helpful Engineer, and at the same time, the only type of man to whom Marine Engineers ought to look forward for assistance,

men who had the knowledge and the experience to understand their difficulties and to get over them as soon as possible. The President, too, was one of those who encouraged younger men to exert themselves to take higher rank in their profession. He (SIR EDWARD REED), was one of those who took every opportunity of encouraging rising men, because he was satisfied that in a country like this, the only success that could attend an Institution of this character, must spring from the combination of the knowledge and experience of the old men, with the spirit, energy, and enterprise of the younger members. Reference had been made to the Royal Society. Was there any Marine Engineer who was a member of that body? And if not, why not? A man who interested himself in bugs and beetles; or a man who, fancying he had heart disease, stuck a thermometer under each arm pit, and after performing certain exercises, carefully recorded the results, would sooner or later find entrance to the Royal Society. But why at the present day were there not abundant representatives of Marine Engineering in the Royal Society? Not because they had not advanced science, not because they did not live lives devoted to science. They were not there simply because they had not yet aroused the country to the importance of the work in which they were engaged, or the importance of that work to the nation at large. After alluding to the very practical manner in which a marine engineer (the late JOSEPH MAUDSLEY) aided the foundation of the Institution of Naval Architects, SIR EDWARD REED spoke of what he considered the condition of depression and the lowness of the level on which the marine engineer now stood. Now let them take the Royal Navy, and he must say he did not know where they could put their finger upon a branch of the service more important in any emergency that might arise than that of the Marine Engineer. He had often put to himself this question; supposing any one of Her Majesty's ships was to suffer, in action or in any other way, the loss of the greater part of her officers, upon whom would they put their finger as the man who of all others it was most important that he should be kept alive? He maintained that it would be the chief engineer of the ship, and for this reason, the chief

engineer could do what no other man in the ship could do, and the duties of all the others into the bargain. He (SIR EDWARD) would undertake to say—and he was not speaking at random, for he had studied for the position of navigating officer—that if they had to choose between making the captain the chief engineer, or making the chief engineer captain, almost everybody on board the ship would declare in favor of making the chief engineer captain. Referring to MR. DURSTON who sat by his side, SIR EDWARD asked why there should not be a marine engineer on the Board of Admiralty. He wanted to impress on the members of this Institute that they had to raise their profession to a level with every other profession in the land, and to have it recognised as it ought to be recognised to-day, as it would be recognised to-morrow, as one of the highest branches of the public services of this great country. So far as he was concerned he should be most glad to ally himself with their distinguished President in rendering the Institute any assistance.

MR. WYMER proposed the toast of “The Visitors” in the following terms:—Mr. President and Gentlemen, I am requested to propose to you a toast which I am sure you will all endorse with pleasure, it is the toast of welcome to the visitors who are with us to-night, and I am sure it is with pleasure in the name of the Institute that I welcome the visitors who have done us the honour to accept our invitation. It is the first time that the Institute has been in the position of Host, and I sincerely trust that such meetings will frequently occur; it gives me much pleasure therefore to propose in the name of the Institute the toast of “Our Visitors” who are with us this evening, coupling it with the name of MR. CATTARNS, a gentleman connected with one of the large shipping firms of this port.

MR. R. CATTARNS who replied, said that he and other shipowners heartily sympathised with the object which the Institute of Marine Engineers was designed to serve. They believed that scientific engineering needed a scientific engineer, and they firmly believed that scientific engineering would be largely developed by that social elevation which this institute sought, and he

thought rightly sought, to bring about. Speaking as a shipowner, and as one having to deal with a very large number of Marine Engineers, he looked, and he knew that other shipowners also looked, to the near future when they would have the opportunity of welcoming marine engineers of a very much higher standard than at the present moment, and they most certainly felt that the sooner that end was brought about the better it would be for the shipowner, as well as for the marine engineer himself.

The company shortly afterwards separated.
