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President: ENGINEER VICE-ADMIRAL SIR GEORGE G. GOODWIN, K.C.B., LL.D.

President's Address.

Tuesday, September 12, 1922, *at* 6.30 *p.m.*

No greater pleasure can come to a man at the end of his career than to be elected President of the Institute bearing the name of his profession and devoted to its interests. I, therefore, appreciate very highly the compliment you have paid me by electing me as your President for the current year, especially as that esteemed honour came to me just I had completed my service as an Engineer Officer of the Royal Navy, continuous service lasting nearly forty years. If, as President, I can during my term of office assist in your endeavours for the betterment of Marine Engineering and the Marine Engineer, I shall be pleased to do so and thereby indicate, in some measure, my gratitude.

It is said, that, when a man retires from long and active service his chief pastime is to review the period during which he served, the occurrences of that period and the progress made in that time. When the pastime includes a comparison with later events, there is frequently a feeling of profound regret that both men and methods have sadly deteriorated. For my part I have not yet experienced such regrets, possibly my case will not be exceptional and developments will mature in the ordinary manner in due course, but I have for a long time indulged in happy and very pleasant reflections on the past.

The changes that have taken place during the period of my service may properly be described as wonderful, those changes have appeared in every direction and most of them, it is pleasing to say, have been highly beneficial and useful. To mention a few of the many instances, the conditions of living, public health, education, recreation, means and speed of locomotion and methods of intercourse have all undergone vast changes, and those changes, some slow, some rapid, but all insistent, have had an effect on the character and life of the nation, greater probably than that of the changes of any previous period of the same duration.

Apparently they have given us a greater love of country. A deeply implanted sense of patriotism has always been characteristic of the British people, the innumerable instances of determination and devotion to duty are among our most cherished traditions, and the rousing of the nation and its kith and kin all over the world and the splendid effort made both by its sons and its daughters during the recent call to arms have intensified our national affection, and provided for us a story of which the race will be proud for all time. There is no doubt that the same underlying affection, consciously or sub-consciously, prompts us in time of peace. The country has always been worth fighting for, and I believe that, engrained in its people, is a feeling that it is worth working for. Pride in the heritage from our forefathers has without doubt stimulated the efforts to maintain its beauties and traditions and improve its life and institutions, and to that end strenuous and praiseworthy endeavour has been made to utilise the changes that science, skill and energy have rendered possible.

In these efforts engineers have taken their full share, and the changes have been as remarkable among them and their work and as influential upon them as on the nation generally. Methods of manufacture have undergone radical changes. Machine tools and shop appliances are now capable of dealing with many varieties of work with a degree of accuracy that has only been equalled by the best of skilled handicraft, and of turning out that work more rapidly and cheaply. The consequence has been that the proportionate number of these highly skilled workmen of whom we were always, and are still, so proud, tends to be a diminishing quantity. Fortunately, however, that smaller proportionate number aggregates, with the greater volume of work, to a very large number, and probably an increasing number, in the various branches of engineering. When James Watt was building his first engines

he complained that he could not get workmen sufficiently skilled to give him an internal cylindrical surface true enough for a gasket packed piston to work in. The changes in men and methods since that time have indeed been remarkable, and the most rapid changes have been made in the later half of the interval. In that period a great deal has been done to improve the hygienic conditions in the workshop, and for the safety of the operatives; also for the welfare and recreation of the workpeople. A contrast of a modern workshop, clean, roomy, well warmed and ventilated, and well organised throughout its details, with the shops of forty or fifty years ago, a contrast that some of us here present are able to make, is striking evidence of the remarkable progress that has been made in our methods and arrangements during that period.

But even more remarkable is the change that has been effected in the education, or rather I would say in the technical training, of the *personnel*. It is only in comparatively recent years that it has been thought necessary or even desirable to give any training to apprentices and boys other than their workshop training, and even that in many cases was arranged without much thought for the boy, it was often subordinated to more commercial requirements.

The changes that have been made so far in the endeavour to combine, measure for measure, handicraft or machine work with a knowledge of engineering principles have already been attended with beneficial results, alike to the apprentice and the master, and they have provided opportunities for lads, gifted above their fellows, to rise to positions of authority and trust which otherwise would have been closed to them.

I am not sure, however, that the best has yet been attained in this direction or that the best means have yet been adopted, and I feel that some of the best work of the future lies in further improvements in our methods of training, and in suiting the quality and degree of the training to the capacity and the intended future of the individual. Youths should always be encouraged to connect the methods employed with the purpose at the beginning and the result at the end and I am inclined to think that such encouragement not only rapidly develops the boys themselves, but proves ultimately to be of considerable all round benefit.

In all these changes and improvements an influence can be traced, sometimes clear, sometimes subtle but nevertheless existent, that of scientific knowledge and power of application

to the problem encountered, the good that has already been effected can be largely attributed to that influence, and it is this that will help us through many of our trials of the future. This fact should be brought home to our young engineers, and exemplified whenever opportunities occur.

In a maritime country like ours, whose very existence depends upon sea communication, it is only natural to expect that ships and the means of propulsion should have participated in the general progress that has been made and that is quite true. Probably greater progress has been made in marine engineering during the last forty years than in any other application of technical science, except perhaps electrical engineering (a new industry in that period, and one therefore in which rapid progress could be anticipated), and even in that fascinating and highly progressive branch, marine engineering has had an important influence in the prior or concurrent development of prime movers of high power and speed. The progress in marine engineering throughout has been such as to make me feel that I have been fortunate in that my life has been placed in this period.

Changes of a far reaching character have taken place in the propelling machinery both of the Navy and the Mercantile Marine, changes which in each service have been mainly of distinct character, but productive of experiences which have jointly been of considerable mutual advantage. In later years the striking changes have perhaps been evinced in the machinery of the Navy more than in that of the Merchant Service on account of the very high powers and speeds that have been required, but it is not always that the Navy has led in this respect. In my early days in the Navy perhaps the slowest steamships on the face of the waters were men of war, and I have taken part in some unauthorised but nevertheless real attempts to race merchantmen, and those not of aristocratic class, in which we were hopelessly beaten. Nevertheless during the long and later period in which this order has been reversed, the Merchant Service has taken a valuable part in developments, the advice and help of its engineering experts have been freely sought and whole-heartedly given whenever required by the Navy, and in such matters the two services have been closely allied for many years. It is probable that, on account of the considerable diminution in Naval Shipbuilding, the Merchant Service will in future take a more prominent part in general developments than in the immediate past,

although it may not do so in those features which are essentially Naval in their character.

The principal changes that have taken place in naval machinery in the period I have referred to are:—

(1) The general change from horizontal to vertical engines, the latter being of short stroke in order to keep the machinery under protection.

(2) The increase in boiler pressure and the change from compound engines to the triple expansion type.

(3) The application of forced draught, in the first place to tank boilers.

(4) The use of locomotive boilers, for a comparatively short period.

(5) The introduction of water tube boilers, and the evolution of the most suitable types.

(6) The use of higher speeds of revolution of reciprocating engines, together with many other devices for reducing weight.

(7) The more recent general introduction of steam turbines and of mechanical reduction gearing.

In the Merchant Service, important increases in power have also been effected, but not to the same extent as in the Navy, and the general features of the great advance that has been made are the concurrent development of such of the means just indicated as are suitable, a larger utilisation of the expansive properties of steam, and a wider and more advanced use of superheated steam, the object being to obtain economical performance of a high degree.

In both services reliability has been the primary consideration, but while in the Navy the main efforts have been directed towards protection of machinery, reduction of weight and endurance, providing for durability and making the best economic performance that those predominating conditions would allow, in the Merchant Service the most important aims have been economy of fuel and a larger measure of durability. In both services the reciprocating steam engine has reached a very high standard of excellence in design and workmanship, its reliability and durability stand very high, it is easily manipulated, and in the Merchant Service, especially in those cases where high steam pressure, a high degree of superheat, and a high ratio of expansion are employed, its performance in point of fuel consumption has reached a very satisfactory stage.

These qualities are now associated with the steam reciprocating engine to such a degree that I am sure it will find favour in the Merchant Service for a long time to come.

This engine, however, is not suitable in marine work for the development of the very high powers required in warships and certain other vessels, and Sir Charles Parsons' application of the steam turbine to marine propulsion has enabled higher powers to be developed and higher speeds to be obtained than would be possible with reciprocating engines.

His further conception and successful evolution of mechanical reduction gearing has also enabled a higher degree of economy to be realised than was possible with the reciprocating steam engine, and this has had its obvious effect in the application of the geared turbine to the cargo steamer of low power. Some practical troubles have been experienced in certain of these ships, but, judging from the more fortunate experiences in the Navy, I think that these troubles will be of a transient nature, and it can be expected that machinery of this type will be widely used.

In recent years the heavy oil engine has received considerable attention for marine purposes, the attraction being, of course, the cheaper cost of running that is anticipated, and it received an impetus during the recent labour troubles resulting in a shortage of coal supplies.

Progress with the heavy oil engine in Great Britain was for many years extremely slow, due presumably to the fact that, unlike other countries in which development had been more rapid, we had cheap and abundant supplies of coal, and had also had an immense and satisfactory experience with, and had reached a high stage of perfection in, the reciprocating steam engine, in fact our commerce had been built up with this engine. The successful introduction of the turbine gave in certain quarters a set-back to reciprocating engines of all types, and this feeling also took a share in the relative retardation of the Diesel engine in Great Britain. For submarine work the oil engine was, and largely is, a necessity, and it was in these vessels that the marine oil engine was first used in this country, the earlier ones being petrol engines and all recent ones of the Diesel type. The Admiralty gave a further lead by fitting some of their auxiliary vessels of lower power with slower running oil engines of more commercial type, and I am inclined to think that the ordering of some of these engines from the Continent

put British engineers on their mettle in characteristic and commendable manner and was the prominent factor in the real start of the industry in this country.

The problems of the Naval fast running and the Merchant Service slow running types of heavy oil engines have many features in common, and as far as these features are concerned the good progress that has been made with both types will be maintained, as heretofore, by the mutual co-operation and exchange of views and accounts of experiences between practising engineers. For the problems that are peculiar to the Naval high speed type, laboratory research and experimental running are essential for development, and the recently organised Admiralty Engineering Laboratory at West Drayton is already doing most useful work in this direction.

Last, but not least, in the period under review great improvements have been made in the status and conditions of service of the personnel, both in the Navy and the Mercantile Marine. This is only fair and just, having regard to the onerous and responsible duties of the marine engineer, and to the attainments necessary to enable him to perform those duties in the manner expected of him. In many cases the improvements have been tardy or are still in arrears, but the claims that have generally been made are not unreasonable, and should not long be delayed.

Now, I think I have been reminiscent long enough. Reminiscences are only useful if we can deduce from them something that can be put to good purpose, otherwise they are recreative or irritating only, and they only affect the individual indulging in them. They are then of no use for engineering purposes, which are primarily and principally not only to advance with the times, but quite frequently to lead the advance. Coming, therefore, to the present we see that we are going through a period of acute depression and comparative inactivity in the shipping world and in the shipbuilding and marine engineering industries. It is very sad to go through our engine shops and shipyards and to see the extent to which our magnificent productive capacity is lying idle. In common with everyone I hope that this state of affairs will not be prolonged and that the industry will soon be restored to its normal prosperity.

But if the industry itself is depressed, I find no such depression among engineers in their regard for their profession. They are as enthusiastic as ever, and I think there is nothing to equal the enthusiasm of engineers for engineering. It is this liking and affection combined with certain natural advantages that

has placed British engineering in the forefront hitherto, and if the same spirit imbues our younger brethren it will keep us there for many years yet. The country possesses these young engineers in large numbers, they are well trained, eager and full of enthusiasm. Taking a long view, the future of British engineering lies with these young men, and with the knowledge that I have of their ability and energy, I have no fear for the future, provided facilities are provided by Institutes such as this and in other ways to enable them to follow their inclination. If this confidence is widely shared it should be very comforting, as the problems of the future will apparently be at least as difficult and exacting as those of the past and probably more so, for the more the secrets of nature are revealed the greater becomes the task of further penetration.

It will be interesting briefly to consider the nature of some of the problems that will have to be faced in the near future by the marine engineer, and the qualities required of him in dealing with them.

(1) The reciprocating steam engine has reached such a stage of perfection that no radical improvement in its performance is expected, and those to whom it is an acceptable type will take it in its present satisfactory form with the greatest confidence.

The steam turbine as a propelling engine is rapidly growing in favour and presents some interesting problems in the practical improvement of its details and in the endeavours to obtain a high thermal efficiency.

In the Merchant Service long running at steady speed, combined with a low fuel consumption at that speed is essential, and design and experience are concentrated on the fulfilment of those requirements.

In the Navy a large power for occasional use is arranged for, but the bulk of the steaming is executed at a very much lower power. Economy at low power has therefore a dominant effect in reducing the fuel bill of the ship. But economy at full power is also important, as the lower the steam consumption at full power the smaller the boiler installation, and this has to be seriously considered in relation to the limited space and weight necessitated in the general design of the ship. The two conditions are antagonistic, the turbine designed for economical working at full power cannot easily be arranged, still having regard to the limitations of weight and space, for economical working also at low powers and the customary way of settling

the conflicting claims is to effect a compromise. Something is sacrificed each way, in economy and in weight.

To arrive at the proper decision, not only is a knowledge of the thermodynamics of the turbine required, but the conditions of working at sea must be brought to bear upon the question, and the best combination of the two will give the most satisfactory result.

(2) In order to combine a high turbine efficiency with a high propeller efficiency reduction gearing has recently been introduced. In this country the gearing has almost entirely been of the mechanical type and in several cases it has brought with it its own troubles, troubles involving problems of a highly interesting character. The troubles take the form of breaking and occasional wearing of the teeth. Experiences have varied. In the Navy mechanical gearing has behaved satisfactorily, the failures have occurred chiefly in the merchant service. A comparison has naturally been instituted into the differences between the conditions of service, methods of manufacture and inspection, and other attendant circumstances in the two services. Time is too short to examine these differences to-night, they have already been, and will be more fully discussed on more suitable occasions, but the point I wish to bring out is that the discussions that have taken place show that the marine engineer, in order to take the important part that belongs to him, must have a clear notion, perhaps much clearer than it now is generally, of the nature of the transmission of power by helical and other forms of toothed gearing, of the action between the teeth, and of the movements of the teeth in contact relatively to one another. In these discussions another situation has arisen, not however for the first time. It has been supposed by some that in certain cases of failure the material has been at fault, and the general impression I have formed is that the suspecting engineer, however warranted his suspicions may have been, has not been able to carry the charge far enough. I have urged for a long time that the practising engineer of the future must possess a better knowledge of physical metallurgy than he generally possesses at present, and by this I mean a general knowledge not only of the mechanical properties of the metals he uses, but also of their structure, and the changes to which they are liable in use, or which can be produced in them by working and by heat treatment. This subject, in its elementary form, must, in the view of many experienced engineers form part of the training of our young engineers, and this matter so much concerns marine engineers that I consider

this address a suitable place to repeat the advice. The matter has been taken in hand by some teaching and examining bodies but not by all; the sooner that general action is taken the better.

Other methods of effecting the reduction between the high speed turbine and the slow running propeller are also being used, chiefly abroad. In America, and to a small extent in this country, electrical gearing has been favoured. It has some advantages over mechanical gearing, but it has also some disadvantages, especially at what may be termed the design stages. As far as I have been associated with such proposals they appear to be expensive in first cost and to require greater weight and space than in some cases can be allowed. Considerable economy in fuel has been claimed for this form of transmission, especially at low speed, and although there is no reason to doubt the accuracy of figures that have been published, care should be taken in making a comparison to ensure that the conditions and attendant circumstances are similar. For example, it is not of much value to compare the performance of up to date machinery of one type with obsolescent machinery of the other, or to compare the results when on the one hand all the circumstances have been favourable, and on the other they have been unfortunate. Diesel engines with electric transmission are also attracting considerable attention on account of the low fuel costs involved and such systems offer some most interesting problems to the engineer. Satisfied that the advantages are real and substantial many minds are working to overcome the disadvantages of electrical transmission that I have referred to, and it is very probable that it will become one of the important problems of the future. The advice of the marine engineer will take a prominent part in guiding the conclusions, and should the system be extensively adopted then marine engineers, or some section of them, will require some additions to their knowledge in order to enable them to take charge efficiently of the additions to the boilers and engines of their ships. Probably those qualified as marine engineers under Government regulations, and holding certificates of competency to take charge of machinery at sea, would require a special endorsement to cover the transmission machinery of this type.

In Germany, hydraulic gearing has been applied to some ships, one of them has been recently added to the Canadian Pacific Co.'s service on the Pacific side, her performance will be of considerable interest, especially in the matter of fuel consumption, as the efficiency of hydraulic transmission is under-

stood to be somewhat low notwithstanding the heat saving devices that can be utilised therewith. This method does not call for other comment from me in this address.

(3) Steam boilers, both of the tank type and the water tube type have been highly developed in this country and the efforts which have been made to obtain the benefit of superheated steam in marine installations especially in the Merchant Service have been most creditable, alike to the designers and to the engineers-in-charge. The problem is affected in the Navy by the fact that although a large measure of benefit can be obtained at full power, it has been difficult to realise any material advantage when the boilers are being worked easily at low power. It is hoped that recent successful experimental work can be applied in this direction with better prospects.

This work and the allied problems, not yet completely solved, of fully utilising the advantages of superheated steam in the various types of turbines will occupy the attention of, and require the best from, engineers engaged in this class of work.

(4) In America, very high boiler efficiencies have been claimed, under certain conditions and with specially designed fittings, which, if maintained on service afloat, will put our engineers on their mettle, and in order to ensure that we shall maintain pride of place, it will be necessary for the marine engineer to whom this problem principally belongs, to have a very wide knowledge, not only of the methods of efficiently burning oil fuels, but of the nature of the fuels themselves, and of the conditions affecting their efficient and economical combustion.

(5) Oil engines for propelling and auxiliary purposes will compel profound consideration for many a long day, and in the near future discussions may take in large part a different form. Before development can proceed much farther we shall have to get farther back into the cause of things, and endeavour to ascertain the nature of the physical and chemical changes which occur during the several stages of the cycle, the conditions affecting penetration and dispersion of the fuel during the period of combustion, the causes and effects of detonation, the nature of the combustion of the oil itself, and the changes of temperature in the gases throughout the cycle. Much more than is known at present must be elucidated respecting temperature changes in the materials exposed to heat, and the manner in which those materials behave and change while undergoing rapid fluctuations of temperature.

All this, and much more, must at the proper stage, be regarded from the engineering standpoint, and that is in the effect of these occurrences and changes upon the suitability and reliability of the machinery for prolonged service at sea. In this exploration, there is probably much preliminary work for the physicist and chemist, and collaboration with other institutions and bodies who are recognised as being more expert in some of the factors will be most helpful, but the experience of the marine engineer, either as manufacturer or as user, will always be most valuable and in many respects indispensable, and it will be incumbent upon him to equip himself in due measure with scientific knowledge to enable him to give his opinions and advice with effect.

The Institute's programme for the coming session indicates the great interest that the members take in the problems of the heavy oil engine, and judged from the titles of the papers, the work of the session in this respect should be instructive and valuable.

(6) The light oil engine has been fitted for propelling purposes in a large number of small craft, and although this application is not largely connected with sea-going engineering, it is interesting to observe that the Royal National Life-Boat Institution has decided, as far as financial considerations will allow, to proceed with a scheme for establishing motor life-boats round our coasts, an action which is significant of the reliability that can now be placed on machinery of this type, and one which cannot fail to be of interest to all sea-faring people and which is deserving of their support.

(7) The methods of lubrication of rubbing surfaces have received considerable attention during the last few years and the correct principles of lubrication are now better understood than they formerly were. The purpose of lubrication is to keep the sliding metallic surfaces apart, and recent applications of these principles have shown that the relative velocity of the sliding parts can often be self-utilised to insert a film of suitable oil between the surfaces, generating the pressure necessary to insert and maintain the continuity of the oil film between the surfaces, the pressure being at the same time sufficient to keep the metallic surfaces from coming in contact. The most notable example is that of the single collar thrust block now in such frequent use in the Merchant Service and universally used in the Navy. The results that can be obtained with such blocks, or rather with the system of lubrication so easily applied with them, as compared

with blocks of the ordinary multi-collar type can truly be described as remarkable. I was profoundly impressed during the trials of the *Hood* when I stood by one of these blocks and reflected that the thrust due to some 37,000 S. H.P. was being transmitted to the ship through a single collar and that, for each of the four shafts, this was being done without any trouble whatever being experienced or any special attention being given throughout the eight hours trial. My thoughts naturally included some relating to the very different circumstances attending on other occasions the working of multi-collar blocks under much smaller mean intensity of load. Such results incite enquiry as to the action that is going on to make them possible, and when that action is fully understood in all its bearings, there assuredly will be many cases which will occur to engineers when the same principles can be applied with substantial gain.

I have taken more time than is really necessary in a brief reference to the few examples I have quoted, but I wished to show that a great deal will be required of marine engineers to enable them to deal efficiently with the problems confronting them, and that it will be necessary for them, individually or collectively, to keep themselves abreast of the advance of the technical sciences bearing upon their work and interests, in order that their experiences may be effectively incorporated in the applications. To this there is no end, the same will be required of the engineer of the future as is demanded to-day, probably more. Demands are as incessant as they are varying and exacting, and the young engineer will have to bear his part in the same spirit as his elders. Progress will not permit of rest, the problem of to-day will become the practice of to-morrow, but that practice, however successful, is bound to be assailed. Competition follows, bringing its own difficulties, its problems and its triumphs and so on in never ending succession. But competition is an important and inspiring factor in progress, its stimulating effects being far reaching and often apparently felt on both sides. The battle that proceeded for some years between the several types of water-tube boilers is a striking example; as one type exhibited or claimed superiority in any particular respect, responses to overhaul this lead were made on behalf of the others, a process which was repeated so frequently that many of the boilers were improved in a very substantial manner and very much to the advantage of the user.

Successful progress often brings its own difficulties, side issues which occasionally develop into large questions. The problems

connected with the corrosion of boiler and condenser tubes may be taken in illustration. No sooner is improvement obtained than a demand arises for better performance corresponding to that improvement. The evil then frequently re-appears, due to other causes such as altered thermal or frictional conditions, and the problem is again presented, for attack in quite a different manner.

Enough has now been said to show that engineers will always have their hands full to maintain the march of progress and the questions arise whether we are sufficiently equipped to deal with the problems that are, and will be, presented to us, and whether our methods are the most efficient for the purpose. In the main I think satisfactory answer can be given to these questions, but a short consideration of some factors may not be out of place.

The most important of them in my opinion is to ensure that the best education and training that is practicable, and which will be the most useful to them in the parts they are going to take in life, is given to our young engineers. This Institute takes great interest in its students and graduate members and is doing its share in the encouragement of these young men. If any improvement is needed in this direction, it may be in fostering a better connection between education at school and training in the workshop or afloat. In a Presidential Address recently given to the Southampton University College Engineering Society, I urged the importance of this connection, and made some outline suggestions for attaining it. In engineering, especially at the present day, both the theoretical and the practical sides have their special values, but they cannot be separated. There must always be experts on either side, but there must also be common ground on which all can meet, and on which views can be on all sides expressed, and heard with respect. Institutions such as this provide in this respect for their members, and for the encouragement of their students, possibly their influence might be advantageously extended further back for the better preparation of younger aspirants.

Many of the problems before engineers, and among them marine engineers, cannot readily be solved without the help of other individuals and associations, and co-operation among those interested should be encouraged by those in authority. It is very pleasing to notice that co-operation of this character is more customary now than formerly and it has been productive of a great deal of good.

Co-operation has played its part in efficient standardisation, both of practice and of details, obtaining the undoubted advantages of standardisation and avoiding at the same time its greatest danger, that of stagnation of progress.

The Institute of Marine Engineers has not been slow in recognising the virtues of co-operation and of practising accordingly. It is represented on those Councils and Committees whose work affects marine engineering, and its advice and help is welcomed and appreciated. Its function should be to see that in all matters relating to marine engineering the voice of the marine engineer is heard early enough to ensure that development proceeds on proper lines, and to carry the impression to all that in the end his opinion must be the paramount one, in order that while all that can be gained by mutual endeavour is utilised, waste of effort is reduced to the minimum. There is nothing unusual or antagonistic to harmonious co-operation in this view, everywhere and in everything the owner or user must finally be satisfied or he will not purchase or use what is offered to him.

In all branches of engineering and in many other professions it is a matter of regret that experiences are not brought as fully as they should be into the common fund of knowledge or into the field of discussion. That is, I think, true in marine engineering. There is a saying in the Apocrypha that "the wisdom of the scribe cometh by opportunity of leisure," and I have often heard that sea-going engineers have no time for writing papers. I rarely accept that as the real reason, the fact in many cases is that they are either too reluctant or feel that what they have to say can be said, and said to the point, in much fewer words than those that go to make up the ordinary paper. Be that as it may, I do feel that a great deal is lost to us by this reticence or reluctance. Contrary to what is sometimes said, the sea-going engineer is a very observant man, he must perforce be so; he is always engaged in diagnosis in which his judgment must be sound or failures will result, and he often has not only to judge but to act promptly to avoid accident or disaster; his judgment is tested by his action. The experiences of these men ought to be available to a much greater extent than they are at present for the general good. Some institutions provide for cases of short papers or descriptions by styling them "Notes," which may or may not be subject to discussion, and a similar method has been adopted by the Admiralty in the circulation of similar information among engineer officers of the Navy. The Institute of Marine Engineers gets very good value

from those who will write or talk, or do both, cannot it also arrange to squeeze the more modest and more numerous portion of its members, for the greater good of all.

Now, gentlemen, I must conclude. I commenced by expressing my pleasure at being the President of the Institute of Marine Engineers, and I will finish in the same strain. The Institute dates from 1889 and its objects are set forth in its Articles of Association, the first being "To promote the science and practice of Marine Engineering in all its branches." The Institute has had that object steadily in view throughout its life and has accomplished most useful work. The outstanding feature of that work is the unique and exemplary manner in which it has associated practice with science, it stands in the front rank of technical institutions in that respect, and in my opinion, it is there that its great value lies. Science and practice can separately be admired, in conjunction they command respect. The standing of an institution is sometimes appraised by the extent of its membership; the members of this Institute now number about 2,700, a roll of which it can well be proud. A satisfactory feature of the membership is the fact that it has been an increasing quantity ever since the Institute was incorporated. Among all these members the Institute has faithfully carried out its other expressed objects, viz.: to facilitate the interchange of ideas and of information relating to marine engineering, to afford facilities for the education of marine engineers, and to improve their status and that of their profession. The benevolent work of the Institute has also been most beneficial and practical.

In carrying out this work, the Institute has been well served by hard working and able office bearers and councillors, and by a very zealous honorary secretary, who has been a most interested and devoted worker for the good of the Institute ever since its inception and incorporation.

The Institute can justly be proud of its past efforts, it can look forward with confidence to a flourishing future, and in wishing it success in its good work I am sure I carry with me the whole of the marine engineering world.

Mr. J. Clark (Chairman of Council): We have listened to an ideal presidential address, and although our President's address is outside discussion according to an unwritten law, perhaps I may be allowed to refer to some of its aspects before formally moving our hearty vote of thanks to him. One

cannot but observe that it touches on all the vital principles which control progress connected with our profession and our Institute. We have always been exceedingly fortunate in our Presidents, and this year our fortunes touch high water mark again. You are aware that Sir George Goodwin was responsible for the engineering side of the Navy for many years; such a position in tantamount to saying that he was head of the marine engineering profession all over the world, and perhaps after our experiences we can form some idea of what this must have meant to him during the stress and strain of such a war as we have successfully passed through. The Navy never stood higher in the estimation not only of our own people but in the critical eyes of the nations of the world, than during the period of our President's responsibility. The spirit of the Navy was and is all right, and a story I heard exemplifies the light-hearted manner both in love and war peculiar to our friend the handyman, who is incorrigible, and always ready for anything at any time. The story goes that a stoker and a seaman on board a certain cruiser about to go into action at Jutland were busy discussing a matter of evident importance when "Action Stations!" sounded. The stoker immediately disappeared down the scuttle, but before he was out of sight he was heard to declare as a parting shot "What I says is, he ought ter 'ave married 'er."

In ordinary business a satisfied staff is a very great and real asset, and it is good to know that our President considers that the claims made in connection with the status and conditions of service of the personnel are not unreasonable and should not long be delayed.

Our Institute, as our President says, takes great interest in its students and graduates, and I feel confident in assuring him that your Council will give his suggestions in this respect their most careful consideration. Possibly we may be able to obtain a copy of Sir George's presidential address to the Southampton College Engineering Society, for I feel sure it would be helpful to us. Our President gives us sound advice on co-operation, and points out the position our Institute should occupy in all things that relate to marine engineering which we cannot afford to neglect.

Gentlemen, I beg to move our cordial thanks to our President for coming here to-night and for the valuable address he has given to us.

Mr. B. P. Fielden (Vice-Chairman of Council): It is my pleasure to second this vote of thanks. Sir George Goodwin begins his address by saying that his election as our President coincides with the end of his career; I hope he means only the end of his official career, as we look forward to many years of his further activity in the engineering world. I was very glad to note his comments in his address concerning the young engineer; I referred to this at our annual meeting, and I would like to see the President's address circulated as far as ever it could be so that the world in general could see what is in front of it in marine engineering. I beg to move a most hearty vote of thanks to our President for his most splendid address.

The vote of thanks was carried with acclamation, and in acknowledging the vote the President emphasised the growing need for facilities being put within reach of the rising generation of marine engineers to learn more about the metals and the characteristics of the materials with which they had to deal. Papers and discussions on practical subjects, and co-operation with other societies such as that indicated in the programme of events for the session, which included the London Branches of the Institute of Metals and the Institute of British Foundrymen—whose meetings were to be held in the Institute premises—all tended to establish a desirable interchange of thought and harmonious working to a common end.

The invitation to attend on the evenings when illustrations of works were shown on the screen would, no doubt, be acceptable to the ladies. The lady graduate had now sailed on her first voyage to sea as a junior engineer of the Holt Line Steamer *Anchises*, and it would be interesting to know the result of her experience on her return.

Before the adjournment of the meeting a film would be shown on the screen in order to test the machine which had been brought for the purpose, in view of the arrangements in hand for illustrating industrial works and enterprise.

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Review of Books Presented to the Library.

COMMON COMMODITIES AND INDUSTRIES. ANTHRACITE, by *A. Leonard Summers.* (*Sir Isaac Pitman & Sons, Ltd.*).—This is a very useful little book, not primarily for engineers, but for all householders, as it deals with the question of economical heating for houses, a subject which appears to have been given very little thought in the British Islands. The days of cheap and abundant coal, however, have passed, and the time has come for a fresh beginning in the matter of design for house warming with a view to economy, efficiency and health, and when one learns that it is possible to keep a whole house heated, with six steam radiators, from one open grate with a special boiler behind, and that a house so fitted has been giving every satisfaction for 10 years without costing a penny for repairs, we realise how lamentably far behind the times we are. Every house owner should read this enthusiastic little volume.

WAVE TRANSMISSION AND THE THEORY OF WAVE TRANSMISSION. *George Constantinesco.* (*Walter Haddon, London*). 10/6.—The first of these books, a pamphlet, gives illustrations of the application of this method of transmitting power, which is on a new principle, and the second volume contains an exposition of the theory underlying the method, which is assisted by mathematical demonstration. The principle by which sound and light are transmitted, and which has made telegraphy possible, namely, the propagation and control of waves or vibrations, is here applied to solid columns of water, contained in pipes, and the compressibility of water, hitherto regarded as practically non-existent, is made use of to reproduce the compression waves at any distance from their source and so operate, through pistons, an engine for the production of power; the essential difference between this method and the ordinary hydraulic type is that the water contained in the pipes does not travel, but whilst remaining practically stationary, is made to transmit pulsation, or waves of pressure in the same manner as the ether does for wireless telegraphy. This ingenious invention, in conjunction with the remarkable Flexstel flexible steel piping, will doubtless find many applications in industry.

BOOK IN JAPANESE.—We have received, by the courtesy of Mr. Hyenohoto, a copy of the Aoba-Kwai Report, the journal of the Blue Leaf Society of marine engineers in the service of the Nippon Yusen Kaisha Line, which contains references to the work of our Institute.

We are indebted to Mr. C. W. Barnes, Member, for the gift of a volume of Notes on the Construction of Cranes and Lifting Machinery, by Edward C. R. Marks, M.I.Mech.E., which will be useful for reference.

The Committee of The British Corporation for the Survey and Registry of Shipping have kindly supplied a copy of their Rules and Tables, which will no doubt be much appreciated by all who desire to refer to them.

Messrs. Dewrance & Co., London, have presented us with a copy of their illustrated catalogue, for which we are grateful. The book is handsomely illustrated, and it would appear that fittings for almost every purpose have been designed and are made by this famous firm, whose name is now a household word amongst engineers.

The Modern System of Naval Architecture (*J. Scott-Russell, F.R.S.*). 3 vols. Published Sept., 1865. Presented by Stephen H. Terry, Member.

These large handsome volumes were dedicated to Queen Victoria in the following terms:—

"To Her Most Gracious Majesty The Queen:

Madam,

Second only to the practice of navigation itself, to a seafaring people, is the art of ship construction; and to no one could be more properly dedicated a treatise on naval architecture than to the Queen of the Maritime Nation, the lady who, beyond all other Sovereigns, is Mistress of the Seas.

"Your Majesty's long and prosperous reign has witnessed such a change in the art of naval construction, as had not before occurred since the first hollow log was launched upon the face of the deep. The general substitution of steam for sails, of iron for wood, of fast fine forms for slow full forms, has made the ancient rules of ship-building a mere matter of history.

"I, therefore, pray your Majesty graciously to accept the dedication of this work, which embodies the experiments, the practical experience, of a laborious lifetime, spent chiefly in the pursuit of engineering and naval architecture."

Time has considerably changed the aspect of engineers and naval architects since the *Great Eastern* was laid down for construction and ultimately launched in January, 1858, after several attempts to persuade her to float on the waters of the Thames.

The volumes are of historic interest, and to those who are interested in tracing the progress of events leading to present day achievements and the possibilities of the future, both the illustrations and the descriptive letterpress will be found useful.

The *Great Eastern* was designed for the Eastern Navigation Co., formed in 1851. I. K. Brunel designed the structure and J. Scott-Russell, Millwall, built the vessel and the paddle engines; the screw propeller engines were built by Jas. Watt and Co., Soho Works, Birmingham.

It was a great disappointment to us onlookers when the ship declined to take the water, but to the builders it was infinitely greater, involving considerable cost and labour, until the day of flotation arrived. The volumes deal with several classes of vessels, both naval and mercantile.

Sir Robt. Hadfield, Bt., D.Sc., has kindly presented a copy of his address on " The Work and Position of the Metallurgical Chemist," which should, we think, be read by every British engineer, chemist, and manufacturer. If ever there was a time when an authoritative and courageous utterance on this subject was needed, it is now, and the brief but powerful summary of the history of Physical Science and the glorious part our nation has played in it should provide a stimulus to still greater efforts in the present and emerging generations of science students.

A copy of " The Principles of Mechanical Refrigeration," by H. J. Macintyre, has been presented by J. Thom, Member of Council. This treatise will be of great value to students, it has been written by a thoroughly competent authority and he unfolds all the mysteries in a way that makes them look really very simple, which is the essence of the teacher's art. A fine example of lucid exposition.

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Election of Members.

Members elected at Council Meeting of 2nd October, 1922.

Members.

William Henry Colpitts, 58, South John Street, Liverpool.
David Dalziel, 11, Albert Mansions, South Lambeth Road, S.W.8.
Harold Drew, 98, Baring Street, South Shields.
John Thomas Edmond, 325, 3rd Street East, North Vancouver, B.C. (Address in England till October 20th, 95, Fort Street, South Shields).
William Forrest, 71, Rochdale Road, Plumstead, S.E.18.
Alfred Tierney Gibson, 17, Corporation Road, Newport, Mon.
John S. Guild, 8, Burdon Terrace, Jesmond, Newcastle-on-Tyne.
Edward Mervyn Hughes, Reid's Chambers, Watt Street, Newcastle, N.S.W., Australia.
Martin Hutchison, 98, Whetstone Lane, Birkenhead.
William Johnston, 12, Thames View Gardens, Seven Kings, Essex.
William Edward Johnstone, 15, Picton Road, Neyland, Pemb.
Dougall MacFarlane, 34, Brisbane Street, Greenock.
Stuart McIntosh, 50, Holywell Avenue, Monkseaton, Northumberland.
Alexander John MacKenzie, 72, Shakespeare Crescent, East Ham, E.6.
Arnold Stewart McLean, Casilla 418, Punta Arenas, Chile, S.A.
Alex. Rogers, 3, St. Andrew's Road, Plaistow, E.
Harry Setford, 58, South John Street, Liverpool.
David Brown Soutar, The Willows, Old Church Road, Whitchurch, Cardiff.
Bernard Stephenson, *c/o* Holden & Brooke, Ltd., Sirius Works, West Gorton, Manchester.
Arthur Closson Widgery, 20, Delafield Road, Charlton, S.E.7.
George Artland Wood, 69, Margery Park Road, Forest Gate, E.7.

Associate-Members.

Walter Henry George Harden, 14, Amherst Road, Withington, Manchester.
Ernest George King, City Fields House, Henlow, Beds.
Russell Peters Nicholas, 29, Wykeham Road, North End, Portsmouth.
Edgar John Williams, 5, Corporation Road, Grangetown, Cardiff.

Associates.

Ernest Head, The Chestnuts, Cumnor Road, Sutton, Surrey.
Walter Alfred Hymas, 301, Westmount Road, S.E.9.
Wilfred Simons, 19, Mount Pleasant, Wolverton Road, Newport Pagnell, Bucks.

Graduates.

Fred. Robert Archdeacon Hutton, 11, Abbeville Gardens, Clapham, S.W.4.
Wilfrid Allan Plummer, E.R.A., R.N., 94, Ashen Grove, Wimbledon Park, S.W.19.

Student-Graduates.

Henry William Howey, Boat Inn, Tweedmouth, Berwick-on-Tweed.
Thomas Robert Lowes, 119, Atkinson Road, Benwell, Newcastle-on-Tyne.
Robert Nesbit Pearson, 154, Hugh Gardens, Benwell, Newcastle-on-Tyne.

Companions.

Alexander Rae Lawson, 22, Loughborough Park, S.W.
Arthur de Wolf Mulligan, 12, New Court, Lincoln's Inn, W.C.2.
Arthur Lewis Rimer, Milburn House, Newcastle-on-Tyne.
William Thomas Rimer, Milburn House, Newcastle-on-Tyne.

Transfer from Graduate to Associate-Member.

Edward O. Stephens, Town Hall, Greenwich.


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