

RE-INVENTING THE WHEEL?

In 1991 CAPTAIN P.C. SANDERSON, then a commander in the Naval Secretary's Officer Policy Section, was the guardian of a cabinet containing many old files concerning manpower policy matters. Judging from the thickness of dust, it was suspected that some of the files had not been disturbed for many years. One of the files contained a report from 1877 on the future of engineering manpower in the Navy. With the closure of Manadon, the birth of Abbey Wood, redundancies etc., an edited version of the report is included in this edition, as a reminder that things have (perhaps) improved in the last 118 years!

For comparison:

£100 in 1870 is worth £3,740 today.

REPORTS FROM COMMISSIONERS, INSPECTORS & OTHERS, 1877

NAVY (ENGINEERS)

Report of the committee appointed to consider the best means of securing the highest mechanical skill and scientific knowledge in the management of the various engines of Her Majesty's Ships of War, and the supply of engineer officers and Engine Room Artificers (ERAs) for Her Majesty's Navy.

Report

In pursuance of instructions from the Lords Commissioners of the Admiralty, we, the members of the committee appointed to consider the best means of securing for Her Majesty's Navy the highest mechanical skill and scientific knowledge in the management of the various engines in ships of war, have carefully examined the regulations and instructions, which have been issued from time to time by their Lordships, respecting the supply of engineer officers and ERAs, and all points connected with their training and position afloat.

We have taken the evidence of 68 witnesses on the subject, including:

- Officers of various ranks in Her Majesty's Navy.
- The General Inspector of Engineering Works of the United States Navy.
- Gentlemen connected with large steam ship companies.

We have visited the dockyards of Portsmouth and Devonport, examining witnesses at those ports and inspecting the factories. Thus we have been enabled to arrive at definite conclusions on those points to which our attention has been directed, and now submit them for the consideration of their Lordships.

We have entered on this enquiry with a full sense of the importance of the subject. No arguments are needed to prove the efficiency of our fleets, on which the strength and security of this country must ever depend, is becoming daily more intimately connected with the care and management of the steam machinery in ships of war. The power of that machinery has increased in amount since the year 1855, from 155,000 Indicated Horse Power (IHP), to 458,000 IHP in 1875. This represents the motive power only of the ships of the fleet, in addition to which the ironclads and other large vessels of the present day, carry numerous engines for duties, which in former days, were performed entirely by manual labour. Indeed, a ship of war, with her powerful engines for propulsion, elaborate machinery for steering gear and capstans, her guns and gun carriages, and all her interior fittings

connected with the various compartments, pumps, pipes and valves, forms one large and complicated machine.

The source from whence officers of that branch of the Service are obtained, who will, under the Officer in Command of the ship, be responsible for the care and management of the steam machinery, the mode of training them in a knowledge of their duties, and the position they will occupy in the fleet, are subjects worthy of much consideration.

The Regulations established by their Lordships in 1863, for the practical and theoretical instruction of the engineer officers of the Royal Navy, with the exception of some points of minor importance, to which reference will be made, are, in the opinion of the committee, well suited to the object in view.

The examination on entry, the six years' practical training in the workshops and steam ships at the dockyards, combined with a certain amount of theoretical instruction in the schools, the subsequent nine months' study at the Royal Naval College, and the selection of two officers annually for a higher course of education, complete a system of training, which, if carefully carried out in all its details, will furnish the Naval Service with a well educated body of engineers, from which officers can be selected to fill any position requiring engineering knowledge and mechanical skill.

We are met, however, on the outset of the enquiry, by a defect of much importance, a defect which is recognised by nearly all the witnesses we have examined, and to which they bear testimony. It is that, notwithstanding the high education to be given, and the position in which the engineer officers will be placed on board the ship as commissioned officers, a large portion of the candidates for entry as engineer students are sons of artificers of various grades in the dockyards, of seamen and marines, or of others belonging to the same class of society.

As it is undoubtedly desirable that officers should be highly educated to perform the duties of naval engineers, and hold the rank of commissioned officers, it is equally desirable that they should be in all respects fitted to take their place with officers of corresponding rank in wardroom or gunroom messes. This evidently cannot be the case with the majority of the students lately entered.

As remedies for this defect, we recommend:

1st.

That in the admission of candidates to compete, more searching enquiries be made of the referees named by the parents (in accordance with the existing regulations), to ensure that the candidates are in all respects eligible for their future position in Her Majesty's Service.

2nd.

That the students should pay a certain sum to defray in part the expense of their education, as is the case in other branches of the Service, and the custom in every other inlet to the profession of Engineer.

If such means are adopted, and if the measures we shall hereafter recommend for the improvement in the pay and promotion of the Engineering Branch of the Service be carried out, it may be expected that a larger proportion of the sons of professional men will be induced to enter as students. We have received evidence that the indiscriminate admission of lads from the lower ranks of society deters officers, and other professional men from allowing their sons to compete for these appointments, although they readily seek admission for them in other branches of the engineering profession. Further, if the regulations for the entry of engineer students, and the prospects of the Engineering Branch of the Navy were made known throughout the country, candidates would probably be forthcoming from inland and northern counties, instead of being restricted, as at present, to the locality of the naval ports.

We have prefaced the detailed portion of our report with the foregoing remarks, as we consider that the point there referred to is one of much importance to the welfare of the Service, and to the full success of any suggestions we may now offer.

Entry and training of engineer students

We recommend that all applications for permission to compete for entry shall be sent to the Admiralty by the 1 April in each year, accompanied by the certificates and references now required by the Regulations.

It appears desirable to extend the age for examination one year, making the limits between 14 and 16 years of age, instead of as at present between 14 and 15. The additional year will give some candidates a chance of a second trial, and will yet admit those who have most ability at the earlier age.

The examination now commences on the first Tuesday in June in each year. The results are not communicated to the candidates until August, the students entering Her Majesty's Naval Service in the following September.

We recommend that the examination should be held in London only by the Civil Service Commissioners, commencing on the first Tuesday in May in each year.

The subjects of examination to be the following:

Subject		Marks	
<i>English</i>	Writing from dictation	75	
	Reading and parsing	75	
	Composition	100	
	Grammar	<u>150</u>	400
<i>French</i>	Translation into English	50	
	Grammar	<u>100</u>	150
<i>Geography</i>			100
<i>Arithmetic</i>			250
<i>Algebra</i>	(Up to and including quadratic equations)		300
<i>Geometry</i>	(the subjects of the first 6 books of Euclid's elements)		<u>300</u>
			<u>1,500</u>

No candidate will be allowed to compete who fails to satisfy the examiners in these subjects. Successful candidates should be bound by indentures, in accordance with recent regulations, and entered at the dockyards on 1 July. They should receive weekly wages, as at present, on a graduated scale, be under the same rules as regards punishments for absence or misconduct, and should pay £25 a year each, during the first three years of their service.

The period now allotted to the practical training of the students during the six years of their apprenticeship, the proportion of that time appropriated to work in the schools, and the distribution of the remaining portion in the various ships and departments of the dockyards, appear to the committee to be well adapted to the object in view, and much benefit has resulted from the instructions issued in May 1873, which direct that a Leading Man shall superintend the students while they are engaged in the various shops, and which require that the examination of the students as to their ability as workmen shall be conducted by the officers of the Steam Reserve, in conjunction with the Chief Engineer of the Yard, and a Chief Engineer of the Fleet.

The committee are, however, of opinion that more supervision and instruction should be afforded to the students while at their practical work, and especially while employed on iron ships under construction. One Leading Man at each dockyard is insufficient for so large a number of students. Any additional expense that may be incurred by affording increased means of instruction will be met by the payment which has been recommended should be made by each student towards the cost of his education.

We also consider it very desirable that during the fifth and sixth years of the student's service in the yards they should receive instruction by lectures or otherwise, on the marine steam engine and boilers, on one afternoon in each week, and to this should be added some means of enabling them to judge of the qualities of different kinds of coal, by inspection and experiment, to determine their relative values for the production of steam.

In order that every encouragement should be given to the students to become good practical workmen, so as to be able skilfully to superintend and effectively carry out any needful repairs to the engine or boilers of HM Ships, we recommend that carefully considered annual reports should be made to the Admiralty, respecting their work in the shops, and that the result of their final examination to ascertain their ability as workmen should be classified as:

- Very creditable.
- Creditable.
- Ordinary.

This to be recorded on the printed annual report of the educational examination which is circulated at the dockyards.

As an additional inducement to the students to improve their skill as workmen, we recommend that two prizes be given annually at each yard, the first of the value of £2 the second of £1, to those who are most highly reported on in that respect.

During the period of service of the students at the dockyards, we consider it of importance that in matters connected with their manual work as artificers in the various shops they should be treated in all respects as other workmen in the Yard; but in order that some distinction should be made with regard to those who will shortly take rank as officers in Her Majesty's Service, we recommend that the students should be:

- Exempted from search by the police on leaving the yard.
- They should not take up and leave tickets on entering to begin work and on leaving, but should sign their names in a book.

Convenient accommodation should also be afforded them for washing, changing their clothes, etc., and taking their tea in the interval between the conclusion of their work and their attendance at evening school.

Before leaving this part of the subject of our enquiry, we think it right to call attention to the great benefits that both students and the Service would derive from the establishment of a residence for the students in the yard, either afloat or on shore, where they would be under the supervision of naval engineers of the Reserve, and would become accustomed to the discipline, which in many cases they find irksome on first appointment to a ship of war. We consider such an arrangement would encourage parents who live at a distance from the sea ports to send their sons up as candidates for engineer studentships, who otherwise would be prevented from doing so by the fear of the unprotected life they would lead when off duty at the dockyard.

Assistant Engineers under training

The students who, having completed their period of service in the yard, pass satisfactorily in both practical and theoretical subjects, should be appointed to the Reserves as Acting Assistant Engineers, and on the following October 1st join the Royal Naval College for a course of study in accordance with the existing Regulations, being placed in the Navy List as 'on probation'.

Having completed their course, as established from time to time, by the Board of Admiralty, they should be examined in the subjects they have studied, and be dealt with as follows:

- Those who take first and second places at this examination should, provided they reach the standard of a 1st class certificate, and have previously passed a 'creditable' examination as workmen, be allowed the option of remaining at the College for further study during two sessions of nine months each.
- Those who obtain 1st class certificates, should receive commissions dated the same day as their acting appointments.
- Those who obtain 2nd class certificates, should receive commissions dated six months after the date of their acting appointments.
- Those who obtain 3rd class certificates, should receive commissions dated the day after their discharge from the Royal Naval College.

The additional time given for 1st and 2nd class certificates, to reckon in all respects as time served as Assistant Engineers. All who obtain certificates, should be placed in the Navy List in the order in which they pass the final examination.

The pay of Acting Assistant Engineers, during the period of study at the College, should be as now, 6s. a day, and they should be allowed 1s. 6d. a day towards their mess expenses.

We recommend that all engineer officers now holding, or who may in future obtain, 1st class professional certificates from the Royal Naval College, and officers who have obtained the first place in each year amongst those who now hold, or who may in future obtain, 2nd class professional certificates, should be advanced to the rank of Chief Engineer after 10 and 13 years' service respectively. These promotions should in all cases depend on the officers having conducted themselves satisfactorily in every respect, and proved themselves thoroughly efficient in the performance of their duties. The above regulations should also apply to engineer officers who hold diplomas of the 1st class, and those who obtained the first place in each year amongst the 2nd class Fellows of the Royal School of Naval Architecture.

We think it desirable not to confine the entry of Assistant Engineers entirely to the students who have been trained in the dockyards, and suggest that a limited number of young men who have received their education in private engineering firms, be entered between the age of 21 and 25, provided they pass the same examination, in all respects, as the engineer students who have completed their time at the dockyards. After their entry they should undergo the same course of study at the Royal Naval College, and receive the same pay and allowances as the Assistant Engineers who have been trained as engineer students.

Engineer officers

Present prospects and number required

The committee have thus far only considered the system of training the engineer students and the Assistant Engineers on their first appointment, and have recommended some modifications of the present regulations, with the view of ensuring a high standard of scientific knowledge and mechanical skill in the officers who fill so important a position in Her Majesty's Fleet.

They now proceed to consider whether the career which appears to be open to those officers after they join the Service—as regards their prospects of promotion, pay, and retiring allowances—is such as to induce well-qualified candidates to offer themselves for entry, and undergo the course of training and study necessary to fit them for the duties they will be required to perform.

The scale of full pay of Engineers and Assistant Engineers is at present as follows:

	One day			One year of 365 days		
	£	s	d	£	s	d
2nd class Assistant Engineer		6	0	109	10	0
1st class Assistant Engineer		7	6	136	17	6
Engineer		9	0	164	5	0
Engineer after 5 years service		10	0	182	10	0

1st and 2nd Class Assistant Engineer generally serve for six years before they reach the rank of Engineers, which rank they attain at about the age of 27.

The term of service as Engineer before promotion is now about 13 years; very few, therefore, reach the rank of Chief Engineer before the age of 40 years, the average age of the 21 senior Engineers on the list eligible for promotion being now about 41 years.

The age and length of service at which an Engineer obtains his promotion to Chief Engineer is increasing every year. In 1866 the period of service from entry until the rank of Chief Engineer was reached was about 12 years, it is now about 19¾ years, and during the last eight years of this period he has received the maximum pay of his rank, which is 10s. a day.

Officers holding the rank of Engineer, who are qualified for promotion, are allowed to retire in a pension at the age of 50, at the rate of £6 for every year of service. Engineers who are not qualified for promotion may retire on the same terms at the age of 45. The maximum pension allowed in both cases is £130 per annum.

The committee are of opinion that in consideration of the important nature of their duties, the age at which promotion is obtained in other branches of the Service, the high educational standard now required, and the actual marketable value of the knowledge and skill the engineer officers possess, their prospects of promotion and the amount of pay they receive are insufficient.

There are at present 170 Chief Engineers and 735 Engineers and Assistant Engineers on the active list of the Navy. So long as this proportion is continued the evils of slow promotion must exist, unless an extensive and costly scheme of retirement be carried out, which we are unwilling to suggest.

We think it desirable that the number of Chief Engineers should be increased, and in consideration of the greater indicated horse power now developed by the engines of the smaller vessels, as well as to prevent the serious inconvenience of retaining a large number on half pay, we recommend that Chief Engineers should be appointed to every ship commanded by a commander. This would raise the number of Chief Engineers from 170 to about 220, which will provide a sufficient number for the present requirements of the Service.

We are further of opinion that the number of engineer officers in each ship might be advantageously reduced, and the places they now occupy filled by ERAs. In this opinion we are supported by the testimony of a large proportion of the witnesses we have examined on the subject.

The number of officers in the engine room of a large ship is out of proportion to the number of men under their control; this is, in a great measure, in consequence of their being required to carry out repairs to the engines and boilers. The committee are very desirous to ensure that every engineer officer in the Service shall possess in a high degree the mechanical skill necessary for superintending any ordinary or extraordinary repairs, and when required of performing them himself, but it appears undesirable to train and educate a large body of officers for the purpose of doing work which can be as efficiently and more rapidly done by artificers, more especially as artificers can be obtained who are skilled in the

knowledge of the various special trades necessary for the repairs of engines and boilers, with several of which trades the engineer officers can necessarily be but imperfectly acquainted, such as that of the boiler maker, smith and coppersmith.

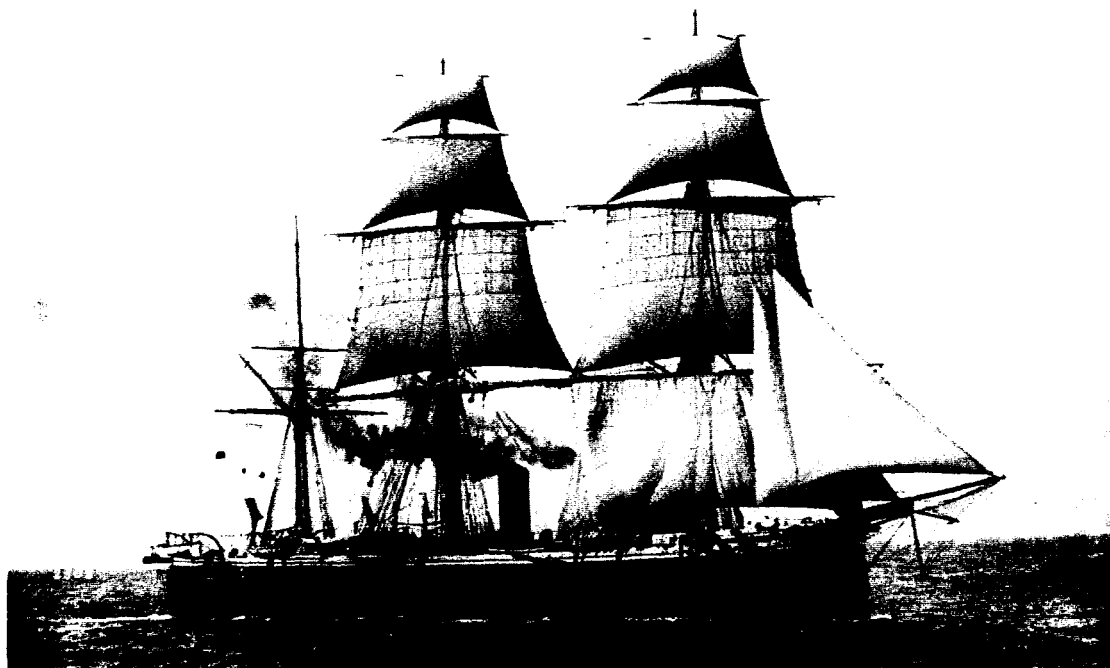


FIG. 1—HMS 'SULTAN' IN 1886

AN IRON CENTRE BATTERY SHIP OF 1870.
SHE CARRIED EIGHT 10 INCH AND FOUR 9 INCH RIFLED MUZZLE LOADING GUNS.
ARMOUR UP TO 10 INCH THICK, SHE COULD REACH 14 KNOTS UNDER STEAM.

We have carefully considered this point as bearing in an important degree on the object of our enquiry. Taking the *Sultan* (FIG. 1) as a type of the largest class, which bears now:

- 1 Chief Engineer.
- 9 Engineers and Assistants.
- 4 ERAs.

We recommend that she should bear:

- 1 Chief Engineer.
- 5 Engineers and Assistants.
- 8 ERAs.

In other ships the numbers are altered in about the same proportion. Some modifications are necessary in ships like the *Inflexible* (FIG. 2) with two distinct engine rooms. In all ships having engines of 2,500 IHP and upwards there would be engineers enough to have one always on watch in the engine room.

The numbers required to complete the complements of all ships fit for service, including those for Home Service, and also of ships in an advanced state for building, in accordance with the scale we have suggested, are:

Chief Engineers	Engineers and Assistant Engineers	ERAs
232	694	835

If the number in each class were completed to the amount here indicated, a large proportion of them must necessarily be unemployed, which is in all respects undesirable; therefore, although we are of opinion that Chief Engineers and Engineers should be borne in sufficient numbers, nearly to meet our requirements

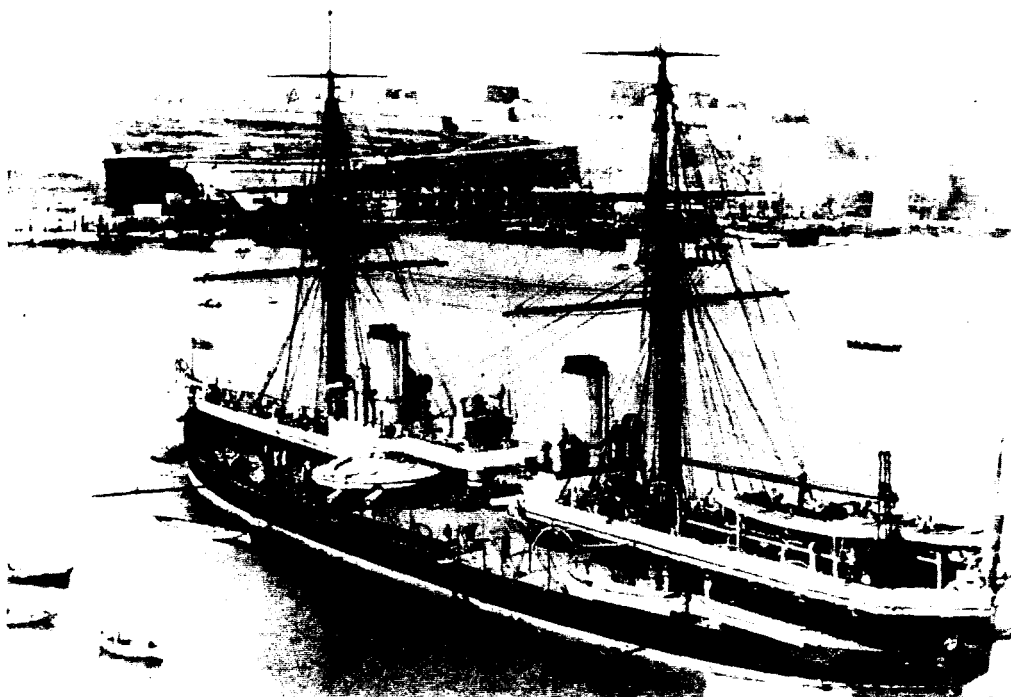


FIG. 2—HMS 'INFLEXIBLE'

SHE HAD THE THICKEST ARMOUR OF ANY RN SHIP—24 INCHES.
 SHE HAD THE BIGGEST RIFLED MUZZLE LOADERS (HYDRAULICALLY WORKED)
 SHE COULD STEAM AT 14 KNOTS.

at the outbreak of war, as officers with the necessary qualifications could not then be readily obtained, we propose that the number in each rank should be limited during peace time to the following:

Chief Engineers	Engineers and Assistant Engineers	ERAs
220	600	450

During the war the number of engineer officers on leave, on half pay, and in the dockyards would be less than at present.

The proportion of engineer officers and ERAs we have suggested for each ship should be modified, so as to furnish employment for them afloat. As we do not apprehend any difficulty in procuring ERAs at the present time, or serious difficulty at the outbreak of war, the numbers entered might be limited to the actual requirements of the Service.

The number in each class now borne for active service is:

Chief Engineers	Engineers and Assistant Engineers	ERAs
232	694	835

The measures which we shall propose will enable their Lordships to make the necessary changes in the number of each class, either gradually or immediately, as may be found most beneficial for the Service. Those measures will consist of:

1. An increase in the number of Chief Engineers, as already mentioned.
2. An improved scale of retirement for Chief Engineers.
3. An improved scale of retirement for Engineers.
4. A progressive increase in the pay of Engine Room Artificers, and other advantages for that class.

Assistant Engineers

The committee consider that the rank of Assistant Engineer of the 2nd Class is unnecessary, and should not be retained, but that the two classes should be merged into one, and the whole termed Assistant Engineers; after 4 year' service they should be allowed to pass for the rank of Engineer, and five years' service should render them eligible for promotion.

If the number of Engineers in each ship be reduced in accordance with our suggestions, it will then be necessary to afford opportunities for the Junior Assistant Engineers to become practically acquainted with the management of engines more immediately after their first entry into the Service than is the case at present, in order that they may be sooner fitted to take charge of a watch in the engine room of large ships. With this object we recommend that on leaving the College on 30th June of each year, they should be appointed to Troop and Store ships, and to the Indian troop ships, in addition to the complement, for six months or longer, and keep watch in the engine room and stokehold under the superintendence of the Engineer on duty.

Pay of Assistant Engineers and Engineers

The following table shows the scale of full and half pay, which we recommend for Engineers and Assistant Engineers:

	One day			One year of 365 days		
	£	s	d	£	s	d
Full Pay						
Assistant Engineer, over 1 year service	7	6		135	17	6
Engineer	9	0		164	5	0
Engineer, over 3 years service	10	0		182	10	0
Engineer, over 9 years service	12	0		219	0	0
Half Pay						
Assistant Engineer	4	6		82	2	6
Engineer	5	6		100	7	6
Engineer, over 3 years service	6	0		109	10	0

Retirement of Engineers and Assistant Engineers

When the number of Chief Engineers has been completed by promotions from the Engineers' List, there will yet remain more on that list than are required; and as by the existing regulations no means are available for reducing the number, seeing that the Engineers qualified for promotion cannot retire till the age of 50, and those not qualified until the age of 45, we recommend the following regulations for the retirement of officers holding the rank of Engineer and Assistant Engineer.

Engineers to be retired at the age of 45 years, or at any age if they have not served on full pay for 3 years, or if physically unfit for service; to have the option of retiring at the age of 40 years, at the discretion of their Lordships, if their services are not required.

The amount of retired pay for Engineers qualified for promotion to the rank of Chief Engineer, to be £7 10s per annum for each year's service on full pay since the date of confirmation as Assistant Engineer—half that amount for each year on half pay; the maximum amount to be £170 per year. For Engineers not qualified, £7 per annum for each year's service on full pay, since the date of confirmation as Assistant Engineer—half that amount for each year on half pay; the maximum amount to be £150 a year.

Engineers with a total service of 20 years on full pay, may be retired with the rank of Chief Engineer, if they are qualified for promotion, and have served creditably.

Assistant Engineers to be retired at 40 years of age, or at any age if they have not served on full pay for three years, or if physically unfit for service. The amount of their retired pay to be £20 per annum under 3 years' service, £25 per annum after 3 years' service, and £5 per annum for each additional year's service on full pay—half that amount for each year on half-pay—until a maximum of £50 per annum is reached.

Messing of engineer officers

It cannot be questioned that much advantage would accrue to the Service if the Engineers' Mess could be at once abolished, the senior members of it being transferred to the Wardroom Mess, and the juniors to the Gunroom Mess. We have stated our opinion in the early part of this report, that such transfer cannot be made at once, but we must express a hope that when the number in each ship is reduced, and candidates for entry offer themselves from a high class of society than at present, their Lordships may see fit in a very few years to carry out this desirable object. We are convinced that such a change would prove the greatest inducement that could be held out to members of the various professions to educate their sons for this branch of the Service, which is becoming daily of more importance, and for which thoroughly well qualified men are required.

The system of admitting Chief Engineers and Engineers 'in charge' to the wardroom has proved so beneficial, that we recommend an extension of that system at once, by allowing Engineers of 8 years' standing in that rank to mess in the wardroom if they desire it, provided that not more than two in each ship are permitted to avail themselves of this privilege.

Cabin accommodation

We also urgently recommend that a cabin should be provided for the two Senior Engineers to sleep in. These officers will be about 35 years of age, and although we are aware of the great difficulty which exists in many ships with regard to cabin accommodation, we are of opinion that the Service would benefit by such an arrangement.

Chief Engineers

The committee have already suggested that the number of Chief Engineers should be increased in order that officers of that rank should be appointed to all vessels commanded by Commanders. This would raise the number to about 220, and combined with our other recommendations, will probably reduce the average age of promotion to the rank of Chief Engineer from 42 to between 37 and 40.

This is still a high average for promotion to a rank equal to that which is reached much earlier in other branches of the Service, and we are of opinion that some improvement in the pay of the Chief Engineers during the earlier years of their service in that rank is desirable, as many will still be compelled to retire, as at present, before they reach the maximum pay to which they would be entitled if promoted at an earlier age.

Full and Half Pay

The committee, although siding to propose more regularly progressive scales of full and half-pay based entirely on service as Chief Engineer, have found it necessary to suggest the continuance of the existing system of allowing junior service to be reckoned as follows:

Under 5 years' service in Senior Rank, 2 yrs' Junior Service besides
 Under 8 years' service in Senior Rank, 4 yrs' Junior Service besides
 Under 11 years' service in Senior Rank, 6 yrs' Junior Service besides
 Above 11 years' service in Senior Rank, all Junior Service which is allowed to count.

The committee recommend the following scales of full and half-pay for Chief Engineers, and that all confirmed time served in the junior ranks from the age of 20 be allowed to reckon for Junior Service in the proportions specified above.

	One day			One year of 365 days		
	£	s	d	£	s	d
Full Pay						
Under 5 years service (incl Jr Service allowed)		14	0	135	17	6
Over 20 years service (Inc Jr service allowed)	1	0	0	365	0	0
And for each additional years of service 1s a day more until the maximum is reached, namely	1	2	0	401	10	0
Half Pay						
Under 5 years service (incl Jr Service allowed)		5	6	135	17	6
Over 25 years service (Inc Jr service allowed)		16	0	292	0	0

Retirement

The committee also consider that it would benefit the Service if encouragement were given to the Chief Engineers to retire after the age of 50, by allowing them to reckon in the same manner as suggested for full and half-pay, all the time they have served since being confirmed as Assistant Engineers of any class, provided that at the time of confirmation they had reached the age of 20.

The existing scale of retired pay for Chief Engineers appears to the Committee to require no change, except that no Chief Engineer, when placed on the Retired List, should receive a smaller amount of retired pay than he would have been entitled to on retirement as an Engineer. We have already suggested, that all time served as Assistant Engineer of any class (and as 3rd Engineer prior to 1847) should be allowed to reckon towards the period of service which regulates the amount of retired pay, and it appears desirable to retain the regulation by which Chief Engineers must retire at the age of 55, and have the option of retiring at 50. We recommend that those who retire after 30 years' meritorious service may be placed on the Retired Lists as Inspectors of Machinery.

Extra Pay

The scale of extra pay allowed to Chief Engineers and Engineers in charge of Engines, by the recent Circular No 49 AG 1875, is quite in accordance with our views; and we would also allow the Senior Engineer in ships with engines of 3,000 IHP and upwards, an addition of 1s a day, in order that an officer selected for so important a position should not receive less in pay than if he had been placed in charge of engines in a small ship.

Chief Inspectors and Inspectors of Machinery

It has been brought to our notice by the evidence we have received, that Chief Engineers have, in several instances, declined promotion to the rank of Inspector of Machinery, the reasons alleged being, that they would have a prospect of remaining on half-pay for one or two years after being promoted, and that the higher rate of full pay of Chief Engineer, with the extra pay when in charge of large engines, or the allowance when serving in a Flag-ship, is actually greater than that of an Inspector of Machinery.

We think it desirable that the highest rank to which an Officer in the Engineering branch of the Service can attain should be eagerly sought after as an honourable and substantial reward for long and meritorious service, and that the responsible duties which an Inspector of Machinery is required to fulfill, should be adequately remunerated.

Full and Half Pay

We recommend therefore that Chief Inspectors of Machinery should receive as full pay, 35s a day, and Inspectors of Machinery 30s a day. The officers holding the appointments of Inspector of Machinery at the Reserves at Portsmouth, Devonport, and Chatham, should receive an additional 3s a day.

The half-pay of Chief Inspectors of Machinery to be 20s a day, and of Inspectors of Machinery, 18s a day.

Retirement

The retired pay of both ranks to be reckoned on the same scale as at present, but they should be allowed to count their time for retirement from the age of 20 in the same way as Chief Engineers. Chief Inspectors should rise to a maximum of £500 per annum, if entitled to that amount by their term of service before the age of 60.

Title

The addition of a the word 'Afloat' to the title appears to be no longer necessary, especially as in some instances a Chief Inspector will have charge of all the machinery in the dockyard.

Number

We recommend that power be retained to increase the number of Inspectors to seven, but vacancies on the list need not be filled up unless officers of that rank are required.

Engineer officers—rank

We recommend that the following changes be made in the relative rank of Engineer Officers:

Chief Inspectors

To rank with captains over 3 years standing (seniority of captains to be reckoned from the time they complete 3 years in that rank).

Inspectors of Machinery

To rank with captains under 3 years, according to seniority.

Chief Engineers (of more than 10 years' standing)

To rank with commanders, according to seniority, instead of those of 15 years, as at present.

Engineers (of over 8 years' standing)

To rank with, but after, Lieutenants.

Assistant Engineers

To rank with, but after, Sub-Lieutenants.

The engineer officers of the Navy are at present classed with the civil branch of the Service as distinguished from the military or Executive Branch. This distinction appears to be no longer necessary. The Chief Engineer has a large body of men under his orders, many of whom are quartered at guns, and have to take an active part in action. His duties are in many respects executive, more so than those of the carpenter, who is classed with the Military Branch. We are therefore of opinion that engineer officers in future should be classed with the Military or Executive Branch of the profession, among those who would not on any occasion succeed to 'Command'.

ERAs

If the measures proposed by the committee respecting the reduction of the number of Engineers in each ship be carried out, it will be necessary to take steps for the entry of a larger number of ERAs. We have, in the course of our enquiry, obtained the evidence of numerous witnesses respecting the qualification of the ERAs now in the Service, and have also endeavoured to ascertain the general opinion existing among themselves with regard to their pay, prospects, and position on board a ship of war.

We find that the ERAs already entered are considered to be fair average workmen, capable not only of conducting repairs in their respective trades with celerity and efficiency, but of soon learning to assist each other in every description of work they are also considered well qualified to take charge of the watch in the stoke hold, and, after a few years experience, to keep watch in the engine room of small ships, under the supervision of the Engineer in charge.

We have, however, learnt from various sources, that they do not feel that they are treated when afloat in such a manner as to make them reconciled to a sea life, or to encourage others to join the Service.

ERAs who have served their apprenticeship as fitters or boiler makers, and have thus placed themselves in a certain position of independence, join the Naval Service at an age of between 20 and 30, having already contracted the habits of their class on shore; they have been accustomed to:

- Regular limited hours of work.
- To pass their Sundays at home.

and on returning from their daily work to find:

- Their meals ready.
- Their house cleaned for them.
- Themselves relieved from all supervision and work other than that of their trade.

On board a ship of war they find themselves surrounded by men who have been brought up to a different system from boyhood, and who cannot therefore understand that the habits of their own ordinary course of life may prove a hardship to others, who for many years have been accustomed to an entirely different mode of living.

The ERAs appear to have no objection to the nature of their work as artificers, either afloat or in the Reserve, but they find themselves uncomfortable when off duty, their principal causes of dissatisfaction seem to be that in some ships they have to:

- Clean out their own mess.
- Prepare their own meals.
- To be under the control of the Master-at-Arms as regards obtaining leave to go on shore.

The pay that the ERAs receive on entry appears to be insufficient to enable us to procure the best qualified man, and as no increase of pay is offered after 10 years' service, it is highly probable that the men now in the Service will leave it at the expiration of their first term of servitude, especially if they have such qualifications as will ensure them employment as engineers in the merchant service, or otherwise in the private trade. Some men who have previously served as Chief Stokers may form an exception, but the number will be very small.

We think it desirable that the Naval Service should be enabled to obtain thoroughly well-qualified mechanics as ERAs, whatever may be the state of the iron trade; the terms offered and position accorded to them as skilled workmen on board ship should be such as would induce a large number to enter at short notice in the event of war, when we should find those already in the Service would prove

to be a valuable reserve of men, capable on an emergency of performing in some measure the duties of Naval Engineers.

Entry, pay and position—Rating of Chief ERA

We recommend the following modifications in the existing regulations respecting the entry, pay and position of ERAs. A candidate should be between the age of 21 and 30 years, and be either an Engine Fitter, Boiler Maker, Engine Smith, Coppersmith, or a Pattern Maker. Of these two last mentioned trades very few will be required. An ordinary Blacksmith should not be considered eligible for entry as an ERA.

In addition to the examination now considered necessary to ascertain the qualification of a candidate, he should be called upon to show proof of his knowledge of his trade, as well as to produce his indentures, or other evidence of his previous training.

He should be examined as to his knowledge of the names and uses of the principal parts of a marine boiler, as well as of a marine engine, as now ordered.

Before being confirmed in his rank at the expiration of a years' service, he should obtain a certificate from the Chief Engineer, or Engineer in charge, approved by the Captain that he is capable of taking charge of a watch in the stoke hold, and has proved himself an efficient workman.

We propose that Engine Room Artificers should receive the following pay:

For the first 3 years	5/6 a day
For the next 3 years	6/- a day

After serving six years, an ERA should be eligible for promotion to the rating of Chief ERA, by the Admiralty if on a home station, or by the Commander-in-Chief if on a foreign station, provided that there is a vacancy on any ship on the station, and that the ERA is qualified as follows:

- He must have obtained a certificate from the Chief Engineer, or Engineer in Charge, approved by the Captain, that he is capable of being entrusted with the charge of a watch in an engine room.
- That he has borne a 'very good' character for the last three years.
- Is a thoroughly efficient workman at his 'trade'.

A Chief ERA should be paid according to the following scale:

Under 3 years as Chief ERA	6/6 a day
Over 6 years as Chief ERA	7/6 a day

An ERA who does not obtain promotion to the rating of Chief ERA should receive 6/6 a day after ten years service.

About one-half the ERAs in each ship should be Chief ERAs. Each increment of pay should be given only if character has been very good for the previous twelve months. The Captain should have the power of disrating a Chief ERA to an ERA, and of reducing the pay of either 6d a day, for a limited period, for each case of aggravated misconduct, but the pay should not be reduced below 5/6 a day.

The Chief ERAs should rank next after the Writers, 1st Class.

Mess

We recommend that all the ERAs should mess together, forming a separate mess, and that a suitable place should be fitted up for them in the neighbourhood of the engine room. Measures should be at once adopted to carry out this necessary provision, by directing the officers of the Reserves to forward plans for this object in every ship now fitting out.

We are of opinion that it is entirely in the power of the Commanding Officer to make this useful class of men comfortable when afloat, and in a short time reconciled to the inconveniences inseparable from a life on board ship, without any relaxation of that strict discipline which is absolutely necessary in a ship of war. Bearing in mind the habits of life to which the artificers have been accustomed on shore, the age at which they join the Navy, and the important nature of their duties, it will be very desirable to make a few simple regulations respecting:

- The mode of obtaining leave to go on shore.
- The care of their mess-place.
- The care of their hammocks.
- Their washing arrangements.

These and all other respects to be placed as much as possible under the control of the Chief Engineer, who is best acquainted with the duties they are required to perform, and whether they can be spared from the engine room. We recommend, therefore, that directions be given to ensure that these apparently minor points are carefully attended to by Commanding Officers, we believe that the benefits which should result from the employment of ERAs are mainly dependent on them.

Chests

We recommend that they be allowed chests of the following dimensions:

	ft	in
Length	3	4
Height	2	0
Width	2	0

We have ascertained by actual measurement that the chests now allowed, which are somewhat smaller than the dimensions here given, are not large enough to contain their full kit.

Extra pay

When Chief ERAs are employed on other ships than those to which they belong, under circumstances which entitle them to extra pay by the regulations, they should receive 3/6 a day, and ERAs, 3/- a day while so employed.
