PROGRESS, PRODUCTION AND PLANNING ORGANIZATION

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Although some thought had been given to Supply, Production, and Labour questions in the between-war years, it was not until 1942 that the Ministry of Production came into existence. Questions of supply for the three Fighting Services were dealt with by the Admiralty, the Ministry of Supply, and the Ministry of Aircraft Production. A very careful balance had to be made between materials available, manufacturing capacity and labour and allocation of these resources between the three Fighting Services.

Departmentally, the Engineer-in-Chief's task was to maintain the closest contacts with the various Admiralty departments set up to deal with these problems, *e.g.*, Production and Priority Branch, Labour Branch, etc., and with other Ministries, particularly the Ministry of Supply. In addition, experience soon proved the need for a Departmental progress and production planning organization.

War History

As the war progressed, it was found that delays were continually arising, usually in minor items, which, although small in themselves, were sufficient to delay the completion of ships. The pre-war routine by which Engineer Overseers reported progress by monthly returns was found inadequate under war conditions ; main contractors had to follow up their own sub-contracted items, and naturally the larger firms exerted pressure on their sub-contractors. In many cases they received their sub-contracted items earlier than essential for the overall progress of the ships concerned. Although not serious in peacetime, this system under the pressure of war conditions resulted in delays, generally with the smaller main contractors. In 1941, for example, the demand for steel castings overtook the supply, and serious delays occurred in the completion of destroyers' main turbines. In order to overcome this bottleneck the Material Section placed orders with the steel founders, and allocated the castings to the various main contractors to fit in with the building programme as a whole. This system worked well, but experience soon proved that better allocations could have been made had we been better informed of the actual progress in the various Yards. Moreover, castings were not the only bottleneck, and fresh delays continued to crop up quite unexpectedly, due to the lack of the necessary detail at Headquarters.

Setting up Progress Section

Early in 1943 it was therefore decided to set up a Departmental Progress Section at Headquarters with the following duties :—

(1) To keep the E.-in-C. fully informed as to the progress of the machinery of every ship (other than minor vessels and craft) in the building programme.

(2) To assist main machinery contractors and sub-contractors to overcome difficulties in supply.

(3) To keep a check on the load on contractors in order to avoid overloading —contractors were notoriously reluctant to refuse a contract. As a corollary to this function, the Section had to advise where additional work, such as large damage repairs or replacements, could be undertaken without delay or dislocation of new construction programmes.

(4) To produce and keep up-to-date orders of priority for the supply of auxiliary machinery and important basic materials to main and auxiliary machinery contractors.

(5) To allocate to main machinery contractors their supplies of steel castings, fabricated turbine and gear casings, large forgings, boiler drums, propellers, etc.

(6) To provide up-to-date information for the Controller's Monthly Production Meetings.

The Section consisted of one Commander, two R.N.V.R. Lieutenant-Commanders, one senior draughtsman, one temporary draughtsman, one temporary clerk, one typist and a temporary (woman) clerk, part time.

The duty of the three Naval Officers was to visit and report on the position at all the main machinery contractors and selected sub-contractors once a month. Reports were made on each visit, giving full information on the progress of the work at the firm visited, and drawing particular attention to any items which were holding up or threatening to hold up work, and also on any labour problems. These reports were forwarded to the section at Bath, with a covering note, showing what action the Progress Officer was taking and in what way the Headquarters section could help. During these visits the Progress Officers always maintained the closest contacts with the Overseers and with Admiralty Regional Officers on labour questions. The round of visits took about three weeks, and all Progress Officers returned to Bath for the week covering the Controller's Monthly Meeting. The duties of the civilian staff of the section at Headquarters were :—

(1) To scrutinize the reports of the Progress Officers, and distribute copies or extracts to those concerned.

(2) To keep a card index (or charts) of all information on progress.

(3) To prepare or revise priority schedules for the guidance of auxiliary machinery contractors.

(4) To allocate sources of supply of important materials.

(5) To inform the Deputy E.-in-C. immediately of any threats of delays, and to take any corrective action on his instructions.

This system worked extraordinarily well ; contractors and overseers soon appreciated the value of those visits and co-operated with the Progress Officers in their work. As a result we had early warnings of threatened bottlenecks and so were enabled to take early action to clear them ; in the later years of the war, machinery delays became more the exception than the rule. The one

bottle-neck we could not clear was that of labour, where even putting the particular machinery item on the designated list did not necessarily mean getting the additional labour to clear the bottleneck.

Planning

The section soon settled down to the routine, and it was not long before it began to undertake the other essential feature of successful production, namely planning. As soon as a new shipbuilding programme was approved, the section prepared a tentative programme of work in relation to the capacity of the firms concerned and the completion dates required. From the knowledge gained by the Progress Officers we were able to establish a capacity figure for each main machinery contractor, *i.e.*, how many lines of machinery (or sets of machinery units) they could complete in a year ; *e.g.*, William Denny was expected to complete machinery at the rate of two ship sets for destroyers and two ship sets for sloops every ten months. Allowing a sloop set to be approximately equivalent to half a destroyer set, this made Denny's capacity six lines of machinery in ten months, or just over seven a year. At the other end of the scale the peak capacity of the Wallsend Slipway & Engineering Co. was 24 lines a year. This planning work was of the greatest assistance, as prior to this, orders for new construction were placed where building slip capacity was available, without any consideration to machinery. This frequently entailed placing an order with a firm whose shipyard side was large enough to undertake the work, but whose engine side would have been overloaded. In such instances we were able to make proposals for relieving the engine side of the firm by sub-contracting the whole or part of the machinery order elsewhere. In later days, E.-in-C. was usually consulted before the order was placed, to ensure that the engine side of the firm was capable of taking on the order as well as the ship side.

Another interesting result of this investigation was to show that many of the initial delays in the building programme were inevitable as the order for the machinery had not been placed early enough. In general, boilers and main turbines must be completed in the shops before the launching date. To meet this requirement the heavy castings and forgings must be delivered to the main machinery contractors' works some 9 to 12 months before the launching date, and the firm supplying these castings and forgings must receive their orders in time to comply with this requirement. With a short time for building, say 18 months, the order for machinery must obviously be placed well before the laying-down date. Unless this is done, completion of the ship is bound to be delayed by the machinery even if the shipbuilder can complete his side of the work in the time allotted. Actually, this applies to other equipment, electrical and ordnance, as well as to the propelling machinery. At the height of the building programme the Controller laid down certain target building periods for the various classes of ships.

Fleet Carrier	36 months
Light Fleet Carrier	24 months
Cruisers	24 months
Large Destroyers	18 months

Provided we were able to plan the programme and place the orders for castings and forgings in time, our machinery contractors could meet those dates ; but they were very tight on the installation side, and any delay in the delivery of machinery, electrical and ordnance items particularly, before the launching date would certainly cause a delay in the completion.

Small Ship Planning

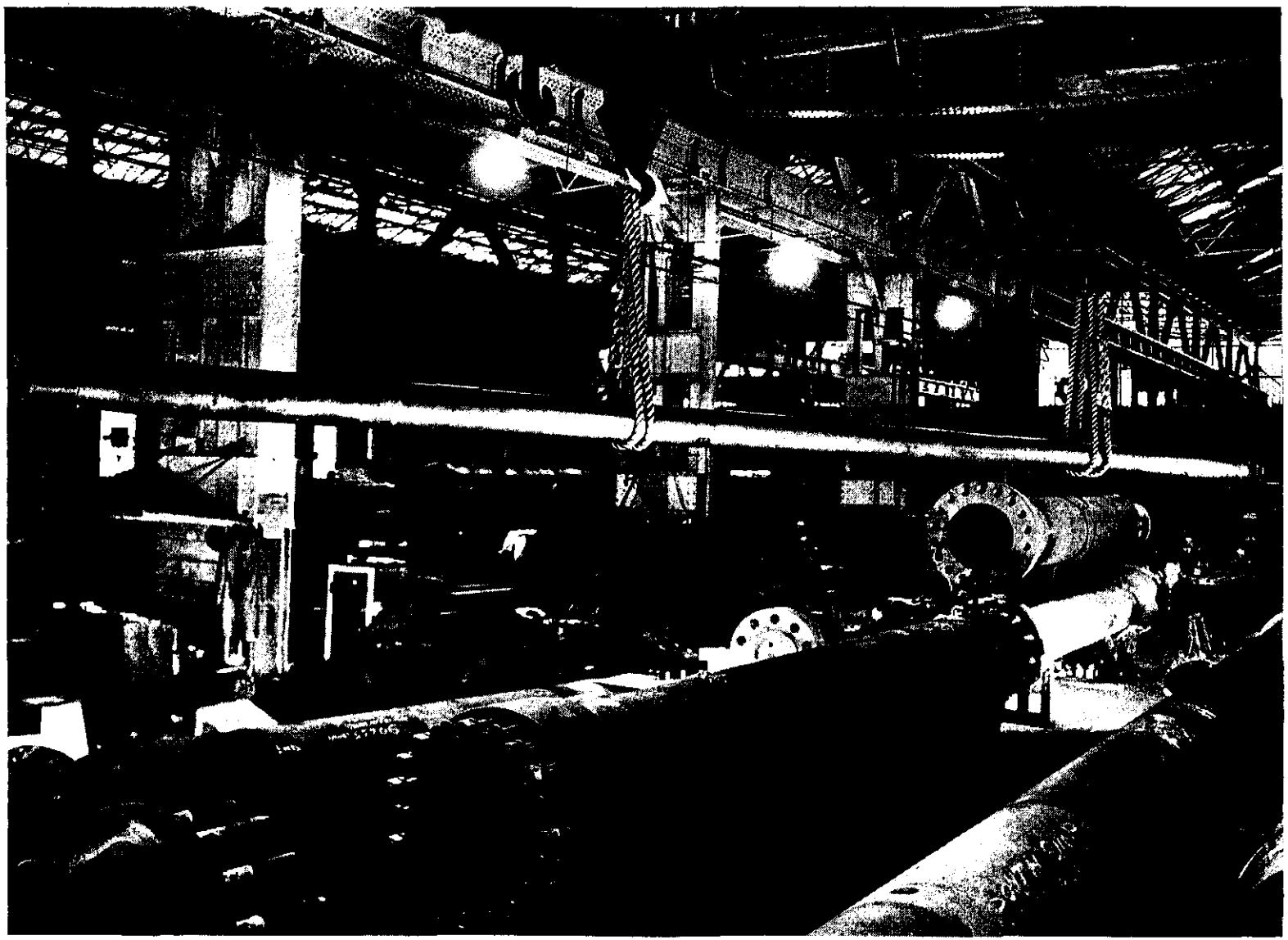
In 1943, the Battle of the Atlantic was at a critical stage and there was an urgent need for more escort vessels. To meet this requirement it was decided to build 200 escort vessels as quickly as possible. This would have been a big programme at any time, but, with Naval shipyards fully extended on the existing building programme, it was a Herculean task for the technical departments. Initial investigation of the problem was taken by the Sloop Section, working in close contact with its opposite numbers in D.N.C., D.E.E., etc. In view of the urgency of the requirement it was decided to make up the number of ships required by building two types, single screw corvettes and twin screw frigates. On the engine side, it was decided to use reciprocating steam machinery, cylindrical or water tube boilers, and simple reciprocating auxiliaries. The main and auxiliary engines in both classes were to be identical, but two designs of boilers were required. It was evident that the normal procedure for building warships could not be adopted, as many of the shipyards selected by D.N.C. had no capacity either for engine building or for installation work. Further, it was evident that we should have to use many firms who had no previous experience of Admiralty work.

It was therefore decided that all main and auxiliary machinery and boilers should be treated as Admiralty supply items and be issued to the shipbuilders as required.

Orders were placed all over the country wherever capacity could be found. Well over 100 firms, excluding minor sub-contractors, were involved. Consideration was given to the adoption of mass production methods, but on account of the large number of firms building small numbers of engines, the cost of jigs and gauges would have been prohibitive, and in any case there was no time to design and manufacture them. It was therefore decided to leave manufacturing methods to individual firms. Designs were prepared and drawings issued, sometimes by a parent firm, *e.g.*, by Messrs. Smith's Dock Co., for main engines, and sometimes by the Admiralty. For auxiliary machinery, bulk orders were placed with firms specializing in the particular class of machinery. The supply of the larger castings and forgings was a major problem, but, by working closely with the various controls, this problem was overcome.

In the case of shafting, consideration was given to using tubing with welded-on couplings to ease the load on the forging industry, but this was not, in fact, necessary, although a prototype shaft to this design was made and later used for experimental tests. For simplicity, it was decided to adopt Board of Trade standards, and to entrust inspection to Lloyds and the British Corporation. This was not entirely satisfactory as Lloyds and B.C. surveyors, while capable of ensuring that the work was in accordance with their rules, were not interested in progressing the work ; whereas for such an undertaking one needed overseers on the spot who could co-ordinate the work of the various firms, deal with bottlenecks and ensure the smooth progress of construction. D.N.C., who was faced with the problem in an acute form due to the large number of firms to be employed on prefabricated parts, and the number of shipyards unaccustomed to Admiralty methods, obtained the services of an outside engineer to study the problem and advise as to the number and qualifications of the staff he considered necessary for this work. We were able to take advantage of this, and obtain his advice on the engineering side.

The final problem was in connection with fitting out, as many of the shipyards could not compete with this work. To meet this problem it was decided to establish two fitting out bases—Dalmuir Basin on the Clyde and Hendon Docks on the Tyne.



PROPELLER SHAFT FOR "DARING" CLASS DESTROYER SLUNG AT WORKS OF ENGLISH STEEL CORPORATION

With so short a building time (Controller's target for the period on the slip, *i.e.*, between laying down and launching, was four months), and with no opportunity to order machinery in advance of the hulls, there were some initial delays due to machinery ; but after a very few months we had caught up and from then on we were faced with the problem of finding storage space for machinery items which were ready for delivery before the shipbuilders were ready to receive them. This position was greatly aggravated when, due to the improved position in the Atlantic and the imminence of the invasions of North Africa and Europe, it was decided to cancel the rest of the Escort Programme and build transport ferries in lieu.

When this decision was taken to build transport ferries we were faced with stocks of completed and partly completed machinery items, and it was obviously economical to use this machinery in the transport ferries although it was realized that we could have produced a better design if time had been available. This change involved a great deal of extra work, as many orders had to be cancelled, and it was necessary to find out the exact state of each contract, and to arrange for transfers of finished or partly finished items from one firm to another.

Small Ship Progress Section

The above brief history of the Escort and later Transport Ferry programmes is sufficient to indicate that it could not be handled by the normal departmental procedure ; both D.N.C. and E.-in-C. set up separate sections to deal with it, and these sections were moved to London. In addition, it was necessary to set up a separate Progress and Planning Section for this work alone, as it was obvious that the newly formed organization at Bath, which was quite adequate when dealing with firms used to our procedure, could not undertake this additional and very different type of work. We therefore obtained three officers from industry, one as a Principal Progress and Planning Officer (P.P.O.) situated in London, the second as Deputy P.P.O., situated in Edinburgh, and the third as an Assistant P.P.O. in London. We also appointed 7 Assistant P.P.O's at Glasgow (2), Newcastle (2), Manchester, Birmingham and Sheffield ; these men were selected from our own Overseeing staff and did excellent work. The Assistant P.P.O's were given a great deal of power and were encouraged to deal with their own problems on the spot. The P.P.O. was responsible for co-ordinating the work of A.P.P.O's and dealing with any problems which could not be settled locally. Periodical reports were called for from the various firms and were collected, scrutinized and logged at Headquarters, and from these reports a Kardex record was built up which showed at a glance the position in regard to the machinery of any ship in the programme.

The need for a progress and planning organization at Headquarters was even more apparent in the small craft field. This was appreciated as early as 1941, when the construction of motor minesweepers (M.M.S.) was started. Some 21 shipbuilders and 6 engine-makers were involved in this programme, and construction was under Lloyds' survey. As with the escort vessels referred to earlier in these notes it was soon found that this arrangement had its limitations, and we had to provide our own arrangements for progressing the work. As a first step an Engineer Commander, R.N.R., was appointed to the Department as Production Officer on M.M.S. construction. This officer was situated at Bath, but it was soon found that for geographical reasons it was quite impossible for him to cover the whole field of activities, and three junior officers were appointed to cover the shipyards of the Scottish area, the East Coast and the South Coast respectively. These three officers were mainly concerned with installation problems ; the Production Officer was in general charge of their

work and personally looked after production at the engine-builders' works. The assistants remained in their districts, but the Production Officer paid periodic visits to his assistants and to the engine-builders. This organization worked satisfactorily and continued throughout the war, as, when the M.M.S. programme eased, the M.F.V. programme was just getting into its stride and the Progress Officer and his three assistants took over this work, so easing the burden on the Admiralty Engineer Overseers.

Many problems arose in connection with the installation of machinery in these wooden ships, but they were generally solved by the Progress team, and the lessons learnt were referred back to Headquarters and embodied in later instructions.

POST-WAR ORGANIZATION

Consequent upon the lessons learnt during the war, the Engineer-in-Chief set up a Committee to investigate his organization at Headquarters. As a result of the findings of this Committee, steps were taken to reorganize Headquarters on a " functional basis."

In pre-war days each section carried out its own Progressing, with the result that conflicting instructions with regard to priorities were given to machinery contractors. Moreover, it had been found during the war years that it was essential to have one co-ordinating section dealing with all such matters, as only it was in a position to know the full details with regard to allocation of material, manufacturing capacity and labour.

In setting up the post-war Progress and Planning Organization, the Engineer-in-Chief was severely handicapped due to shortage of staff but it was found possible to create a skeleton framework which would be capable of rapid expansion in times of emergency.

It must be realized, therefore, in the following remarks, that a number of functions of this organization are combined under a single sub-section.

Duties of Section

The Production, Planning and Progress Section consists of two main parts : the technical part Planning, and the clerical part Progress.

In addition, due to the aftermath of the war, it was necessary to have a Disposal Section for dealing with all redundant machinery from cancelled contracts, etc.

The duties of Planners are to consider questions relating to production, initiate action to place orders on behalf of all sections in the Engineer-in-Chief's Department and undertake the responsibility for ensuring that all contracts placed are completed to meet the required delivery date.

The duties of the Progress clerks are to compile the various contract history sheets, maintain the contract records in a systematic filing system, take routine progress action, keep the Planners advised of the progress of all contracts and check satisfactory despatch from supplier and receipt by consignee.

Under the Disposal sub-section is carried out the disposal of all machinery items declared as surplus by the appropriate sections in the Department, and liaison with the Ministry of Supply.

A further sub-section known as the Supply Group deals with firms on Admiralty list, material estimates and authorizations (with particular regard to steel allocation) and various controls, issues of licences and schemes to assist production by the firms in whom the Department is interested.

Basic Working Principle

The Production, Planning and Progress Section is organized on a functional basis.

The Planners are arranged in groups each dealing with the contracts falling within the demarcation shown. Within each group the work is distributed as considered expedient but the number of personnel can be increased or decreased according to the conditions prevailing (*viz.*, peace, emergency or war-time).

The Progress clerks have their work divided according to the types of contract history sheets to be handled, without relation to the division of contract work among the Planners. Each deals with one or more types of history sheet and the Progress Reports appropriate to the contracts covered by those history sheets. Here again the number of personnel can readily be increased or decreased according to the work in hand.

The contract history sheets form a summarized record of every contract and in most cases should provide all the information necessary to enable progress to be followed easily and quickly without resorting to a more detailed scrutiny of filed records. A " Bring-up " system ensures that every contract is periodically reviewed.

Procedure for Originating and Dealing with a Contract

Any Section requiring material, machinery items, or machinery installation for a ship or craft to be ordered completes an Order Form EN/PP 1 in duplicate. This Order Form after being signed by the Inspector or Assistant Inspector of the Section concerned is forwarded to the Production Planning Officer for action. The Planner responsible inspects every Order Form on receipt and gives priority to those requiring urgent action. The Planner takes all necessary action to initiate the D.51 necessary for the Director of Contracts to arrange the contract. Only when the order contains complex technical requirements, which it is considered that the originating section should check, is it necessary to refer the draft order to the originating section.

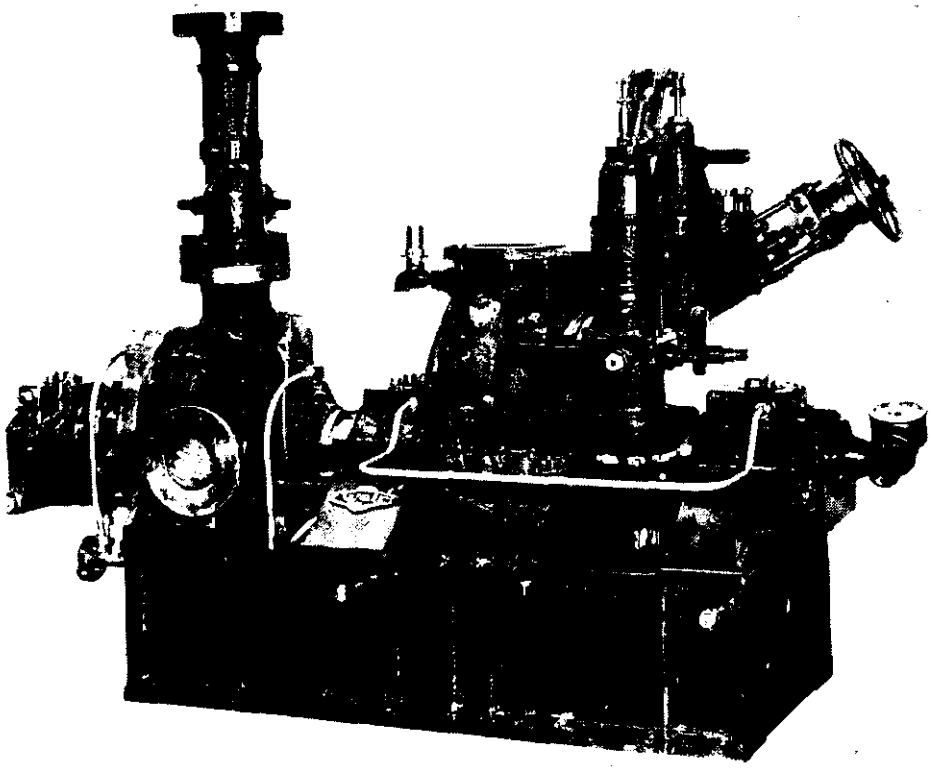
Financial approval is normally obtained by the originating section before rendering the Order Form. In certain cases, where urgency or other considerations justify it, action to obtain financial approval can be included in the D.51 initiating contract.

When orders are placed by the Director of Navy Contracts, copies of the contract letters are sent to the Progress Section. A history sheet is then made up for each order and these sheets are then referred to the Planner concerned for supply of details of Progress instructions to be issued. On return of the history sheets to the Progress clerk the appropriate Progress instructions are issued to the Overseer concerned and the history sheet is inserted in the filing cabinet. History sheets are of five types :—

Ship.
Ship's auxiliary machinery.
Craft.
Admiralty contract.
Sub-Contract.

Ship

These are intended to cover all orders for vessels which are built in relatively small numbers of each type ; for which the machinery installation consists of a number of auxiliary items and involves a fair amount of work in addition to the fitting of main engines.



MESSRS WEIRS MULTI-STAGE FEED PUMP

Ship's Auxiliary Machinery

These sheets are intended as appendices to the ship history sheets where necessary. Details of the auxiliary machinery and ancillary equipment generally are inserted on the sheet, more than one being used in cases where there are numerous items to be fitted.

Craft

These sheets are intended to cover small vessels and boats in which machinery and installation equipment are supplied from bulk orders, or sources other than the shipbuilder, and require only relatively simple installation work. These mostly comprise internal combustion engine driven craft such as are used in coastal and landing craft.

Admiralty Contract

These sheets are intended to cover all contracts placed through the Director of Navy Contracts for material of any kind except Ships and Craft. They cover orders for " Admiralty supplied " items, however, for Ships and Craft (*e.g.*, diesel generators, domestic automatic refrigerators, and distilling machinery).

Sub-Contract

These sheets are intended to refer to sub-contracts placed by firms working on Admiralty, Ship or Craft contracts with other firms. Local orders placed by Dockyards, which Engineer-in-Chief has been requested by Director of Dockyards to progress, are recorded as sub-contracts placed by Dockyard for the purposes of Progressing.

Issue of Progress Instructions

As already stated, on receipt of the contract outletter from Director of Contracts, instructions are issued to the appropriate Admiralty Engineer Overseer on a series of forms detailing the commencement date and frequency of Progress Reports to be rendered.

In requesting Progress Reports, the appropriate forms to be used should be stated when corresponding with the Admiralty Engineer Overseer. Reports are rendered on forms : EN/PP.2—Ship Progress Report ; EN/PP.3—Craft Progress Report ; EN/PP.4—Admiralty Contract Progress Report ; and EN/PP.5—Sub-contract Progress Report.

On receipt of reports they are first passed to the Progress clerks who sort them, summarize the information and make up the history sheet. They are then referred together with the history sheet to the planner concerned if the information supplied—

(*a*) reports any possibility of any delays,

(*b*) requires delivery of any Admiralty supplied or Sub-Contracted item to meet the specified date,

(*c*) reports anything which will advance or retard the completion date of the main contract,

(*d*) reports any technical matter or failure or rejection of any machinery part.

If, however, the Progress Report contains only routine Progress information with no outstanding feature, the Progress clerks file the Report in the knowledge that the history sheet will be scrutinized by the Planner at frequent intervals.

Demarcation

The Planner responsible for a ship or craft follows the progress of that ship or craft from the shipbuilder or main machinery contractor's standpoint. This involves following up the sub-contractors also. " Admiralty supplied " items are followed by the Planner dealing with such contracts and the Planner responsible for the ship or craft advises all other Planners concerned with machinery parts or requirements, notifying them of all alterations as necessary.

The Progress clerk responsible for a ship or craft history sheet records briefly the progress of " Admiralty supplied " or Sub-Contracted items in the spaces provided and watches the effect of altered completion dates on these items. Requirements for " Admiralty supplied " or Sub-Contracted items notified in Progress Reports are referred to the Progress clerk concerned with the relevant Admiralty or Sub-Contract.

The Progress clerks responsible for Admiralty or Sub-Contracted items pass on the information regarding altered delivery dates to the Progress clerk concerned with the ship or craft contract in order that the effect on the ship or craft progress may be watched. A similar relation exists between Admiralty contracts and Sub-Contracts.

Supply

Questions of estimates for and allocation of materials in short supply and regulated by controls are dealt with by the Supply Group who consult the appropriate Planner as necessary. This group also deals with all general questions of production capacity and alternative manufacturers.

Planners keep the Supply Group advised of any large potential material requirements so that timely provision in the estimates or through the appropriate control can be arranged.

Disposals

The Production, Planning and Progress Section is responsible for the disposal of all machinery items declared surplus by the Maintenance or other sections concerned. In the case of internal combustion engines and auxiliary machinery driven by internal combustion engines for which the Ministry of Supply is the Disposal Authority, the P.P.P. Section provides the necessary liaison. Disposal action is regulated by A.F.O's or Office Acquaints issued from time to time and is the concern principally of certain individuals specializing in this subject and is, therefore, not dealt with at length here. Moreover, such disposals are mostly the result of cancelled contracts on cessation of hostilities and cannot therefore be considered as a true function of the P.P.P. section.

The foregoing remarks refer only to the internal Headquarters organization but, under existing conditions of lack of priority for Admiralty requirements, it becomes essential for frequent visits to be made by the Production Planning Officer to the various firms throughout the country engaged in Admiralty work. This aspect is particularly important when dealing with new construction of advanced or particular design, where numerous bottlenecks are likely to occur in the production of special material, castings and unusual manufacturing features.