

LAUNDRY INSTALLATIONS IN H.M. SHIPS

The first part of this article is an extract from a comprehensive series of notes contributed for the JOURNAL by Commander (E) R. A. Gould, O.B.E., R.N., Engineer Officer H.M.S. "Alaunia," since 1945. This ship was jocularly referred to as H.M.S. "Alaundry" by a distinguished Admiral who once had a number 10 suit returned to him washed, starched and ironed in under three hours. Commander Gould took a keen interest in equipping and operating the naval laundry and we very much appreciate his introduction to this important subject.

Part II by Lieutenant (E) W. T. McKee, R.N., of the Engineer-in-Chief's Department, gives an outline of future policy.

PART I

The decision to fit laundries in H.M. Ships is one which has probably brought more comfort and ease of mind to both officers and men than any other amenity. The laundry is absolutely essential to the health and comfort of a ship's company, especially in time of war, when there is little or no time for the individual washing of clothes. A good laundry can also bring credit to a ship by improving the appearance of the ship's company, particularly when in white uniform.

Administration

Despite the so-called *voluntary* principle of manning the laundry, it should be operated under a very strict control. Unless this is so, the routine upon which the smooth running depends will inevitably go astray, due to loitering, irregular receiving, careless bundling and indifferent packing. It must be remembered that, except to the very unobservant, all the laundry processes are most fascinating and therefore tend to cause loafing. Moreover, if the finish of the work is affected, a ship's company soon becomes critical and, as a result, the laundry staff becomes discontented, and requests to "go to part of ship" to avoid barracking.

As it is the hope of reward which sweetens labour, so must a laundry staff be paid an adequate remuneration to compensate for the heat, long hours, interrupted meals, and other unusual conditions. This can only be accomplished if a known regular sum is received. It is essential for every officer and rating to pay a fixed subscription each week, deducted on the pay ledger, since it is undesirable to have any monetary dealings in the laundry. In the author's view, the ideal staff can be drawn from the Engineering department. They have a close liaison with the personnel running the prime sources of power, and since all laundries require steam, compressed air and water and as densities are frequently being taken, the very nature of the work suggests engineering and the whole atmosphere is a familiar feature of the daily life below.

Object

The aim in the various laundry processes should be to produce an article or garment hygienically cleaned, in its original colour or whiteness, and neatly pressed to its former shape, without damage to fabric or thread.

Washing

The first process of washing is to remove all loose dirt by water passing through the interstices of fabric. Many stains are removed in these early low-

temperature washes. Secondly, to remove grease, perspiration stains and other soiling by a detergent, usually hot soap and soda solution ; and, thirdly, to reduce more obstinate stains and soiling by a bleaching agent, usually sodium hypo-chlorite (NaOCl). Bleaching does not remove loose dirt, and, of all the washing processes, it is the most dangerous to the threads and should not therefore, normally be resorted to. If it is necessary, it should only be done under strict control of quantities and temperature.

Rinsing

Rinsing is the process of removing all alkali and soap, with a small amount of dirt in suspension, which has been left in the clothes from the previous processes. For an obstinate alkali which water will not wash away, a mild acid or bi-fluoride, or *sour*, as it is called in laundry nomenclature, is introduced, which reduces the alkali to a neutral salt. It is now known that soft water should be used for all rinses. Hard water causes deposits of insoluble calcium on the fabric. Failure to remove alkali is one of the causes of yellowing. With really good rinsing, souring is not necessary. Advantage is taken in the rinsing process to reduce the temperature of the clothes to normal. Any sudden shocks or rapid changes will produce shrinking.

Washing Machine

The usual type of washing machine consists of a highly perforated brass or monel metal cylindrical drum, revolving in alternate directions on its horizontal axis inside a cylindrical housing of similar metal. The perforated drum is usually fitted with four beaters or perforated ribs which extend inwards towards the centre. Depending upon the speed and loading, the clothes are picked up on the beaters and carried to an angle of between 70° and 160° , and then flopped into the water. This process is repeated a number of times in each direction. During the picking up and flopping, the clothes are rolled up or *roped*, and it is necessary to reverse the direction of rotation to unwind the roping. The smaller the quantity of water, the greater the hitting power, but the greater the wear. Moreover, the ribs or beaters striking the water inject powerful jets of liquid through the load, further assisting cleansing. The dirt is forcibly knocked out of the garment, and is merely a mechanical version of the flopping of wet garments on a stone, the method used in biblical times and even up to the present time in many countries where soap is scarce. This same process of flopping also takes place in the rinsing when alkali and residual detergents with dirt in suspension are removed.

Power Drying

Having rinsed the clothes, the problem is then to dry them as quickly as possible without damage or shrinkage ; in laundries this is a mechanical process. It is usually done first in a hydro-extractor by centrifugal force. Where clothes are not required to be pressed and for particular fabrics like towels and blankets, any residual moisture retained in the threads is then removed by the circulation of heated air in a machine called a tumbler dryer.

Centrifugal Hydro-extractor

The hydro-extractor consists of a perforated bowl, revolving on a vertical axis, and usually held in position on a rubber cone mounted on a spindle. The latter is belt-driven and supported by heavy ball and thrust bearings. The speed of these machines is dependent upon the diameter of the cage but about 1500 revolutions per minute are common.

These machines suffer considerably from breaking belts, due to the high speed, coupled with heavy initial loading. Longer belt life and speedier build-up can be achieved by giving the clothes-laden bowl an initial spin by hand, then closing the lid switch and making the starter. The machine fitted with a mechanical interlock cannot be helped this way. Care should be taken to pack clothes evenly in the hydro, otherwise undue out-of-balance weight causes the cage to bind against the casing and it will not work up to its final revolutions. Moreover, bad packing is one of the causes of the mysterious tearing which appears in some garments.

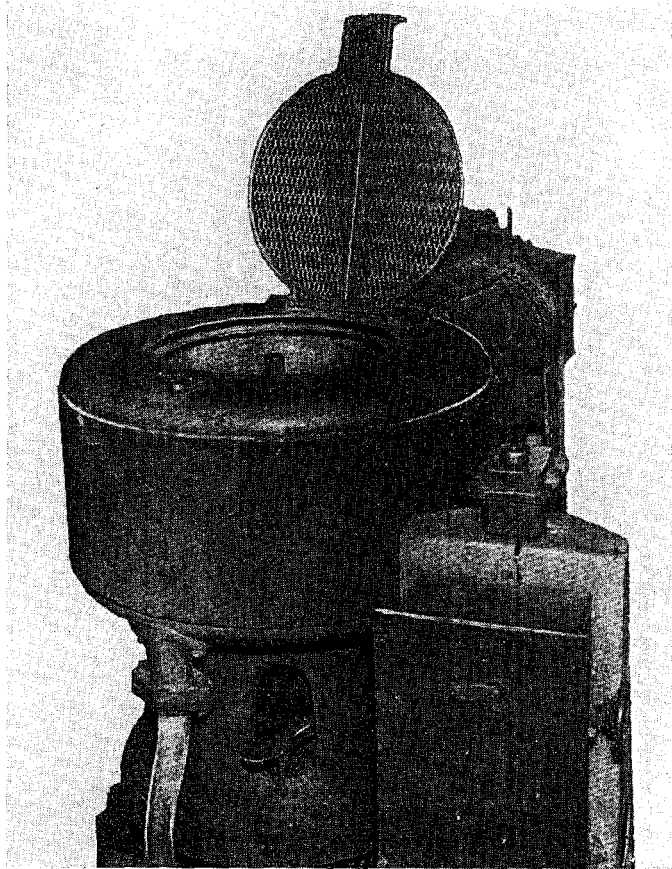


FIG. 2.—CENTRIFUGAL HYDRO-EXTRACTOR

Tumbler Dryer

In the tumbler dryer, the clothes simply tumble over and over in a cylindrical cage, through whose perforated circumference heated air is drawn, and which, on discharge, is screened through some coarse-grained material which picks up fluff, etc., before allowing the air to pass away to exhaust. The fine fluffed-up downy appearance of blankets and towels is a result of this hot tumbling process. The exhaust trunking from the machine should take the shortest cut overboard, since hot trunking warms up every compartment it goes through if it is not properly lagged.

Starching

Starching is the "cream" of the launderer's art in every sense of the word. It is the introduction of the right quantity of starch of the proper constituency and at the right place. For instance, in the cuff and not in the tail of the shirt. The fine grains of rice or other starch should be present only in the spaces formed by woven thread and not on the surface. According to whether starch is baked as in a pie crust, or boiled as in a pudding, so will the finished article be stiff or semi-stiff and pliable. There are many tricks in the starching process. The addition of a little borax adds stiffness and prevents browning under heat, and a little Japan wax, stirred into the starch mixture, will give a decided brilliance to the polish obtained by the heat and slip of the roller. It is this polish and gloss-like surface which is so desirable in well-finished collars and shirts, and so noticeably absent as yet in naval laundry. It is understood that Japan wax is not yet available for supply to laundries, owing to restrictions in its manufacture.

Pressing

Pressing is a rapid substitution for hand ironing, but has, as yet, to improve in its methods to produce better results than good hand ironing; it is quicker, but except for sheets and tablecloths certainly not better. It relies for its general operation by compressing a garment or article between a highly polished hot surface and a pad which absorbs the moisture, takes the shock and levels off inequalities in pressure. "Still" pressing will not produce the polish.

There are several types of presses, the *bucks* being shaped to suit the function of the individual press; i.e., for the body of a shirt, a press with a rectangular buck is used, while to press the neckband and cuffs to shape a triple inverted "V" buck is used. For general work a tapered buck is common. Presses for cloth garments do not have polished heads, but padded bucks and heads with steam damping. Presses are usually arranged in tandem as a time saver—whilst one is in use pressing, the other is open to receive work.

For ironing large flat work items, such as sheets, etc., there is the calender, which is merely a steel mangle on a large scale and heated both in the roller and the bed. The roller has the padding cover, the bed the polished surface. The operator's hands are protected from injury on the *feed in* side by a sensitive knock-off gate, which cuts out the rotary motion if pushed the slightest amount. This should be checked daily.

A collar ironer is a form of calender, the electrically heated polishing roller revolving over the collars, which are carried beneath it on a flat reciprocating table. This is an essential item in any modern laundry.

PART II

The present Admiralty policy regarding the installation of laundry equipment is that all existing cruisers and above, including depôt ships, and all new construction destroyers and above, and possibly submarines, are to be fitted with laundries capable of washing and fully finishing (i.e., ironing, pressing and starching) an average of 8 lb. of clothing per man per week for the whole ship.

Approval is now being sought to extend this policy to cover existing destroyers and other small ships.

Ships on Service

In practice it is rarely possible to fit sufficient equipment to achieve the desired output in ships already in service, due to insufficient space being available. The following figures give some idea of the minimum area clear of obstructions required for a properly balanced 8 lb. per man per week laundry with full finishing and adequate receipt and issue space:—

<i>War Complement</i>	<i>Area</i>
401—600	450 sq. ft.
601—800	780 " "
801—1000	960 " "
1200—1500	1150 " "
1801—2000	1510 " "

Ideal area and what is done in practice

When a ship is taken in hand for refit, and the maximum available area in which to fit a laundry plant is less than that given above, equipment will be fitted according to the following priority:—

- (i) Basic washing equipment.
- (ii) Addition of receipt and issue arrangements.

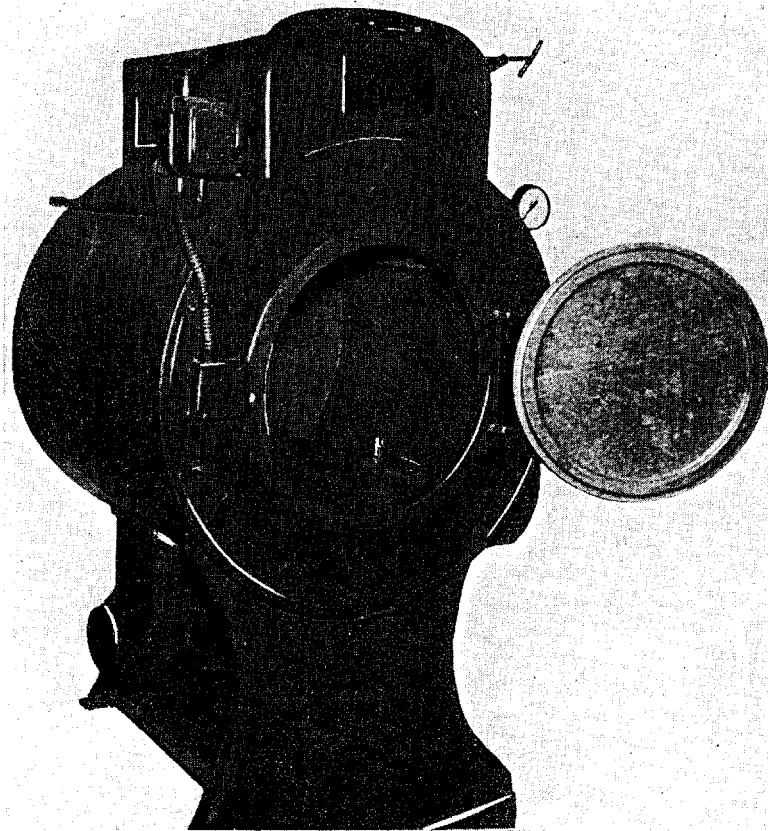


FIG. 3.—DRYING TUMBLER, SHOWING REVOLVING INTERNAL CAGE WITH BEATERS, AND AIR HEATER

- (iii) Addition of a limited amount of finishing equipment.
- (iv) Full washing and limited finishing.
- (v) Finishing equipment extended to include starching, etc. Temporary shortage of suitable equipment may result in it not always being possible to adhere to this.

Ideal Plant

A laundry equipped to deal with 8 lb. per man per week, with full finishing would be built around the following equipment (the type, size and number of each item depending on complement) :—

- (i) *Washing machine* complete with two-speed motor, or interrupter gear for woollens, and wash trough.
- (ii) *Hydro-extractor* fitted with self balancing arrangements to permit slight out-of-balance loading.
- (iii) *Drying tumbler* for articles merely requiring drying and folding after washing, e.g., towels, blankets, overalls, etc.
- (iv) *Calender* with 32" spring padded single roller for sheets, underclothes, etc.
- (v) *Shirt unit*, including shirt bosom press, sleeve form, neckband and cuff press, shirt body press.
- (vi) *General purpose press* for general work.

- (vii) *Garment press* for cloth garments.
- (viii) *Collar unit*, including starching machine, collar polisher, collar edge ironer and hot tube.
- (ix) *Set of stock tanks* for preparing detergent solutions, bleach, starch, etc.
- (x) *Full receipt and issue arrangements*, including marking machine, classification bins, issuing racks, etc.

Equipment provided and developments

At present the equipment supplied is of standard commercial design, but several manufacturers are now co-operating with the Admiralty in developing machines that are more suited to ship conditions, particularly as regards space, accessibility of mechanical parts, habitability and resistance to shock. For example, a fully fabricated single roll utility calender is being produced with *feed in* and *return* on same side of machine. Working space is, therefore, only required on one side, and the other side can be placed up against a bulkhead, and much valuable floor space thus saved. Another development is an electrically heated press for new construction small ships, which shut down steam in harbour. Development is also proceeding with a washer-extractor-dryer to take the place of the three bulky machines that achieve the same object at present.

In this immediate post war era all manufacturers of laundry equipment are inundated with demands from almost every commercial laundry in the country, as new plant was largely unobtainable during the war. On top of this, export abroad has a high priority, so that production of special machines suitable for our needs alone cannot be as rapid as would be liked.

Small Ships

As stated above, approval is now being sought to fit limited laundry equipment in existing destroyers, frigates and fleet minesweepers. During the Pacific war several small ships did fit domestic washing machines, purchased out of canteen funds in Australia and New Zealand, and found them extremely valuable under the conditions then pertaining. Such domestic machines, however, are normally not sufficiently robust to stand up to the punishment they receive in Service use, and the electrical portions fall far below Admiralty specifications. A small unit is now being developed consisting of a fairly robust domestic sized automatic washing machine, incorporating a form of hydro-extractor, and an electrically heated drying cabinet. It is hoped to fit one or more of these units in each small ship, as weight and space permit. The weight of such plant is 7 cwt. and the electric load $6\frac{1}{4}$ k.w. It is not intended that there should necessarily be a laundry compartment laid apart for these units, but rather that they should be fitted in the ship in any convenient shelter position.

Submarines

As regards submarines, endeavours are being made to produce a special plant that will maintain submarine crews' clothes in a state that is hygienic but not necessarily fully finished, for prolonged periods at sea. The development of this plant has special problems of its own; fresh water consumption has to be reduced to a mere fraction of normal for washings which is roughly 4 gallons per lb. dry weight. The space question is more pressing than in any other type of vessel; the clothes must be dried without producing *lint*, i.e., the "fluff" found in the exhaust of a drying tumbler, and the moisture removed, both of which must be kept out of the free air in the submarine.

The use of liquids other than water, e.g., trichlorethylene, for cleaning is precluded due to the potential danger to the crew.

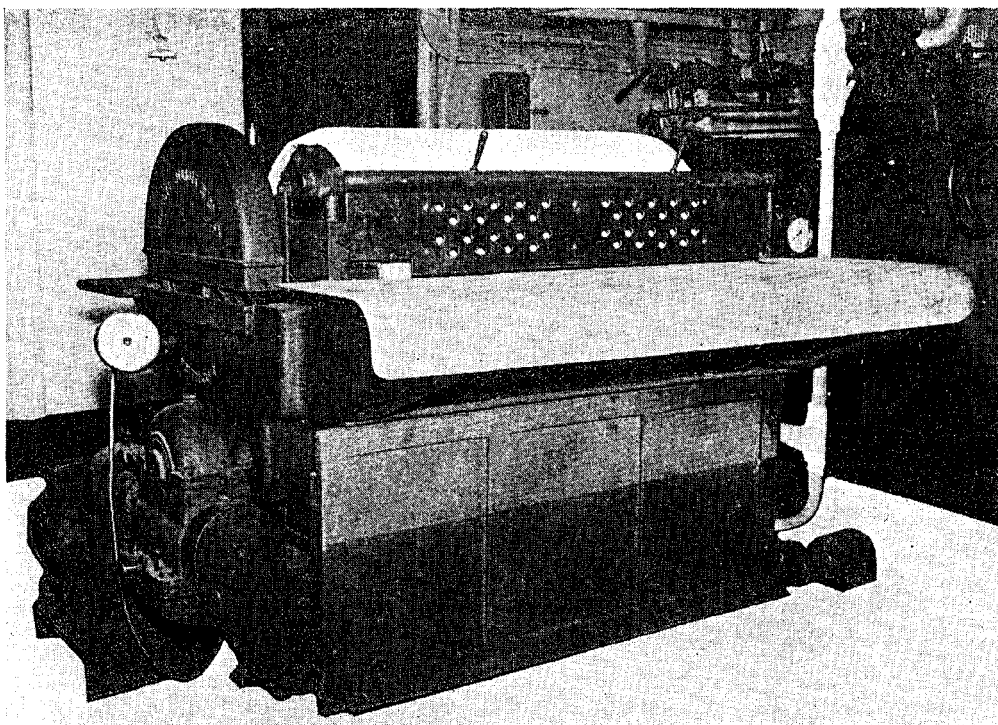


FIG. 4.—UTILITY FLATWORK IRONER, SHOWING FINGER GUARD “ CUT-OUT ”

Layout

In an ideal laundry the plant is laid out so that there is a straight *flow through* of clothes from the receipt to the issue hatch—the processing plant being arranged in the following order, i.e. :—

- (i) Receipt.
- (ii) Racks for dirty bundles.
- (iii) Marking booth.
- (iv) Classification bins
- (v) Washing equipment.
- (vi) Drying equipment.
- (vii) Finishing equipment.
- (viii) Sorting racks.
- (ix) Issue.

The obstructions and odd shaped spaces available in ships—in some cases not even adjacent—make it difficult at times to arrange a layout with a flow through free from bottlenecks and doubling back. This problem is not made any easier by the requirement for certain doors and passageways through the laundry to be kept free for decontamination purposes.

Drainage

Wherever possible the drainage is arranged with the deck divided into three areas :—

- (i) *Sumps under washing machines* arranged so that *dump* valves can be fitted to speed up the emptying of machines, divided by 9 in. coamings from the
- (ii) *Wash-house floor*, round washing machines and hydros, where a certain

amount of liquid may be expected to be slopped on to the deck, covered with tiles suitably ribbed to prevent slipping. This space is separated by 3 in. coamings from the

- (iii) *Dry deck areas*, where only dry or damp clothes are handled, i.e., receipt, finishing and issue spaces.

Habitability

The question of habitability is obviously important in a ships' laundry. The majority of the equipment uses steam for some purpose, either in steam chests or as free steam. A large amount of the wild heat can be checked by efficient lagging. Certain machines, however, such as presses and calenders, must have large areas of heat-producing surfaces that cannot be lagged, as these machines work by evaporating the moisture remaining in the clothes after passing through the hydro extractor.

The resultant high temperatures and humidities (under tropical conditions) can only be kept within reasonable bounds by careful application of the latest principles of lagging and ventilation. This calls for plastic lagging to be applied wherever possible to all external surfaces where the surface temperature exceeds 120° F. Unfortunately manufacturers for the British market have seldom considered the need for lagging, but this fault is now being corrected.

Ventilation canopies are fitted over machines, such as washing machines, presses, calenders, etc., where water vapour is emitted, with a lead away to an exhaust fan. As far as possible the canopies are arranged so that the operator's head is outside, and not in the stream of humid air. Ideally, the exhaust fan capacity is such as to be capable of renewing the air in the laundry every minute ; two-thirds of this is supplied by supply fans and one-third via natural openings, hatches, etc.

Salt water washing

One of the reasons for the installation of laundries in ships is the necessity of reducing fresh water consumption. It has been found in practice that when a ship's company uses the laundry onboard, the fresh water consumption is considerably reduced. Even so, in order to reduce the fresh water consumption still further, a washing process using salt water is being developed, which will result in a saving of 30-40% of the fresh water already used in laundries. The development of this process has reached an advanced stage, and it is hoped that it will soon be possible to adopt it as the standard washing process for seagoing ships.

Receipt and Issue

Next to basic washing facilities, the provision of good receipt and issue arrangements is most important. The receipt space is provided :—

- (i) For receipt of dirty bundles.
- (ii) To check the articles in each man's bundle against his list.
- (iii) To mark each single article with its owner's laundry mark.
- (iv) To divide the articles from all bundles into different classifications, such as white work, woollens, coloured work, etc., for it is essential that loads of mixed classifications are not washed together.
- (v) To provide an uninterrupted supply of classified loads for the washing machines, as it is essential to prevent a machine lying idle even for a few minutes if the designed output of the laundry is to be attained. To achieve this, two sets of classification bins (usually three or four in each set) are provided, so that as an incoming *journey* of clothes is being

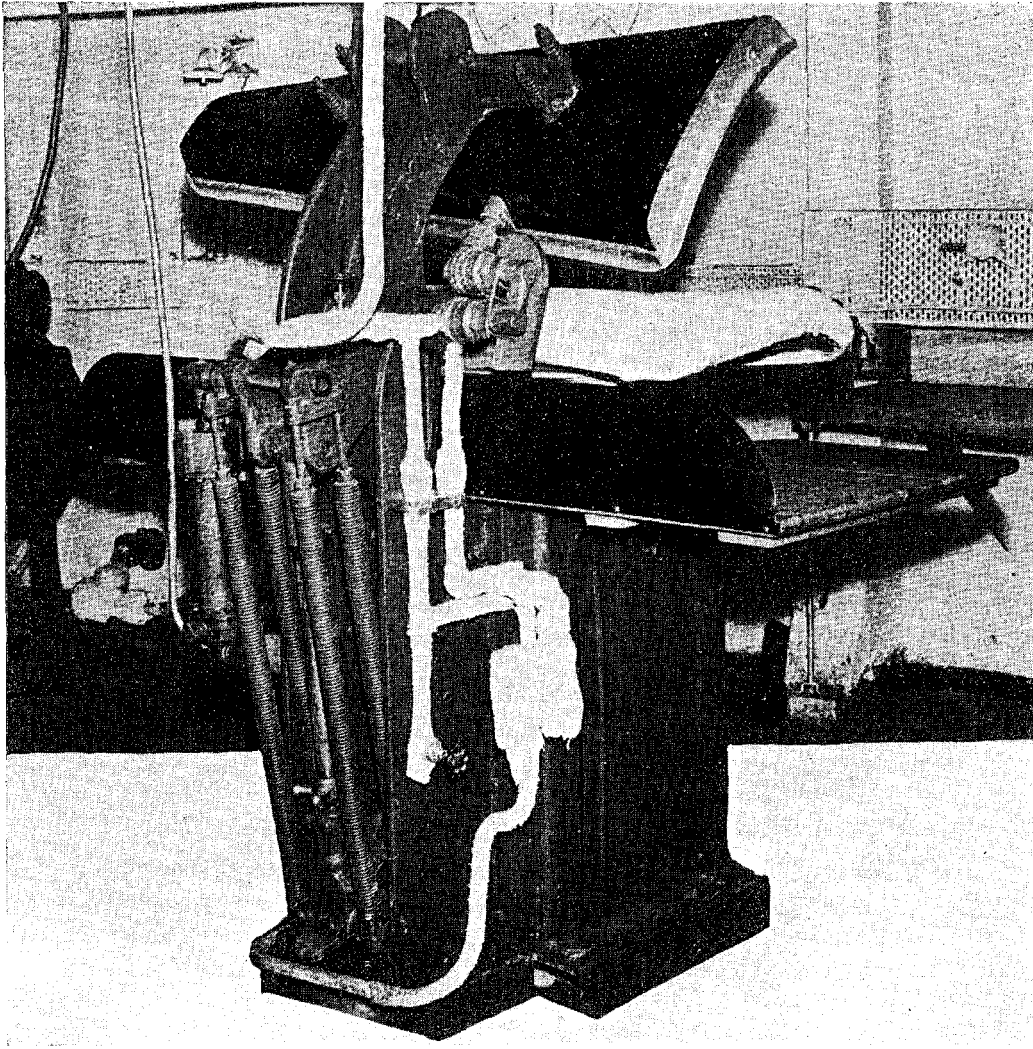


FIG. 5.—GENERAL PURPOSE PRESS, AIR-OPERATED

marked and classified into one set, the washhousemen are feeding their machines from the other set, filled previously from the previous *journey*.

It will thus be seen that the clothes pass through the washing-drying-finishing cycle in a series of *journeys*, each of which may contain several classified loads.

The issue space is provided :—

- (i) To sort and collect each man's clothes together again,
- (ii) To check any losses that may have occurred in the process through the plant, and
- (iii) To issue bundles of clean clothes.

If possible two sets of sorting racks are fitted in the issue space, one set per journey. When a journey starts to emerge from the drying and finishing plants, each article, already folded, is deposited in the rack marked with the appropriate laundry mark and is checked against the lists of clothing passed on from the receipt. When one journey is sorted in racks, the articles of the following journey are sorted in the second set of racks ; meanwhile the first is removed from its racks, bundled up and issued.

Effect of ship's routine

The method of arranging for journeys to arrive at the receipt hatch, the numbers of bundles per journey and whether by messes, etc., is a matter for the internal organisation of each ship. A very great deal depends on the care with which this is organised, and ships that have given the matter some attention have reaped their reward in greatly increased output from the laundry. Ships that have a somewhat haphazard system get a far smaller weight of clothes per man per week laundered.

Supervision

Within the laundry itself, the flow through and processing all break down if insufficient or inexperienced supervision is exercised. Indeed, the importance of good and knowledgeable supervision cannot be overestimated. Many, far too many, complaints are heard of shirts with beautifully pressed backs and tails but very badly creased round the neck and front, just the part of the shirt that is normally seen. Or again, of socks that have returned from the laundry two-thirds of their original size, or of white garments that come back a horrid yellow or grey colour. None of this is the fault of the machinery. It is due solely to bad processing either by ill-trained operators or trained operators who are not properly supervised. Speaking generally, the clothes handed in to a ship's laundry for dhobeying are more heavily soiled than the average intake of a commercial laundry ashore, except in heavy industrial areas. This means that correct processing, both in washing and finishing, is even more essential if properly cleaned and properly finished clothes are to be turned out.

Administration and Manning

The Admiralty policy for administration and manning of laundries has not yet been finally settled, though several proposals are under consideration. It has been decided that such items as Sick Bay washing shall be done at Crown expense; but the question of how, and if, individual officers and ratings should pay for their personal washing is largely bound up with the question of manning. Whether laundries should be run by a Special Branch or taken over by NAAFI or run as at present by an assorted collection of ratings from different branches are questions which are tied up with many complexities.

While these problems are being settled, the interim arrangements for administration frequently suffer from an acute lack of *laundry-mindedness* on the part of officers of all ranks. In laundry-conscious ships where they are determined to make a good job of it the laundry has proved to be of the most widespread value even with a far-from-ideal plant. In other ships with identical plants the laundry has become a liability rather than an asset and the money spent installing the plant has been wasted.

There is a tendency at present for operators to be ill-trained and for them to be working under inexperienced and part-time supervision. This leads firstly to mishandling of and damage to machinery by ratings over whom the Engineer Officer has little jurisdiction, and secondly to the production of low-quantity output, and, what is almost worse, very low-quality work. This in turn results in officers and ratings in many ships becoming not unnaturally more and more distrustful of ships' laundries.

The fostering of *laundry-mindedness* in the Navy is most important, for it is essential that the provision of amenities should lead not to grumbling and discontent, but to a higher standard of living onboard ship.