KING EDWARD'S

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HOSPITAL CATERING ADVISORY SERVICE

CARE OF CATERING EQUIPMENT

SECOND EDITION

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In catering, the cost and quality of the final product has a close relationship with the standard of raw materials used, the grade of the staff employed and the efficiency of the equipment they operate. Materials and staff may be beyond criticism, but the resultant effect may be marred by failure to provide and maintain suitable equipment.

Care of equipment has not yet received its due measure of consideration, but if the cost of operation, repairs and replacements were always realised by those in control, as in the purchase of food, greater interest would be aroused. It may not be possible to determine the exact effect of equipment on the overall efficiency of the catering department, but it is obvious that better results can be achieved when every item is of good quality and properly maintained.

The heavy capital cost involved in purchase, the dislocation of service that frequently change or breakdown incurs, stress the fact that the greatest care should be given to selection, installation, operation and maintenance of every article. Equipment badly maintained may increase fuel costs; vigilance in this direction may be the means of reducing overhead expenditure.

Lack of organised care and maintenance is all too evident when a tour of catering departments reveals corroded equipment, damaged controls, deposits of grease and grime, fitful gas burners, handle-less utensils with a resultant loss of efficiency.

By instituting a simple system of care and maintenance as outlined in this circular, unnecessary expenditure and depreciation will be arrested.

CONTENTS

1. ORGANISING THE SYSTEM.

(1) TAKING STOCK.

Those responsible for the organisation of the catering department should know what equipment is available for use, in order that menus may be properly planned, and the service not hampered by lack of certain items. This information, though rarely available, is no less essential than details of food in the store.

To be successful, a maintenance schedule must include every item available, whether in use or not, and it should be compiled with entries under the following headings:—

(a) Apparatus. Items which are used for cooking or are fitted with fuel consuming media, such as ranges, steaming ovens, boiling pans, fish fryers, hot cupboards, water boilers, etc.

(b) Equipment. Large static items used for preparation, such as sinks, tables and racks.

(c) Machinery. Mechanical items, such as mixers, peelers, slicers, mincers, dish-washers, refrigerators, etc.

(d) Utensils. Hand tools and vessels, such as knives, forks, ladles, whisks, bowls, pots and pans, etc.

(2) PREPARATION AND USE OF RECORDS.

These should be compiled in such a form that quick reference can be made to any particular item. Entry in a bound book is not recommended since inclusions or deletions are not easily made, particularly if the items are entered in alphabetical order. An inexpensive card index or loose leaf system allows greater flexibility. All the relevant facts could be entered on one side of the card or leaf, leaving the reverse side for entries regarding such details as date of purchase or acquisition, cost, and dates of incidents such as breakdown, repair and possible cause.

(a) Capacity or Size. This factor determines the quantity that can be cooked or prepared in a given time, and will indicate how long or how often an item of equipment must be operated to produce a certain requirement.

(b) Operation. Definite directions for use will obviate the risk of damage to the equipment or food.

(c) Materials. The construction and the materials used indicate the method of cleaning the article in question.

(d) Care and Maintenance. Details should be available on the care and maintenance of every item to obviate risk of breakdown, damage or abnormal depreciation.

(e) Fuel Consumption. This factor is often overlooked since separate meters are not fitted to each item, but even a rough indication of individual consumption may serve as a guide to cost of cooking.

The compilation of these details may present many problems, but the experience gained in their collection will be valuable, especially when replacements or additions are required.

Manufacturers should be able to give details of their products and reference to any number that the equipment bears will enable them to trace details of the item concerned.

Another source of information should be the engineer, who is concerned with the installation and provision of services.

(3) General Organisation.

Having collected all the available information regarding operation and maintenance, the next step is to ensure that explicit instructions are issued to those concerned. These instructions must take into consideration the facilities and staff available.

Responsibility for the care of any particular unit is best vested in the person who uses it most frequently, even if they delegate it to a junior or subordinate member of the staff. In this way, care in use will reduce much of the time spent in cleaning and maintenance.

Staff should be encouraged to take a pride, not only in their culinary art, but in the tools that make it possible, and when it is made clear to them that only by ensuring that their equipment is operating properly can they hope to achieve successful results, their co-operation can be assured.

It should be stressed that care and maintenance is an " all day and every day " affair and not a periodic " clean up " when things get so bad that action has to be taken. Damage and deterioration are often caused by harsh measures used to remove accumulations of grease and grime.

(4) Inspection.

A routine inspection should be made at weekly intervals by a responsible person, and any defect, depreciation or uncleanliness should be noted for action to be taken. Reference to any such note should be made at the next inspection to ensure that neglect does not continue unchecked.

Hygiene should be the first consideration, in order to avoid the possible risk of food infection. Any neglect in this direction must call for immediate action.

The staff should be encouraged to report immediately any loss or damage of equipment in order that appropriate action may be taken at the earliest possible moment. The service of meals in hospitals is part of a rigid time-table, deviation from which affects all other departments. Equipment that is missing or otherwise out of action may be the cause of delay in service, but prompt action in the matter may allow time for alternative means to be provided.

Heavy consumption of fuel in large kitchens, sometimes from inadequate supply lines and pipes, may cause loss of pressure to various items at critical times. Unnotified withdrawal of supplies may cause chaos in the kitchen and therefore warning of any impending alterations to fuel supply should be given to those responsible for menu planning and cooking.

No maintenance schedule should be drawn up, or expected to thrive, without the co-operation of the Engineer. He cannot be held responsible for the cleaning and general care of the equipment in the kitchen, but all matters concerning fuel supplies, damage to large apparatus and equipment should be referred to him for action. Guidance on general maintenance, operation and cleaning should be obtained from him and new equipment must necessarily concern him. If he is able to attend the inspection at regular intervals, co-operation between his department and the kitchen will be further enhanced. Requests for minor adjustments and routine tasks should be notified to the Engineer in writing, dated, and marked " Urgent " or " Normal " as the case demands. Too frequent use of the former word on trivial matters may alter its meaning, with obvious results.

In order that explicit instructions may be issued for the care and maintenance of each item, it will be necessary to take into account the nature of materials, method of construction, the fuel employed and possible difficulties beyond the control of the catering organisation. The following information may be of assistance in this respect.

2. MATERIALS

With the wide range of materials used in construction of kitchen equipment it is impossible to generalise regarding operation, cleaning and storage. Study of their particular properties, however, will serve as a guide when instructions are being issued.

(1) METALS—GENERAL PROPERTIES.

(a) Strength. Items of cast metal are generally less able to withstand shock, strain or extremes of heat than wrought or fabricated articles.

(b) Corrosion. All metals are subject to corrosion in varying degree, due to chemical or electrolytic action.

Chemical Action. Moist or impure atmosphere, contact with water containing dissolved oxygen or acid have the effect of oxidising the surface of the metal concerned. Although formation of oxide sometimes serves as a protective covering to the material, it is not always firmly adherent and may find its way into food, with possible serious effect. Oxides are not impervious, and may not fully protect the metal from further attack.

Electrolytic Action. When dissimilar metals are in contact with each other, or in the same body of liquid, there is a tendency for electrical activity to take place, which may eventually cause the decomposition of the materials. Damage of metallic protective coatings, which expose the original material, unplated components, and neglected articles in sinks and water pans will allow such action, the effect of which is not noticeable in most cases until irreparable damage has been done.

Prevention of Corrosion. Due attention to cleaning as prescribed for the metal concerned will obviate much of the risk of corrosion. Articles in frequent use should be kept as far as possible in dry locations. Those which are seldom used, or in store, should be wrapped and sealed separately in moisture-proof material. Where larger items are permanently fixed, but not in frequent use, they should be thoroughly cleaned and coated with mineral jelly to exclude damp. Increased resistance to corrosion may, in same cases, be obtained by the use of protective coaings.

(c) Heat Transfer. Some metals are better conductors of heat than others. This property governs their use in cooking and heating equipment. Those with poor heat transfer properties tend to localise the heat at the point where it is applied, and cause burning of the food.

(d) Expansion. All the metals in general use expand on heating at varying rates. Those with a low rate of expansion are less liable to warp or disintegrate where heat is applied.

(e) Weight. The comparative weights of materials may serve as a further indication of their suitability for a particular purpose.

(f) Hardness. The factor of hardness of each material indicates to what extent damage to the surface is likely. Certain materials may scratch others in use and observations of this may prevent damage to softer materials.

(g) Specific Heat. Each metal has a relative factor which indicates the amount of heat required to raise its temperature. This has a bearing on fuel cost since the actual article involved is only used to transfer heat to food contained therein.

(2) METALS—NORMAL METHODS OF CLEANING.

As a general rule, cleaning of metal equipment should be carried out immediately after use. Methods may differ according to the construction of the item, the material involved and its function. Details of special methods where required are given under the various headings of materials and items. The following general policy should be adopted unless stated otherwise: —

(a) Portable Items. Where possible, all small items should be washed by immersion, thoroughly cleansed and dried. Equipment for this operation should comprise (a) reception draining board with stripping facilities and scrap containers, (b) a washing sink with an adequate supply of hot water, to which a suitable detergent may be added, (c) a rinsing sink where facilities will provide a water temperature of 170° F., and (d) a draining board for cleansed items. All items should be stripped of all easily removable food particles, carbon deposits and grease before immersion in the washing sink. Firmly adherent particles should be removed by scrubbing with a hard bristle brush, or soaked until this is possible. Abrasives should not be used. When cleansing is complete, articles should be immersed in the rinsing sink for sufficient time for them to absorb enough heat to evaporate off all adherent water when removed. They should be removed from the rinse by grapples or tongs, since the temperature should be too high for hand contact.

(b) Fixed Items. Those articles which cannot be transported to or immersed in the sink should be cleaned *in situ*. Ample supplies of hot water with suitable detergent added and rinsing water should be available. All food, grease or carbon deposits should be removed by scrubbing with a stiff bristle brush, or soaked by application of wet cloths until this is possible. Abrasives should not be used. When cleaning is complete the articles should be rinsed in clean water to remove detergent and afterwards wiped dry with a clean cloth.

(c) Abrasives. The use of abrasives should be discouraged in normal cleansing operations. Their action is to scratch the surface of the articles to remove foreign deposits and adherent oxide in order to brighten the appearance of the metal. Each application of abrasive renders the article more difficult to clean the next time since the finely etched surface provides a key for deposits. If due care is taken in cleaning and storage the need for abrasive action should be very small.

(d) Polishing. Metal polishes should not be applied to surfaces liable to contact with food, since their persistent odours will affect flavour. Their action is only mildly abrasive and they also act as a solvent to adherent grease which is often responsible for lustre-less appearance. Polishing by mechanical means, such as buffing wheels, is recommended.

(3) METALS—PARTICULAR PROPERTIES.

(a) ALUMINIUM. Aluminium is silver-white in appearance, is comparatively light in weight, and specific heat factor is low. Heat transfer properties are good but expansion is high. It is only very slightly magnetic, but a good conductor of electricity. It is subject to corrosion when in contact with most other metals, when decomposition may be fairly rapid. In moist air a firmly adherent oxide forms on the surface which serves as protection.

Cast Aluminium. Many items of kitchen equipment are available in this form. Casting technique sometimes involves the addition of other metals in order to produce stronger or more easily poured alloys and in some cases the resultant material is not suitable for contact with food.

Rolled Aluminium. A variety of articles are fabricated from rolled sheet or section, which may be of greater purity than cast material. Construction is generally limited to riveting or welding. Soldering of aluminium is technically difficult owing to the rapid formation of oxide.

Cleaning. The methods prescribed under the general instructions for metal articles should be followed, but strong alkali solutions should not be used. Abrasives and metal polishes should not be used.

Prevention of Corrosion. Do not allow prolonged contact with other metals in moist air or vessels containing liquid. The film of oxide should not be removed since it will appear again very quickly. Constant removal results in reducing the thickness of the material. Protective coating may be supplied.

(b) BRASS. This material is an almost pure alloy of copper and zinc. Owing to ease of machining, it is usually employed in the manufacture of components and fine mechanisms. It resists corrosion in normal kitchen use. It is not generally used for actual cooking utensils, except for such items as draw-off cocks and handles.

Cast Brass. Certain components are cast and afterwards machined and these are relatively brittle. This material is suitable for hot pressing in mass production and the articles are of first-class finish and stronger than those produced by casting methods.

Rolled Brass. This is not greatly used for kitchen equipment, owing to cost and the existence of cheaper materials which are able to perform the same function. It is extremely easy to form and may be brazed, soldered or riveted.

Cleaning. The normal method of cleaning is suitable. Metal polishes may be used on surfaces not liable to contact with food.

Prevention of Corrosion. The metal is able to resist corrosion in normal usage. Protective coating may be applied.

(c) CHROMIUM. This metal is not used by itself in the manufacture of equipment, but is alloyed with steel and other materials, to which it imparts qualities of hardness and corrosion resistance. The most common use in the kitchen is in protective coating where it is applied by electric-deposition. It is bluish white in appearance and is capable of very high polish.

Cleaning. Normal method is suitable. Metal polishes or abrasives should not be used.

Prevention of corrosion. This metal is highly resistant to corrosion in normal use. Daily cleaning is recommended.

(d) COPPER. This is used to a very great extent for cooking vessels owing to its good heat transfer properties, low specific heat and medium expansion rate. It is a very good conductor of electricity. It discolours on heating due to rapid formation of oxides, but does not tarnish in pure air. Moist air or contact with sulphurous fumes and liquids causes corrosion.

Rolled Copper. This metal is generally used only in rolled form and construction may be by brazing, riveting or soldering.

Cleaning. Normal method is suitable. Abrasives should not be used.

Prevention of corrosion. Protective coatings are generally applied to interior of vessels used for cooking. Care should be taken that these remain undamaged and impervious and therefore abrasives must not be used. Metal polishes may be used on surfaces not liable to contact with food.

(e) GUNMETAL. This metal is an alloy of copper, tin and zinc. The zinc is added to improve the casting qualities of the alloy, but this reduces its corrosion resistance and durability. The colours vary according to constituents, but are distinguishable as being between those of copper and brass. It tarnishes in moist air or contact with sulphurous fumes.

Cast Gunmetal. The material is generally used in cast form only for such items as draw-off cocks, valves and screwed connections. It may be brazed, riveted or soldered.

Cleaning. Normal method is suitable.

Prevention of Corrosion. Protective coatings may be applied and are necessary where there is contact with food. Care should be taken to ensure that these coatings remain undamaged and impervious, and therefore abrasives must not be used. Metal polishes may be used on surfaces not liable to come into contact with food.

(f) IRON. In its pure state, this metal is not greatly susceptible to corrosion. Exposure to air results in an oxide being formed which serves as a protective coating. Manufacturing processes which may increase the strength or working qualities often reduce the resistance to corrosion. Iron is available in cast, wrought or rolled form.

Cast Iron. Many of the larger items of equipment are produced from this metal. It is brittle and unable to withstand shock or extremes of heat. Because of this and the technical requirements of casting, the construction is generally heavier than for similar items fabricated from wrought or rolled sections.

Wrought Iron is practically pure iron with a reinforcing texture of oxide slag, which enables it to withstand shock, strain and extremes of heat.

Sheet Iron has properties similar to that of wrought iron, and may be cut, formed to shape, soldered, riveted or welded.

Cleaning. Normal method is suitable.

Prevention of Corrosion. Attention to normal cleaning and care in storage will prevent undue corrosion. Protective coatings are generally applied and care should be taken that these remain undamaged, therefore abrasives should not be used.

(g) MONEL METAL. This is an alloy of nickel, copper and a small amount of iron and has great strength and resistance to corrosion. It is usually employed in sheet form for fabrication of sinks and other large vessels. It may be soldered and riveted. Its colour is white and it tarnishes in moist air.

Cleaning. Clean by normal method.

Prevention of Corrosion. Frequent cleaning with soap and water, drying and polishing with a dry cloth will prevent a heavy film of tarnish forming. If neglected, pitting of the surface beneath the tarnish will occur.

(h) NICKEL. This metal is lustrous white in colour and is used generally for coating materials in order to render them less liable to corrosion, although nickel itself will tarnish in moist atmosphere.

Cleaning. Clean by normal method.

Prevention of Corrosion. Great care must be taken to ensure that a heavy film of tarnish is not allowed to form, since this will provide no protection to the material and will allow the underlying surface to become pitted. Abrasives or metal polish should not be used.

(i) SILVER. This metal is not generally used by itself in the manufacture of equipment, but is alloyed with copper and cadmium, and is applied as a protective and decorative coating by electrolysis. It is white and soft in texture and is used generally for tableware. It is liable to darken in colour by contact with foods and an acid or sulphurous content.

Cleaning. Normal method should be used, but discoloured portions require special treatment. Oxides which are produced by contact with acidulous foods can be removed by soaking in ammonia solution. Sulphides produced by contact with sulphurous foods are insoluble, and therefore mild abrasive preparations may be used. In all cases treat for oxide removal first.

Prevention of Corrosion. Avoid prolonged contact with foods of an acid or sulphurous nature.

(j) STEEL. This material, in its simplest form, is iron to which carbon has been added. It is produced in many grades and alloyed with other metals to meet a very wide range of requirements. Specially hardened, it is used for cutlery and blades of slicers and choppers. In rolled section, it is used for construction of heavier items and in sheet form it may be welded, soldered and riveted for fabrication of all types of equipment. It is dull white in appearance and is subject to corrosion in moist atmospheres.

Cleaning. Cleaning should be by normal method.

Prevention of Corrosion. Attention to proper cleaning and storage will prevent heavy corrosion. Protective coatings can be applied to both rolled section and sheet forms.

(k) STAINLESS STEEL OR IRON. This material consists of iron or steel with nickel and chromium added. It is white in appearance, has high resistance to corrosion and is available in cast, bar and sheet form. It may be welded, soldered or riveted. Its heat transfer properties are not so good as copper and it will discolour on heating. Chrome-steel or nickel-free steel is similar in appearance but, as the name implies, is a chromium-steel alloy, with the exclusion of nickel. As far as catering purposes are concerned there is no detriment, other than limitation in methods of manufacture and construction, due to the particular properties of the alloy.

Cleaning. Normal methods of cleaning should be used.

Prevention of Corrosion. Corrosion is possible and takes the form of small collections of rust marks, where pitting will occur if neglected. Attention to normal methods of cleaning and storage will minimise the risk.

(l) TIN. This is a white, soft metal that melts at comparatively low temperature, but is highly resistant to corrosion. Owing to its high cost and softness it is used only as a protective coating for other metals in kitchen equipment. Copper, iron, steel, brass and gun-metal are usually treated in this way. When articles are tinned after manufacture they are less liable to corrosion than those made from tin-coated sheet metal. In the latter case the parent metal is exposed on all cut edges.

Cleaning. Normal method is suitable.

Prevention of Corrosion. In each process the coating is very thin. Abrasive action, or scratching in use may expose the parent metal, allowing corrosion to occur.

(m) ZINC. This is bluish-white, soft, brittle, and melts at a comparatively low temperature, but is highly resistant to corrosion. It is used generally for coating iron and steel, when the process is known as galvanising. In rolled form it is sometimes used for lining wooden sinks. In moist air a film of carbonate forms on the surface. When heated, this decomposes to oxide, which is less adherent and therefore " galvanised " items should not be used for cooking purposes. Owing to its electrical affinity to iron, the value of zinc as a protective coating is enhanced by the fact that even when the surface is scratched corrosion is very slow.

Cleaning. Clean by normal methods.

Prevention of Corrosion. Although the risk of corrosion is slight, due attention to cleaning, storage and avoidance of abrasives will extend length of service.

(4) PROTECTIVE COATINGS.

(a) VITREOUS ENAMEL. This coating is applied to iron and steel articles in order to prevent corrosion and also to present a surface which is more easily cleaned and attractive in appearance. It is generally applied by spraying and afterwards fired at a temperature of 1,500° F., which produces a hard, glossy surface. When applied to sheet articles it is less able to withstand shock than if solid or cast sections are used. Care should be taken to avoid damage to the surface, especially on corners and around holes, etc. Overheating causes the surface to chip.

Cleaning. Cleaning should be carried out by the normal method. Most grease and grime may be removed in this manner and various prepared solvents are available for removal of neglected grease deposits. If abrasive powders are used to remove neglected deposits the surface may become scratched and make future cleaning more difficult.

(b) STOVE ENAMEL. This may be applied to most metals and is used mainly where the action of heat is not excessive. The coating is applied by spraying and is stoved at a temperature of 250° F. to 350° F. The surface has not the durability of vitreous enamel but is less likely to chip if properly bonded to the surface. Light colours are affected by heat.

Cleaning. Clean with a damp cloth and carefully dry. Abrasive powders or solvents should not be used.

(c) PLATING. This is the method by which such metals as silver, chromium, nickel or tin are used to coat metal articles in order to increase resistance to corrosion and to provide a more easily cleaned and attractive surface. The coating, which is very thin, is applied in molecular form by electrolysis and afterwards polished to produce a lustrous impervious surface.

Cleaning. This should be by normal method. No abrasive or metal polish should be used, except in the case of silver.

(d) ANODISING. This is a finish that is produced on aluminium which is oxidised by electro-chemical means and then polished. The surface is very hard and resistant to corrosion. The oxide may be dyed, in which case the colour is as permanent as the coating.

Cleaning by normal method will prevent corrosion. Soda, abrasives or metal polishes should not be used.

(e) BOWER-BARFFING. This process makes use of the fact that oxides are generally protective to the parent metal and is used for cast iron equipment. It is produced on iron by raising the article to red-heat and subjecting it to superheated steam, whereon a heavy coating is formed on the surface.

Cleaning should be by normal methods. Abrasives or metal polishes should not be used.

(5) GLASS.

This material has a hard durable surface, is highly resistant to corrosion, but generally is of a brittle nature and therefore most causes of damage are due to lack of care in use, cleaning and storage. Sudden extremes of temperature cause breakage owing to the fact that glass is not a good conductor of heat. Even so-called " heat-resisting " glass is not immune from breakage in this respect. Toughened glass is tough only at the surface and may disintegrate if this is damaged.

Cleaning. Wash in hot water, scrub to remove particles of food or grease. Rinse in water of sufficient temperature to enable articles to dry by own heat when removed. Polish, when dry, with a cloth. If suitable detergents are used and articles are properly rinsed, polishing, except before use for beverages, should not be necessary.

(6) CERAMICS (Earthenware, Pottery, etc.).

This is the name given to those materials which are formed from clay and fired in ovens or kilns. There are many varieties, which in general, are hard, durable, and corrosion resistant but brittle. Although earthenware is often used in cooking, glazed surfaces may chip when subjected to heat. Sudden shock or extremes of heat are mainly responsible for breakage.

Cleaning. Treat as glass as far as cleaning is concerned. Do not damage surfaces by use of metal utensils or abrasives.

(7) WOOD.

Many varieties are used in kitchens, some of which are described below. As a general rule, wood should be protected from moisture and heat to prevent rot and warping. Table legs in proximity to the floor may be damaged by rot if subjected to constant moisture. Where cutting, carving or chopping is carried out, special boards should be provided since blades either split or sever the grain, reducing the life of the wood. Small boards are more easily replaced than table tops. Avoid the bolting down of equipment on to preparation table tops. Holes once made are difficult to plug satisfactorily and a table top may be made unsuitable for other use.

Cleaning should be effected by scrubbing with bristle brush and water, to which a detergent has been added, afterwards rinsing and drying as far as possible.

(a) Ash. A light, tough and pliable wood, generally used for handles. It is liable to warp if subjected to moisture.

(b) Beech. A hard, heavy, strong and fine grained wood, suitable for table tops. This is liable to warp if excess moisture is left on the top, especially where heat is present.

(c) Deal. Soft wood from pine trees. It is tough, pliable, light and easy to work. Either yellow or red in colour, it is used generally for framing.

(d) Maple. A hard, close grained wood, very tough and is generally used for chopping blocks.

(e) Teak. A dark coloured, fibrous and tough material. Mostly used where resistance to rot and insects is required.

(8) PLASTICS.

There are many uses for plastic material in the manufacture of catering equipment and components. They can be divided into two main classes; methods of manufacture differ according to the type used.

(a) Thermo-setting Material. This material is produced under heat and pressure and becomes permanently rigid after manufacture. It is used for handles, control knobs, thin tableware such as beakers, egg cups and ash trays. Owing to its constituents it is generally more brittle than thermo-plastic material. It may be washed in reasonably hot water, but care must be taken to avoid breakage.

(b) Thermo-plastic Material. This material is produced free from impurities or filling material and is usually used for tableware such as cups, saucers, dishes and trays. It is less liable to breakage, but care should be taken that articles are not subjected to very hot water, otherwise they may become mis-shapen.

(9) MARBLE.

Two types of marble may be found in kitchen and preparation room, (a) white Sicilian and (b) Belgian black. The best means of preservation is washing daily with clean water, no detergents. They may be scrubbed with a bristle brush and all excess water removed. Care should be taken that highly polished surfaces are not damaged by utensils. In cold rooms or larders the possibility of ice forming on the surface or in the pores will hasten the decay of stone.

To clean marble, scrub it with a bristle brush and clean hot water, no detergents. Remove excess water after cleaning. If ice is allowed to form in the pores the marble may crack. Do not damage polished surfaces with utensils.

3. FUEL SUPPLIES.

The provision and maintenance of fuel supplies is not the concern of the catering department, but, if proper attention is to be paid to fuel consumption and cost, responsible members of the department should have some knowledge of the principles of fuel supply and control.

(1) GAS.

(a) Measurement. Gas, passing through the meter, actuates the mechanism therein and registers the amount on the dials provided.

(b) Cubic Feet (Cu. Ft.). This is the unit of measurement that is adopted for actual quantity of gas supplied.

(c) Calorific Value (C.V.). The amount of heat or energy provided by one cubic foot of gas may vary according to the district concerned and is expressed in B.T.U.'s per cubic foot. Generally 400-500.

(d) British Thermal Units (B.T.U.). This is the unit of measurement adopted to define quantity of heat. One B.T.U. represents the amount of heat that is theoretically required to raise the temperature of one pound of water by 1° Farenheit.

(e) Therm. This is the unit by which gas is usually sold. 1 Therm= 100,000 B.T.U.s.

(f) Cost. It will be evident that the number of cubic feet of gas cannot be expressed in therms unless the calorific value is also known. Since gas is supplied at a certain cost per therm, running costs can be calculated by the following formula:—

$$\frac{\text{Cubic Feet used} \times \text{Calorific Value} \times \text{Cost per Therm}}{100{,}000}$$

(g) Output. The calorific value is theoretical and can only be regarded as heat available if there is 100% efficiency in combustion. Actual efficiency may vary from 0—80% according to care in operation, maintenance and installation.

(h) Pressure. Town gas pressure is normally expressed in water gauge measurement, which indicates the amount by which it exceeds that of the surrounding atmosphere. The instrument employed is a U-tube with one end connected to the gas supply and the other open to atmosphere. When filled to reasonable capacity with water, held vertically and the gas turned on, the water levels on each side will rise or fall to balance pressures involved. The difference between levels is measured in 1/10 in. and the pressure is stated as being X/10 in. Water Gauge (W.G.).

Normal Pressures are in the region of 25/10 in. to 50/10 in., which corresponds approximately to 1/10 to 1/5 pounds per square inch (lbs. $\square$") or (P.S.I.). Frequent fluctuation in pressure may cause difficulty in efficient control of apparatus, and where this occurs the use of gas pressure governors is recommended.

Loss of Pressure. The flow of gas in pipes is subject to loss of pressure which occurs to a greater extent in small pipes and those where the direction is changed by fittings. Internal obstructions and long lengths of piping reduce pressure still further. Due to this, items which are connected nearer to the source may be supplied at a greater pressure and consequently may reduce supplies to those more remote.

Pressure Governors. The careful installation of pressure governors may help to overcome this difficulty. These instruments are not capable of increasing the pressure beyond that at which it is supplied, but will control it so that it does not rise beyond a certain level, thus enabling a more even distribution throughout the installation.

(i) Combustion. Efficient operation can only be attained by the use of correctly designed burners, combustion chambers or spaces, flue outlets and control gear. These factors are, or should be, considered in the design and manufacture of equipment, but standards of combustion may be considerably lowered by neglect in operation and maintenance.

Dangers of Inefficiency. Damage to a component may result in a serious accident, while imperfect combustion may produce fumes which are serious enough to cause death or, in less harmful concentration, be responsible for complaints of ill-health from the staff.

Methods of Heating. There are two main methods of heating by gas and each is used in accordance with the character of the apparatus in question. For contact heating, as generally used in fish fryers, steaming ovens, boiling pans and boiling plates, the atmospheric type of burner is used. For heating by radiation, as in hot cupboards and certain types of water heater, the heat gas or luminous type of burner is generally used.

Flame Temperature. It should be made quite clear that, although the atmospheric burner produces a flame temperature higher than that of the luminous burner, the same amount of heat is liberated, per cubic foot consumed, by each type and the same amount of oxygen from the air is ultimately required in each case to afford complete combustion.

Air Requirements. For every cubic foot of gas burnt, approximately 4 - 5 cubic feet of fresh air are required to provide sufficient oxygen for complete combustion. When combustion is complete, approximately 4 - 5 cubic feet of water vapour are produced. Failure to provide sufficient air and to carry away the products from the burner render the equipment not only inefficient but probably dangerous.

Combustion. A brief description of the two types of burners, their action and how they should perform are given below. Symptoms of imperfect combustion and their remedies are also stated, but for removal or adjustment of components the engineer's staff should be called into action, since an unhappy choice of tools by an enthusiastic but inexperienced member of the kitchen staff may cause irreparable damage.

(j) Atmospheric Burner. This type of burner is designed to mix the gas and part of the air needed for combustion before it reaches the flame port, where the remainder of the air should be available.

The complete burner can be generally defined as consisting of five sections:—

(a) Control Cock.
(b) Injector.
(c) Air Adjuster.
(d) Mixer Tube.
(e) Flame Ports.

Operation. When the control cock is opened, gas issues from the injector at a speed approaching 100 miles per hour into the mixing tube, and has sufficient energy to entrain approximately double its own volume of air with it. The air adjuster which regulates the amount of air entrained at this stage is dispensed with in certain designs. The mixer tube has to be of sufficient length to allow gas and air to combine before they reach the flame port, where combustion takes place provided further adequate supplies of air are available.

Highest Efficiency. Atmospheric burners are for contact heating and the flames produced should consist of sharp blue cones immediately over the flame ports, with enveloping firm spear shapes of orange to purple hue. The outer envelopes should make contact with the surface it is desired to heat, but on no account should contact be made with inner blue cones, since this would lead to the liberation of unburned gases.

Imperfect Combustion Although the technical means for testing appliances are beyond the scope of most kitchen staff, some of the more prominent symptoms of poor combustion can be identified and, in some cases, the remedy applied without recourse to outside help.

Lighting Back. The symptoms are obvious enough: each attempt to ignite results in an explosion inside the burner and mixing tube. In some cases gas is ignited at the orifice of the injector. This is due to the mixture of gas and air being incorrectly proportioned inside the burner and mixing tube. An excess of air within the burner slows down the speed of the mixture while at the same time the speed at which flame will travel through the mixture is increased, so that flame actually proceeds in an opposite direction to that which is normal.

Care in ignition may remedy the difficulty on ordinary burners. Before gas is turned on, the burner is full of air and therefore sufficient time should be allowed for the mixture to stabilise in proper proportions before igniting. If explosions continue, the cause may be sought in the injector. It is clear that insufficient gas is reaching the burner and this may be due to blockage of the injector orifice. The orifice may be cleaned with fine wire, but care should be taken to ensure that the orifice is not damaged either on the surface or internally as this will affect the future flow of gas and mixing operation.

If after ascertaining that the orifice is clean, lighting back continues, examination should be made of the gas rate adjuster, which is generally in the form of a screw at the rear of the injector. At this stage the services of the engineer's staff should be sought to avoid damage to components.

Should adjustment of the gas rate bring no better results, the fault may be attributable to the fact that the gas pressure available is too low for the apparatus concerned. (In which case the matter should be referred to those responsible for the supply of gas and equipment.)

Yellow or Shapeless Flame. The flame appears limp and licks under the surface to be heated. Soot or carbon deposits appear like stalactites on the underside of the heated surface and fumes are noticeably obnoxious. This is due to insufficient air being present to allow satisfactory combustion. It may be caused by blockage of flame ports or mixing tube.

If the burner is of the removable type it should be cleaned in hot soda water, deposits should be removed with a stiff bristle brush and the actual holes, if blocked, pricked with fine wire. It should be rinsed and dried before replacing. Fixed type burners may be accessible only by removal of other components and this should be left to the engineer's department.

A further cause may be that the injector passes more gas than the burner is designed to use; attention to the regulation may be necessary. The injector should be in line with the mixer tube and any deviation from its proper position may be responsible for insufficient air being entrained.

Poor ventilation of the apparatus may also affect combustion. Flues can become blocked, or air inlets to the combustion chamber may be impeded. The result is the same in each case and total extinction of flame may occur, the danger of which is obvious.

(k) The Aeromatic Injector. Certain types of gas-heated apparatus are now fitted with an injector, by which air is introduced in two stages. The design is such that lighting back can be almost eliminated, but care must be taken to ensure that air entry points are not impeded or blocked by neglect in cleaning. Adjustment of components should be left to those experienced in such matters.

(l) Luminous Burner. This type of burner is often referred to as a " neat gas " burner, due to the fact that gas alone issues from the flame port and depends upon the full quantity of air required being available within the combustion area. They are easily distinguishable from the " atmospheric " type by the fact that there is no injector, air entry or mixing tube. These burners are designed for specific purposes, and generally the flame ports are in the form of individual jets screwed into the main burner. These are of fragile materials and constructed to very fine limits, and therefore great care must be taken in operation and cleaning.

Operation. The flame produced is bright yellow, with a bluish centre, and is less rigid than that of the atmospheric burner. Heating is effected by radiation alone and flames should not come into contact with any surface, otherwise soot deposits will be formed and unburned gases liberated.

Blockage of Jets. The very fine holes in the jets occasionally become blocked with dust particles. The symptoms are obvious: the flames are either mis-shapen or non-existent. The offending deposits may be displaced by probing with fine wire, care being taken not to enlarge or damage the orifice in any way. Removal of the jet for cleaning is not to be recommended, since re-setting is extremely difficult.

Damage of Jets. Breakage or maladjustment of jets may result in dangerous quantities of gas escaping. The apparatus should not be used until the faulty jet has been removed and a new one fitted. If further jets are not immediately available the socket should be plugged by a suitable screw, securely packed.

Combustion. The flames should have the appearance of being firmly positioned over the jets and be regular in shape. Any tendency to " lift " or become limp indicates that there is insufficient air available. The control cock should be turned down until a correct flame is obtained, but those responsible for installation should check that there is no risk from incomplete combustion in normal use.

(2) ELECTRICITY.

In catering, this medium is employed both for heating and mechanical operation. Although safety precautions demand that only qualified electricians should be allowed to install or adjust equipment, knowledge of the principles involved will be of assistance as far as use and care of equipment are concerned.

(a) Data. All equipment should bear certain details regarding the electrical supply necessary for its safe and efficient operation. These details should be noted and understood by those responsible for their use. Equipment that is designed for operation on A.C. supply will not necessarily work on D.C. and vice versa, even though the voltage may be the same in each case. This is especially important to observe in the case of equipment with motors, thermostats or timing controls. In some cases the use of an incorrect supply may result in the complete breakdown of the equipment or render it dangerous to operate.

(b) Volts (V.). This is the term used to state the pressure at which current is supplied.

(c) Amperes (A.). This term describes the capacity that an item provides for the passage of electrical current.

(d) Watts (W.). This indicates the actual amount of electricity that an item will consume.

(e) Inter-relation. The above three terms are related to each other and each may be determined if the other two are known by the following formulæ:—

$$V = \frac{W}{A} : \qquad A = \frac{W}{V} : \qquad W = V \times A$$

(f) Horse Power (H.P.). Mechanical items often bear details which indicate the amount of power that is available for use. One horse power is equal to 746 watts.

(g) Direct Current (D.C.). This term is used to describe an electrical supply where the current flows continuously in one direction only. Control gear for this type of supply is generally of heavier construction than that controlling similar supplies of A.C. current. Finely adjusted mechanisms such as thermostats can control only comparatively small loads. For larger loads magnetic relay switches must be used, which lessen the possibility of "arcing" between contacts.

(h) Alternating Current (A.C.). This term is applied to an electrical supply where the flow of current is changed from one direction to the other in rapid succession. These fluctuations are known as "cycles" and generally occur as frequently as 50 times per second. With this type of supply electric contacts are not so liable to produce "arcing" when they make and break, so that more delicate mechanisms are possible.

(i) Single Phase and Three Phase Supply. The following explanation of these terms may give an outline on what is a highly technical subject. Four wires are normally used for distribution of alternating current, and these may be named Red, Yellow, Blue and Black (neutral). When current flows between any two colours the voltage is in the region of 400 volts. Between any colour and black (neutral) the voltage is in the region of 230 volts. Technical aspects of generation require that the loads on each line should be equal, and electrical engineers endeavour to "balance the load" by connecting certain items to each particular pair of wires or "phase".

(j) Cost. Electricity is supplied at a certain cost per unit. When current passes through the meter, a small amount, in direct proportion, actuates the mechanism which registers the amount consumed in "units". The "unit" represents the amount of heat or energy consumed by a load of 1 kilowatt (1,000 watts) when used continuously for 1 hour. By the same standard a 100-watt lamp would be used for 10 hours, or a 500-watt electric fire be used

for 2 hours. In each case a unit would be consumed. Cost of operation of apparatus can be calculated as follows:—

Load (in kilowatts) × Hours (actual use) × cost per unit = Running cost.

(k) Heating Elements. There are several types of heating elements that are in general use for kitchen equipment, details of which are given below.

Immersion Heaters. As the name implies, this element is actually immersed in the liquid to be heated. Two types are usually employed (a) the flat blade type, which may consist of several blades arranged in battery form, (b) the tubular type, which may also consist of several tubes. In each case the actual element is housed in a water-tight case which transfers the heat from the element to the liquid.

The most frequent cause of breakdown is overheating, generally due to the contents boiling away and leaving the heater with little means of dissipating the heat generated internally. Soldered joints of the casing, or even the parent metal, may suffer damage in this respect. The presence of scale, due to water hardness, may also be responsible for similar trouble, since scale acts as an insulating material and prevents heat from being conveyed away from the heater. Some immersion heaters are provided with a thermostatic " cut-out ", which serves as a safety measure in such circumstances.

Explicit direction on the use of the apparatus will lessen the risk of breakdown. Heaters should be switched off before the contents are drained. Vessels should be filled before the heaters are switched on. Scale deposits should be removed from the heater by careful scraping. There are certain chemical preparations available of a mild acid nature which can be used to remove scale. If they are used the vessel should be thoroughly rinsed and boiled out before use for beverages.

Open Fire Bar Elements. These are used in items requiring space heating, such as ovens, hot cupboards, etc. They consist of a refractory base with coils of resistance wire located in grooves on the surface.

Damage to the refractory base is generally responsible for breakdown of this type of element, although dislocation of the resistance wires may cause localised overheating, resulting in the fusing of the actual wire.

Damage can be avoided by care in handling the equipment. Sudden shocks or vibration should be avoided. The presence of damp not only weakens the refractory material, but increases the risk of " short circuit ", which may be dangerous to staff. The elements should be protected against the possibility of food or liquid coming into contact with them. Cleaning must only take place when current is switched off and the element is cool, and a soft, dry drush should be used.

Mica Wound Elements. This type of element is used in smaller items of equipment such as waffle irons, toasters, etc. A mica base is wound with resistance tape and may or may not be enclosed by a further insulating strip of mica.

The base material is liable to flake if subjected to vibration. Dislocation of the tape winding will cause premature burn-out. The presence of damp will cause short circuit.

Avoid undue shocks in transit. Do not expose to damp or moisture. Clean carefully with a soft brush when the unit is switched off and cool.

Clamp-on Elements. These are used for contact heating, as in fish fryers, steaming ovens, etc., and consist of a refractory base, with resistance windings enclosed by an insulated metal case. They are usually clamped into position with heavy supporting bars and do not run such risk of damage from vibration.

Overheating, due to boiling away of the contents of the vessels concerned, is the most usual cause of breakdown.

Do not switch on if the vessel is empty. Switch off before draining the contents. Clean the elements with a dry cloth, if accessible, when the unit is switched off and cool. Damage may be caused to the actual vessel before the elements are affected owing to the high temperature that these are sometimes designed to withstand.

Solid Top Elements. These are usually employed for range top or boiling plate and consist of a refractory material with the resistance wire embedded internally and encased in cast iron on aluminium at the top and sides, with a removable mild steel plate at the base. Some have mica wound elements clamped between cast iron plates. With this type of element it is necessary to have utensils with a flat base to make contact with the top plate.

Overheating is generally caused by leaving the heater switched on when not in actual use, although this type of heater is designed to withstand a great deal of mis-use in this respect. Breakage is rare, owing to the heavy construction of the exterior.

Reasonable care in use and due attention to switching off when not required will prolong the life of this type of element. Clean the top and sides with a damp cloth and dry afterwards. Fine emery cloth may be used to remove rust deposits.

Radiant Type Elements. These are used for the same purpose as solid top elements and have the advantage of being able to heat by radiation so that utensils with rims at the base may be used for cooking. They consist of tubular elements of high durability, formed into shapes and fitted flush with the top of the boiling plate.

Breakdown can be caused by prolonged overheating and sudden extremes of heat.

Reasonable care in use and due attention to switching off when not required will extend the life of the element. Clean with a damp cloth when cool and wipe dry.

Blanket or Woven Elements. These consist of resistance wire woven with asbestos fibre and are used for shelf-heating, etc. They are usually enclosed and insulated by asbestos mats.

The asbestos becomes brittle with prolonged heating and may break, allowing the resistance wires to touch and cause local overheating, resulting in fusion of the wire.

Avoid undue vibration and shock. Do not subject to prolonged unnecessary use. Since these elements are enclosed, cleaning is not required.

(l) Electric Motors. There are many types of motors for kitchen machinery and the actual construction and wiring need not concern kitchen staff, but there are certain rules regarding use and care of equipment which must be observed if efficient operation and length of life are to be considered.

Each motor is capable of providing a certain amount of power, and of rotating at a certain speed. Any impediment that reduces the speed or otherwise over-strains the motor will cause the internal wiring to become overheated and burn the insulation and eventually cause the wires to fuse. Lack of lubrication in rotary parts may also be responsible for some degree of overload.

Do not switch on motor when there is any likelihood of obstruction. Fix a maximum amount of materials that may be used at one time. This will vary according to the consistency of materials. At any sign of obstruction switch off the motor immediately.

(m) Maintenance. All electrical equipment should receive regular attention by a qualified electrician. All adjustments, lubrication of motor bearings, fitting of brushes and wiring, testing of elements, etc., should be left to his care. Any equipment that is not operating satisfactorily should be switched off pending his inspection.

(3) STEAM.

The maintenance of an adequate steam supply is the concern of the engineer in charge of that particular department, but a knowledge of the main principles will assist kitchen control.

(a) Latent Heat. When ice melts or water boils, a change of state occurs in the material and during this process a large amount of heat is absorbed. When changing back to its former state, this heat is liberated.

(b) Steam Heating. In the case of steam heating, the water enters the boiler and is converted to steam under pressure. The steam flows through the pipes to the apparatus concerned and when in contact with a cooler surface it condenses, at the same time liberating the amount of heat that it absorbed when changing from water to steam.

(c) Condensation. The rate of condensation is in proportion to the area of the cooling surface, so that large areas cause more rapid condensation. The water thus formed is separated from the steam by suitable traps and is returned to the boiler to be used again. In some systems the water is allowed to run to waste.

(d) Pressure. The pressure at which steam is supplied is calculated in pounds per square inch and is shown on dials distributed throughout the system. Special valves may be fitted to reduce pressure to certain items.

(e) Apparatus. Several forms of apparatus for steam heating are available and some general details of them are given below.

Jackets. Generally used for boiling pans, and consist of heavy cast sections, bolted together to form an internal space into which steam is injected.

Pads. Generally in use for hot cupboards, where the shelves and tops are heated by hollow " pads " clamped to the underside.

Coils. Generally used for water boiling in all types of apparatus, and also for hot cupboards, where they are clamped to the underside of shelves and service tops.

Jets. Used in " live " steam ovens, where the steam actually enters the compartment, generally at a lower pressure than that used for other types of apparatus. They are also used in some cooking vessels where the injection of steam causes the cooking water to boil, and for raising the temperature of water used for washing up.

(f) Inefficiency. Most of the aspects of efficient use of steam should be carefully watched by the engineer. Bad trapping arrangements and heat loss during distribution are matters for his attention, but actual waste of fuel inside the kitchen should concern those in control. Owing to the fact that the temperature of steam apparatus does not increase greatly when left on after use, as in the case of gas or electric items, there may be considerable waste of fuel. Steam control valves should be closed when daily use is over in order to save fuel costs. Jets should be turned off immediately when not required in order to save fuel and also to prevent undue condensation in the kitchen. The formation of scale on heating surface acts as an insulator and prevents efficient transfer of heat taking place.

Breakdown. If due care in use and cleaning is observed, breakdown in steam-heated equipment is unlikely to occur. Components require attention periodically for renewal of seatings, etc.

4. WATER HARDNESS.

The hardness of water varies according to the district from which the water is drawn, and the treatment it receives from the supply authorities.

(a) Scale. The formation of scale in water boiling equipment is due to the presence of certain solids dissolved by the water and thrown out during certain stages of heating. Most of this action takes place between temperatures of 140° - 180° F., which is the reason why most water heating apparatus is designed to supply water of a temperature not exceeding 140° F.

(b) Effect. The effect of scale on the life of apparatus is considerable. Deposits formed on surfaces subjected to heat act as an insulation and do not allow full transfer of heat to occur. This not only diminishes efficiency but causes the surface of the material to become overheated and liable to damage.

(c) Removal. According to the nature of the scale formed the method of removal may vary. Where the deposit is of a soft texture it may be carefully scraped from all surfaces. In some cases flakes are formed which may be removed by hand. Really hard and tenacious deposits may be chipped away from the surface, but in order to avoid damage, the use of a mild acid scale remover may be preferable. If acid is used, the vessel should be thoroughly rinsed and boiled out before use for food purposes.

(d) Prevention. Water softening plant will remove most of the cause of such deposits. Daily cleaning and attention as prescribed for the materials and apparatus concerned will obviate the possibility of large and troublesome deposits.

5. COMPONENTS.

(1) BALL VALVES.

These control the level of water in steaming ovens, water boilers and some types of hot cupboard. They consist generally of a copper ball, a brass lever arm and brass valve in which is set some form of removable washer which fits over the water inlet orifice. Great care should be taken that movement of the ball and lever is not impeded in any way. Application of heat to the feed tank should be avoided to prevent the formation of scale.

(a) Adjustment. An overflow should be connected to the feed tank and any discharge from this will indicate that the apparatus is not functioning correctly. Adjustment of the water level should be made by the engineer's staff. The washer should be inspected periodically and renewed when showing signs of wear.

(b) Cleaning. For cleaning, the water supply should be cut off and the unit drained. All connecting pipes should be cleared of obstruction by bottle brush. Wipe with a cloth, avoiding undue pressure on lever or ball.

(2) BIBCOCKS.

These are the normal type of water taps fitted over sink units. In general use, handles should be turned sufficiently to shut off. Further turning may damage seatings and screw threads. Cleaning should be carried out by the methods prescribed for materials concerned.

(a) Adjustment. Internally there is a small loose plug with a renewable seating. When the tap drips it is a sign that the seating requires replacing by the engineer's department.

(3) BURNERS.

(a) Atmospheric. To maintain burners at highest efficiency they should not be allowed to become silted up with burned-on deposits. Clean by scrubbing in hot soda water, clean mixer tubes with bottle brush, rinse in hot water and dry. Fixed types should receive as much treatment *in situ* as is possible, and arrangements should be made with the engineer's department for periodic stripping down of the equipment to allow complete cleaning.

(b) Luminous. Removal of fallen carbon and oxide deposits may be effected with a soft wire brush carefully applied. Blocked holes in burners may be pricked with fine wire. Care should be taken not to enlarge holes. Do not wash.

(4) CASTORS.

Should be lubricated at both hub and swivel. Grease nipples are usually provided and a grease gun should be available in the engineer's department. Pneumatic tyres should be kept at high pressure. All tyres should be regularly inspected for embedded fragments which shorten the life of the tyre. Spring loading will increase resistance to shock of the unit and castors. Clean with damp cloth and dry as far as possible.

(5) COCKS.

(a) Draw-off Type. These are generally made of brass or gun-metal and depend on precisely ground surfaces to form a water-tight joint. If the surfaces are damaged, leaks will be caused, which should be attended to by the engineer's department. Avoid any strain on the lever handle, especially downwards. The rotating plug should not be removed if thorough cleaning of the tap can be effected otherwise. Cocks should be cleaned by bottle brush, and this is easier if cleaning noses are provided. Clean as prescribed for materials concerned.

(b) Gland Type. These items are of an improved design, and leakage from the plug is obviated by the use of a greased gland. The plug should not be removed except by the engineer's department. Clean as prescribed for material involved.

(c) Gas. These are of similar design to draw-off cocks, but lever handles are not usually fitted. Adjustment of these should be left to the engineer's department, since damage may prove dangerous. Clean by methods prescribed for materials concerned.

(6) Door Catches.

Violent slamming of doors places a great strain on the catches and if they are adjustable they should be examined periodically to ensure that they are not too tight or too slack.

(7) Elements.

These items have been described under Fuel Supply—Electricity.

(8) Gauge Glasses.

Where gauge glasses are used for beverages, daily cleaning is imperative. A small diameter tube or bottle brush should be used. In most gauge glass fittings a small cover cap is provided, removal of which gives access to the actual glass. Rinse well with warm water after cleaning. Avoid extremes of temperature and do not use boiling water.

(9) Gas Injectors.

Care should be taken that gas and air controls are not altered accidentally. Adjustment should be carried out by the engineer's department. Cleaning should be as prescribed for materials used.

(10) Switches.

Rotary types should not be subjected to lateral strain as this tends to bend the spindle and may damage contacts. Do not wash, but clean with dry cloth.

(11) Thermostats.

Thermostats usually are sealed to avoid internal interference. It is useful to check thermostats by comparison with a thermometer. Variable thermostats should receive great care at the hands of kitchen staff in order that maladjustment does not occur. The dial should not be subjected to lateral strain otherwise the operating spindle may be bent and consequently affect the delicate mechanism internally.

(12) Valves.

Treat as for bibcocks.

6. APPARATUS.

(1) Bain Marie.

This item may be gas, electric, or steam heated and may be of the open or enclosed type, forming part of a hot service unit or operating separately. A perforated false bottom is fitted to most open types to

protect the actual bottom and the heating medium from damage, whilst allowing complete water circulation round the vessels. Cleaning of either type should be carried out daily by removing the false bottom, draining, and rinsing with clean hot water and wiping dry with a cloth. Food particles should be removed with a bristle brush. The draw-off cock should be cleaned with a bottle brush.

(2) BOILER WATER.

Care should be taken that heat is never applied when the vessel is not filled to adequate capacity to protect the unit from overheating. Heavy deposits of scale should be avoided since this acts as an insulator and prevents transfer of heat to water. The unit should not be kept filled with water over long periods without use. Daily draining and wiping dry with a clean cloth will minimise the risk of electrolytic action and also reduce scale deposits. Clean as prescribed for materials and components concerned.

(3) BOILING PAN.

Do not apply heat when vessel is inadequately filled to protect from overheating. The unit should not be kept filled with liquid over long periods without use. Drain daily and clean by methods prescribed for materials and components concerned.

(4) BOILING PLATE OR RING.

Do not overheat burner, elements or grids by prolonging heat without cooking vessels in position. Switch off or reduce heat when the vessel is removed. Wipe over with a damp cloth and dry with clean cloth when cooled after use. Clean as prescribed for the material and components concerned.

(5) CAFE SET.

See Boilers—Water.

(6) COOKER (Gas and Electric).

See Boiling Plates and Ovens.

(7) COOKERS (Solid Fuel—Heat Storage and Insulated Types).

These items require special attention on care and maintenance, according to type. They are designed for prolonged high temperature operation, with the use of special fuels. The usual observations regarding withdrawal of heat do not apply in such cases. The use of insulating covers over boiling tops conserves heat when the latter are not in use. The robust construction renders damage in reasonable use very improbable. Cleaning should be by methods prescribed for the materials concerned.

(8) FISH FRYER.

Do not apply heat unless the pans are adequately filled to prevent overheating of unit. Withdraw heat before draining the contents of the pan. Remove deposits of grease after use, especially where contact with heat or flame is liable. If pans are of the lift-out type, do not remove until heating is switched off. Cleaning should be as prescribed for materials and components concerned.

(9) GRILL.

Grills use the principle of radiant heating and their particular function demands that they shall be allowed to heat up before actual use, but their life is considerably shortened if periods of service are unreasonably prolonged. Do not maintain heat longer than is necessary. When firebrick lining or radiants are used extreme care must be taken to avoid vibration or shock. Clean by methods prescribed for materials and components concerned.

(10) HOT CUPBOARDS.

Hot cupboards should be capable of heating up to required temperature 15 - 20 minutes from switch-on. Do not waste fuel or shorten the life of heating arrangements by unnecessarily prolonging heating. Lubricate sliding doors regularly and provide insulated door grips to prevent damage from opening doors by kicking. Take care in cleaning that particles of food or liquid do not fall on to the heating component. Clean out after use by the methods prescribed for the materials and components concerned.

(11) OVENS—Roasting, Baking, etc.

Estimate time taken to reach required temperature and ensure that heat is not applied unless or before it is actually required. The ovens should be level, and this can be demonstrated with a pan of water or spirit level. The slamming of doors is not conducive to good cooking or to the long life of the apparatus. Clean out after use where possible, remove food particles and grease before they become carbonised by heat. Clean by methods prescribed for the materials concerned.

(12) OVEN—Steaming. Live Steam Jet (Pressure Type).

These ovens are normally fitted with automatic valve action to cut off steam when doors are opened. When they are not provided, care should be taken that doors are not opened when steam in still on. The time for heating the interior should be estimated so that undue use of steam may be avoided. Doors should be closed carefully to avoid damage to gaskets. After use, the unit should be cleaned out and wiped dry to avoid corrosion. Cleaning should be by methods prescribed for the materials and components concerned.

(13) OVENS—Steaming (Atmospheric or Non-Pressure Type).

Do not apply heat unless the water pan is filled to adequate capacity. Heat up the interior by raising steam before cooking commences, but estimate the time this takes in order to prevent undue use of fuel. On no account should the steam vent be blocked or impeded. The door should be closed gently to avoid damage to the gasket and also to prevent sudden inrush of cold air. When the door is opened, heat should be reduced to prevent undue condensation in the kitchen. The unit should be cleaned daily after use, special attention being paid to the water pan, which should be drained and cleaned to remove food particles. Water supply to the automatic feed valve, if provided, should be turned off to allow the contents to be completely drained. If the feed tank is remote from the water pan, care must be taken to ensure that the supply pipe is not blocked by particles. Care of automatic valves is described under components. General cleaning should be as prescribed for materials and components concerned.

(14) OVEN—Proving.

Should be wiped dry to avoid corrosion after use. Water pans, if not removable, should be drained and wiped dry. General cleaning as for materials and components involved.

(15) SOLID FUEL APPARATUS.

General instructions regarding care and maintenance are given under the various items concerned, but attention must be given to the cleaning of flues regularly in order to promote efficiency. Where plain black cast iron is the main material used, this may be protected from corrosion by the regular application of black lead and stove polishes. Emery paper may be used to remove deposits of rust and carbonised food particles.

(16) STOCKPOT STOVES.

See Boiling Plates.

(17) TOASTER.

See Grillers.

(18) TROLLEYS—Insulated Electric.

The time taken to heat should be noted, since the life of elements is extended if heating periods are not unduly prolonged. Care in transit will prevent damage to elements and components. Proceed as for Hot Cupboards. The castors should be lubricated regularly at hub and swivel.

7. EQUIPMENT.

(1) BASIN—WASH-HAND.

Should be cleaned as prescribed for the materials used.

(2) BIN—REFUSE OR SWILL.

Should be fitted with close fitting cover. Hose and scrub to remove adherent food particles. Avoid accumulation of moisture at the base, since corrosion usually occurs at this point.

(3) BIN—STORAGE.

Should be emptied occasionally, washed and thoroughly dried. Keep bottom raised from floor to avoid attack by damp to underside.

(4) BIN—TEA LEAF.

See Bin—Refuse.

(5) BLOCK—BUTCHER'S.

Should be scrubbed after use with bristle brush and hot water, to which soda has been added, afterwards rinsed with clean water. A scraper should be used to level slight indentations. Wire brushes should be used sparingly, since their action makes cleaning more difficult owing to the roughened surface they produce. Care in use of butcher's tools and distributed use over the whole area will serve to prolong the life and serviceability of the block.

(6) BOARD—CARVING, CHEESE, CHOPPING.

Should be scrubbed and rinsed after use. Treatment to both sides will prevent warping.

(7) CONTAINER—FOOD—INSULATED.

Do not heat externally, but warm with hot water or steam jet before use. Wash out, scrub with bristle brush to remove food particles, and dry thoroughly after rinsing, store inverted if damage to locking device is not likely. This will obviate risk of moisture attacking the seams.

(8) CONTAINER—BEVERAGE—INSULATED.

The infuser should be removed immediately the beverage is infused. The leaves or grounds should be removed immediately and the infuser washed and dried. When the container is empty, it should be washed and dried. Draw-off cocks should be cleaned by bottle brush and left in the "open" position. Store inverted if possible to avoid attack from moisture. Remove deposits at least once weekly by filling with boiling water with added detergent and leave overnight. Wash out thoroughly and rinse with hot water before use.

(9) HOD—FUEL.

These should be completely emptied occasionally and inverted to drain moisture from the interior. Corrosion generally occurs through contact with damp floors and wet fuel.

(10) SCALES—PORTABLE.

Should be kept out of balance when not in actual use to protect the knife edge and should be cleaned after use as prescribed for materials concerned. A box with a lid should be available for storage of weights. Scales should be checked regularly for accuracy and adjusted if necessary.

(11) SCALES—PLATFORM.

Should be kept out of balance when not in use. Bring into balance only when article to be weighed is actually on the platform in order to avoid damage to beam. Spare weights should be accommodated on a rack.

(12) SINKS AND DRAINERS.

The sink, drainers, overflows and actual waste outlets should be cleaned after use, by methods prescribed for materials used. Hardwood sinks should be cleaned out and, if liable to be unused for a long time, should be filled with clean water to prevent shrinkage of the timber. Inspection of the clearing eye in the waste trap should be made periodically to remove grease and film that may accumulate at this point.

(13) SLABS—MARBLE.

Should be scrubbed with hot water and rinsed. All excess moisture should be removed with clean dry cloth.

(14) TABLES.

Should be scrubbed clean with hot soda water and wiped as dry as possible to avoid warping. No cutting or chopping should be allowed on table tops.

(15) TRITURATORS (SOUP MACHINES).

Should be thoroughly cleaned after use by stripping all removable sections and scrubbing to remove food particles. Rollers should be scrubbed. Brushes should be soaked and worked free of particles. The mesh should be scrubbed and thoroughly dried to avoid corrosion. The container should be washed and thoroughly dried.

8. MACHINERY.

(1) BREAD AND BUTTER MACHINE.

The whole of the machine in contact with food should be taken down as far as possible and cleaned by immersion in the sink. Fixed components should be cleaned *in situ*. Attention should be paid to lubrication of mechanical arrangement.

(2) BUTTER PAT MACHINE.

Should be taken down and washed in separate pieces to ensure complete cleanliness after use.

(3) CHIPPER—HAND.

Manual types should be washed and dried after use by prescribed method. Interiors of blades should be cleaned with folded cloth to prevent corrosion. Pressure should be applied gradually in order to prevent misalignment of die with blades, which can be caused by violence.

(4) CHIPPER—ELECTRIC.

Each section in contact with food should be cleaned after use. Care should be taken that no obstruction prevents the motor from operating at normal speed. All moving parts should be lubricated to reduce friction.

(5) DISH WASHING MACHINE—SPRAY TYPE.

Adequate water supply should be the first consideration, and this may be diminished if revolving or fixed sprays are blocked. Temperatures of washing and rinse water should be checked occasionally. The interior should be rinsed and drained after use. Strainer plates should be cleaned and the complete machine thoroughly dried where possible. All moving parts should be lubricated regularly to avoid friction.

(6) DISH WASHING MACHINE—BRUSH TYPE.

Remove and clean brushes daily after use. Lubricate bearings regularly. Clean out overflow compartment and proceed as for sinks.

(7) MIXER.

Care should be taken to avoid overloading the motor. This can be caused by obstruction to rotary components. Switch on motor while unit is in neutral gear. Put into required gear when motor is running at normal speed. Remove and wash all attachments after use by prescribed method. Clean the fixed portion as prescribed for material concerned. Lubricate frequently in accordance with manufacturer's directions.

(8) PEELER—POTATO.

Potatoes should be free from earth and stone before loading. Machines should not be loaded until abrasive plate is in motion and water spray working. The interior should be cleaned out daily and the abrasive plate removed to ensure that small particles are not lodged below. Care should be taken to avoid any obstruction that would prevent the motor from operating at its normal speed. The peel trap should be emptied as often as required during operation and should be cleaned daily after use. The waste outlet should be kept free from obstruction. Clean the exterior as prescribed for the materials concerned.

(9) REFRIGERATOR.

Cleaning of the units can only be effected when empty, and therefore suitable arrangements for food storage should be made to allow this to take place at least weekly. The accumulation of frost on the cooling system acts as an insulator and causes the refrigerator plant to remain in action longer than is necessary, thus reducing the working life of components. When cleaning, the unit should be switched off and frost may be gradually melted by leaving the door of the compartment open to air, or the continued application of cloths soaked in hot water may achieve quicker results. After frost has been removed, the interior should be cleaned as prescribed for the materials involved. In large Cold Rooms the water produced by defrosting should be removed as quickly as possible from the flooring. All interior surfaces should be dried with a cloth after cleaning. Constant opening of the door not only reduces the efficiency of the compartment, but increases the possibility of frosting, due to the high humidity of the warm air admitted.

(10) SLICING MACHINE.

Each section in contact with food should be cleaned after use; care should be taken that no material likely to damage the rotary blade is included with the food to be sliced. All moving parts should be lubricated frequently and the rotary blade should be sharpened by application of the grinding wheels when the blade is rotating. The thickness gauge should be checked regularly to ensure that it registers satisfactorily. Clean as for materials and components concerned.

9. UTENSILS.

(1) BASIN.

Clean as for material concerned. Avoid using utensils of harder material for stirring, etc. Do not stack unless design is such that interior is not scored or top rim damaged.

(2) BASKET—WIRE.

These are liable to damage through misuse in handling and washing. They should be washed by the method prescribed for materials concerned, and afterwards thoroughly dried to avoid corrosion of joints.

(3) BOILER—JACKET (PORRINGER).

Interior and exterior should be cleaned according to materials involved. Scale formation can be avoided by filling linings with boiled water. This should not be done if linings are of earthenware or glass. Remove scale with dilute mild acid.

(4) BOILER (OVAL).

Should be cleaned by prescribed method. Utensils of harder material should not be used for stirring.

(5) BROOM OR MOP.

Wash regularly to remove dust particles, shake out, hang to dry. Store on rack and do not stand on bristle end for long periods.

(6) BRUSH.

Should be fitted with screw eye to enable it to be hung on hook when not in use. Wash thoroughly after use and hang to dry.

(a) Bottle Type. Usually tinned or galvanised twisted wire with bristle inserts. Choice of the correct diameter for any cleaning operation will increase the life of brushes and make cleaning easier. Wash thoroughly after use, shake and hang to dry. Wipe metal holders.

(b) Butcher's Type. Usually of wire set in wood. They should be thoroughly cleaned after use by soaking and working out particles of meat, etc. Wash, rinse out, shake off moisture from wire before storing.

(c) Pastry Type. Made of bristle set in either wood or metal holders. Should be washed and rinsed thoroughly after use and metal holders should be wiped dry.

(d) Pot Type. These may be of brass or bristle set in wood or metal. They should be washed and rinsed thoroughly after use. Metal holders should be wiped dry.

(e) Scrubbing Type. See Brushes, Pot Type.

(7) BUCKET.

Rinse after use, wipe dry and store raised from floor, in inverted position if possible, to avoid corrosion at base.

(8) CASTOR OR DREDGER.

Remove sifter top, remove contents and clean as directed for material concerned.

(9) CLEAVER.

Keep in rack when not in use. Ensure that handle fitting remains secure. Keep sharp by grindstone. If storage is prolonged apply mineral jelly to all metal parts.

(10) COLANDER.

Often damaged and corroded around the support ring through neglect of drying at this point. Harsh treatment and drying by heating in ovens also contribute to this weakness. Wash and dry by methods prescribed for materials concerned. Hang; do not stack when not in use.

(11) CORER OR PEELER.

Treat as knives.

(12) CORKSCREW.

Corks are best removed by a straight upward pull. If the corkscrew is used as a lever it may be bent and consequently be unsuitable for further use. Treat as knives.

(13) COVER—PLATE.

Treat as for material involved. The nesting type sometimes sticks together. In order to release, run a string between rolled edges and pull alternate ends.

(14) CUTTER—PASTRY.

Treat as for metal concerned. Prevent damage to shape by storage in rack or box.

(15) DIPPER—MILK.

Treat as for material concerned and sterilise in boiling water or steamer.

(16) DISH—PIE.

Clean by method prescribed for material concerned.

(17) FORK.

Ensure that prongs are kept parallel and handles secure. Wash thoroughly after use and wipe dry. Keep in racks, even for dining room service, to avoid damage to plating and handles.

(18) FUNNEL.

Wash thoroughly by method prescribed for material concerned. Remove particles by flushing under tap.

(19) GRATER.

Remove particles by brushing under running tap. Wash by prescribed method for material concerned and dry by own heat.

(20) HOOK—MEAT.

Should be washed and dried after use. Store on rails.

(21) JUG.

Wash as prescribed for materials concerned.

(22) KETTLE.

Scale should be kept to a minimum by wiping round interior with clean damp cloth after use. Heavy deposits should be removed by filling with dilute acid (vinegar) overnight. Wash out thoroughly with hot water before further use.

(23) KNIFE.

Ensure that handles are secure. Keep in racks, even for dining room service, to avoid damage to blades and handles. Arrange periodic sharpening on grindstones by expert for all kitchen knives. Handles of wood, bone or plastic material should not be subjected to prolonged immersion in hot water. Wash thoroughly and dry after use.

(24) LADLE—WIRE OR PERFORATED.

Treat as for wire baskets.

(25) MOULD.

Clean as prescribed for material concerned and store inverted. Ensure that nesting types do not become jammed together in storage. (See plate covers.)

(a) Roll Pudding Type. Thoroughly clean with brush after use. Wash by prescribed method for material concerned. Pay special attention to all fastenings and seams.

(26) OPENER—CAN, BENCH MODEL.

See that the escutcheon plate is securely fixed to the bench top. Remove pillar daily and clean both pillar and socket. Clean space between knife and milled wheel. Do not press unduly on the handle when rotating.

(27) PAN—BAKING.

Clean as prescribed for material involved. Remove all grease and burned food after use.

(28) PAN—FRYING.

Do not allow damage to occur to the base as this will increase risk of burning. Clean interior with cotton waste or paper and wash as prescribed for materials concerned.

(29) PIPING TUBE AND BAG.

Soak after use in hot water to avoid solidification of piping material in the orifice. Flush under tap, wash in hot water and allow to dry by own heat. Do not probe with cloth. Store in box separately. Soak bags until material is removable by rubbing, wash in clean hot water and hang to dry.

(30) POACHER.

Remove individual pans and support plate. Wash as prescribed for material concerned. Assemble only when completely dry.

(31) POT—TEA.

Drain and remove leaves immediately after tea is served. Wash out with hot water, removing strainer if possible. If strainer is fixed, place spout under water tap to flush perforations. Remove tannin deposit at least once weekly by filling with boiling water with detergent added and leave overnight. Wash out thoroughly and rinse with hot water before use.

(32) PRESS—VEGETABLE.

Wooden types—scrub thoroughly and dry with cloth. Metal types—wash by method prescribed for metal concerned.

(33) ROLLING PIN.

Do not scrape with palette or other knives. Scrub with brush after use, rinse and wipe dry with clean cloth. Hang in rack to store.

(34) SAUCEPAN.

Do not allow damage to base as this may cause burning. Clean as recommended for materials used.

(35) SAW—MEAT.

Wash after use and dry with cloth. Hang on rack and coat with mineral jelly if not in regular use.

(36) SCISSORS.

Wash thoroughly and dry after use. Hang on rack.

(37) SCRAPER.

Ensure that there are no chips in edge of blade. Arrange for periodic grinding by expert. Wash thoroughly after use and coat with mineral jelly if not in regular use.

(38) SERVER—POTATO AND ICE-CREAM.

Soak to remove or loosen food deposits. Remove rotary blades if possible to ensure thorough cleaning by method prescribed for materials concerned.

(39) SHARPENER—STEEL—STONE.

Not recommended for use by the inexpert as, unless used properly, are more likely to do harm than good.

(40) SHEET—BAKING.

Remove burned food deposits by soaking and brushing. Do not warp or damage edges by rough treatment. Wash by method prescribed for material concerned.

(41) SHOVEL—CHIP.

Treat as for wire baskets.

(42) SHOVEL—REFUSE.

Should be kept free from deposits by washing frequently and drying. Avoid damage to leading edge by storing on rack.

(43) SIEVE.

All metal types should be rinsed under running water tap to remove particles, with application of brush for adherent matter. Shake well to remove moisture and wipe dry. See treatment for wire baskets.

(44) SLICE—EGG—FISH.

Clean as prescribed for materials concerned. Store in rack to avoid damage.

(45) SPATULA.

Wooden spatulæ should be used where there are coated metal linings, to prevent damage by scraping. They should be scrubbed clean, rinsed in hot water and dried after use. Keep away from moisture as much as possible in order not to soften the wood. Metal spatulæ should be used only where not likely to damage linings.

(46) SPOONS.

Should be soaked to loosen deposits, scrubbed and washed by method prescribed for materials concerned.

(47) SPOON—WOODEN.

See Spatula.

(48) SQUEEGEE.

Should be scrubbed after use and wiped dry. Hang on rack to protect rubber strip.

(49) STRAINER—CONICAL.

Treat as sieves and colanders. Hang on rack to prevent damage to tapered end.

(50) TIN—CAKE AND BUN.

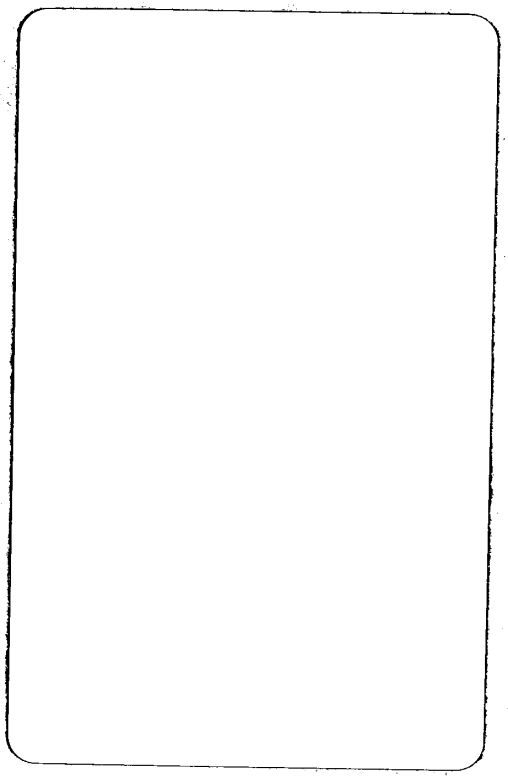
Should be scrubbed to remove food particles. Afterwards wash by prescribed method.

(51) TRAY—COOLING.

See Wire Baskets.

(52) WHISKS—WIRE.

See Wire Baskets.



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