

This heading is the general heading for operations which utilise heat exchange to effect a liquid/vapour phase change. In particular, the heading is concerned with distillation, evaporation, condensation and stripping and includes certain unit functions and means therefor occurring in such operations, certain associations of the operations with functionally different operations, and servicing arrangements

Distilling techniques normally involve the association (sometimes intimate) of the unit operations of evaporation and condensation which are therefore at a lower organisational level than distillation. However, for the purpose of organising inventive disclosure in the distilling art for search purposes it is convenient to regard distilling as a single technique rather than an association of these lower level unit operations

In practice distillation is usually concerned with the separation of liquids of different volatilities. The differential separation techniques involved may be directed to one or other of the component unit operations of evaporation or condensation or to both of these in intimate association (as in fractional distillation columns)

In general, since disclosures in distillation techniques are biased strongly to process characteristics emphasis is placed on the kind of distilling operation with which the invention is essentially concerned, working from the highly characteristic (*eg* azeotropic) to the general (*eg* with no added agent), rather than on the levels of organisation present. Therefore, the distinction between higher and lower organisational levels is not a primary distinction and the levels are distributed throughout the classifying schedule

Explanation of heading subject matter and relationships with other headings

Energy conservation and heat balance

This is an important subject in liquid/vapour phase change operations but is not reflected in the number of inventions specifically concerned with the subject. It is considered to transcend all types of such operations and tends to be organisational in character. Hence it is not subordinated to types of operation or regarded as a unit operation

Associations of liquid/vapour phase change apparatus with functionally different apparatus

Classified here are disclosures at higher organisational levels *eg* the association of evaporating and/or condensing apparatus with cleaning apparatus. Three terms are provided in appropriate parts of the Schedule depending on whether the association is with distillation or the unit operations of evaporating and condensing

Excluded are:

- . arrangements and disposition of condensers in motors—*such headings as* B7H, Motor vehicles &c; F1M Steam engines &c
- . application of condensers to internal combustion engines—F1B, Internal-combustion engines &c

Distillation

Classified here are disclosures of the organisation of single and plural (whether similar or diverse) methods of distilling and of the corresponding apparatus and its modes of operation, choice of added agent (*eg* azeotropic agent, solvent) and choice of conditions, procedures or distillation plant

One organisational subject occurring not only in distillation but also at higher and lower organisational levels, namely energy conservation and heat balance, is dealt with at a general level covering this subject wherever it occurs in liquid/vapour phase change

Distillation operations in which steam is used at a lower temperature than the boiling point of the desired overhead product are dealt with under steam distillation or distillation of immiscible mixtures since such operations are generally used for the distillation of products which are immiscible with water

Explanation of heading—*cont*Distillation—*cont*

The use of steam in a mere stripping operation, however, is dealt with at the unit operation level under evaporating since the steam is at a sufficiently high temperature to flash off overhead components and acts primarily as a direct heat transfer medium

Unit operations in distillation, *eg* reflux arrangements are dealt with under unit operations

Processes for distilling specific organic substances are classified in the headings for such substances, *eg* C2C, Organic compounds. Such processes may additionally be classified here where the apparatus or technique used is of interest *per se*

Also excluded are:

- . synthesis, purification, isolation and stabilization of specific inorganic chemical substances (*other than* acids and hydrogen peroxide) by methods including general or non-specific distilling operations—C1A, Inorganic substances
- . distillation processes for recovering and purifying polymers—C3L, Polymer &c working up
- . distilling hydrocarbons (*other than* resin oils and turpentine)—C5E, Destructive pyrolysis, gas, hydrocarbons &c
- . stills for the production of combustible gas—C5E, Destructive pyrolysis, gas, hydrocarbons &c
- . extracting and refining metals by distillation—C7D, Process metallurgy &c

Unit operations

Classified here are inventions in evaporating, condensing and in unit functions occurring in distillation not essentially related to specific types of distillation or to the distillation of specific materials. Elemental subjects of wider application are dealt with separately as is also control

Novel methods and means *per se* for effecting unit functions, *eg* heating, are classified elsewhere where suitable headings exist

Examples are the following:

- . Heating/cooling methods and means—F4K, Direct contact heating of fluids; F4S, Indirect heating and cooling

Excluded are:

- . carburetted apparatus, vapourisers, and heaters for internal combustion engines—F1B, Internal combustion engines &c; F1H, Spray carburetters
- . centrifugal and centripetal ejector condensers and pumps—F1C, Non-positive displacement pumps &c
- . ejector condensers (*other than* centrifugal and centripetal)—F1E, Injectors and ejectors
- . vapourisers in vapour engine power plant—F1Q, Power Plant
- . condensing-pumps—F1W, Fluid-pressure reciprocating machines
- . steam generators—F4A, Steam generation and liquid heating plant
- . evaporators and condensers for refrigerating-systems—F4H, Refrigeration &c
- . drying systems and apparatus—F4G, Drying &c
- . liquefying and re-vapourising air and gases (*including* separating gaseous mixtures thereby)—F4P, Gas storing, liquefying &c
- . surface condensers—F4S, Indirect heating and cooling
- . vapourising apparatus for burners—F4T, Burners &c

Subjects of general applicability (*ie* to any distillation, evaporating and condensing operations)

Classified here are *eg* choice of specific kinds of apparatus units (*eg* type of pump), choice of constructional materials, servicing arrangements. Often these are not essentially associated with a particular type of liquid/vapour phase change apparatus

Excluded are:

- . fumigating and vapourizing for sanitary and like purposes—A5G, Disinfecting, fumigating &c

Affinity exists with heading B1R, Treating gases with liquids &c as regards components applicable to gas (vapour)/liquid contacting in general. In particular, B1R is the general heading for the construction of gas (vapour)/liquid contacting plates or trays (*eg* liquid seal and bubble plates) and packings, and for associated accessories, *eg* downcomers or supporting means

Control

Classified here are disclosures of methods and the associated apparatus dependent upon the monitoring of particular parameters in a distillation, evaporating or condensing operation with the subsequent adjustment (if necessary) of the operating conditions

Note

The exclusion references listed in this heading are not exhaustive. Reference should be made to the appropriate general heading/s for processes, materials, elements or devices which may be more widely applicable than can appropriately be classified in this heading.

Relationship with the Universal Indexing Schedules (heading U1S)

In addition to recording the nature of broader processes and apparatus with or in which inventions classified here may be used, U1S is used, subject to its indexing rules, to index materials operated on and useful products obtained, except that where it is clearly intended to produce only a single useful product from a mixture of starting materials the latter are not indexed

Up to the operative date of Edition F, indexing terms B701 to B717 of this heading were used to identify materials evaporated, condensed, distilled or concentrated. The function of these terms is now fulfilled by assignment of terms from U1S. For convenience, the superseded terms and the U1S terms nearest in scope to them are indicated below. *As the scope of a U1S term may differ from the term it supersedes, reference should be made to the Universal Indexing Schedules themselves to determine the scope of each U1S term.* U1S "in general" terms are indicated in brackets below. Terms B709 and B717 were such that their function cannot be fulfilled by simple assignment of U1S terms and no attempt has therefore been made to indicate equivalence

F o r m e r
B1B termNearest U1S Term(s)

	materials evaporated, condensed, distilled or concentrated—	
	. acids—	
B701	. . inorganic	S1504
B702	. . organic	S1518, S1522
	. . . fatty acids derived from oils, fats— <i>See</i> fats &c	
B703	. alcoholic beverages	(S1109)—S1112
B704	. aqueous effluent <i>including</i> sewage	S1433, S1434
B705	. fats, fatty oils, fatty acids	S1518, S2323
	. gas solutions—	
B706	. . ammonia	S1496
B707	. . carbon dioxide	S1502
B708	. . hydrogen sulphide	S1499
B709	. . other	
B710	. glycerine	S1515
B711	. glycols	S1515
B712	. hydrogen peroxide	S1500
B713	. monomers	(S1508)—S1528
B714	. sugar solutions and foodstuffs	(S1074)—S1102 S1458, S1517
	. water—	
B715	. . sea water; brackish water	S1271, S1448
B716	. . distilled water	S1444
B717	. other materials	

Operative date for Key entries

The operative date of the terms in this heading is that of Edition A

Classifying, indexing and searching note

The indexing schedule is applied to all disclosures. Since the classification of certain disclosures having affinity with two or possibly more subjects cannot be certain, consideration should be given in such cases to searching both, or all such subjects when there is a corresponding search need. Two such subjects are heat or energy balance or conservation arrangements (classified here under overall organisation) and localised heating arrangements (classified here under unit functions). It should be borne in mind that when methods and means for performing unit functions, *eg* heat exchangers, heating/cooling, are novel *per se* they are subject matter for other headings

Classifying Schedule

See also Indexing Schedule

- BB concerned with heat or energy balance or conservation arrangements
 . localised heating/cooling arrangements—*See* terms BKB, BMD, BT *below*
- BA associations of distilling apparatus/processes with functionally different apparatus/processes
 distillation *per se*—
 . characterised by plural diverse types of distillation processes—
 Note: Distillation processes using a volatility affecting additive are commonly associated with conventional subordinate distillation operations or the resulting products. Where a single type of volatility affecting additive distillation can be regarded as characterising an overall distillation process irrespective of whether any invention resides in that type of distillation *per se*, the overall process is classified accordingly as set out below under the various distillation types listed under terms BDA1—BDD *below*

Classifying Schedule—*cont*

- BCA . . characterised by different types of distillation occurring in the same unit assembly
- BCB . . other systems involving diverse process types
 . characterised by the addition of a volatility-affecting additive—
 . . solid absorbent (as solid or in solution, *eg* NaOH as water absorbent)—
 BDA1 . . . concerned with systems involving a solid absorbent distillation unit or stage
- BDA2 . . . concerned with the solid absorbent unit or stage *per se*
 . . azeotropic agent—
 BDB1 . . . concerned with systems involving an azeotropic unit or stage
- BDB2 . . . concerned with the azeotropic unit or stage *per se*
 . . extractive agent (solvent)—
 BDC1 . . . concerned with systems involving an extractive distillation unit or stage
- BDC2 . . . concerned with the extractive unit or stage *per se*
- BDD . . steam distillation or distillation of immiscible mixtures
 . . . stripping using steam—*See* terms BJ, BK—*below*
- BE . characterised by distillation conditions, procedures or plant, in the absence of volatility affecting additives, for specific materials
- BF . without additive and characterised by evaporation and condensation occurring in the same region in substantially equilibrium conditions, *ie* with reflux
 . without additive and characterised by evaporation and condensation occurring in different spaces or different regions of the same space (*ie* without reflux) but not necessarily in different vessels
- BGA . . characterised by use of carrier gas between evaporator and condenser
- BGB . . molecular still organisation
- BGC . . other, multiple stage apparatus
- BGD . . other, single stage apparatus
 associations of unit operation apparatus with functionally different apparatus—
- BHA . associations of evaporators with functionally different apparatus (*other than* condensers)
- BHB . associations of condensers with functionally different apparatus (*other than* evaporators)

Classifying Schedule—*cont*

- unit operations; sub-systems therefor; unit functions therefor—
- . unit functions in distillation—
- BT . . localised heating/cooling arrangements
- . . . in the evaporator or condenser of a distillation apparatus—*See terms BKB, BMD below*
- BN . . reflux and internal circulation arrangements
- . evaporating (*including* steam stripping)—
- BJ . . evaporating particular materials
- . . evaporating arrangements and evaporators *per se*; process characteristics—
- . . . general organisation and subjects *not otherwise provided for*—
- BKA1 . . . single evaporator operation
- BKA2 . . . plural evaporator operation
- BKA3 . . . other subjects
- BKB . . . localised heating arrangements
- BKD . . . surface characteristics
- BKE . . creating movement of liquid or vapour; removing evaporated material or stagnant vapour or gases; exposing fresh liquid surface; venting
- . condensing—
- BL . . condensing particular materials
- . . condensing arrangements and condensers *per se*; process characteristics—
- . . . general organisation and subjects *not otherwise provided for*—
- BMB1 . . . single condenser operation
- BMB2 . . . plural condenser operation
- BMB3 . . . other subjects
- BMC . . . surface characteristics
- BMD . . . localised cooling arrangements
- subjects of general applicability—
- BS1 . choice of specific kinds of component apparatus
- BS2 . choice of specific constructional or surface materials
- BQ . supporting, mounting and housing of sub-systems and elements
- BP . servicing arrangements *not included* under unit functions, *eg* cleaning, corrosion prevention, indicators, alarms
- control—
- BR1 . apparatus
- BR2 . process
- BX . other subjects

Indexing Schedule

- types of distillation—
- B201 . azeotropic
- B202 . extractive
- B203 . fractional
- B204 . steam
- B205 . molecular
- B206 . absorbent
- B207 . other
- types of evaporation—
- B301 . steam stripping
- B302 . flash
- B303 . multiple effect
- B304 . spray
- B305 . tubular (*other than* film)
- B306 . film
- B307 . other
- types of condensation—
- B401 . fractional
- B402 . direct heat exchange
- B403 . indirect heat exchange
- B404 . other
- process parameters and conditions—
- B501 . subatmospheric pressure
- B502 . super atmospheric pressure
- type of heating employed—
- B601 . solar
- B602 . direct heat transfer
- B603 . indirect heat transfer