

C10B

DESTRUCTIVE DISTILLATION OF CARBONACEOUS MATERIALS FOR PRODUCTION OF GAS, COKE, TAR, OR SIMILAR MATERIALS (cracking oils C10G; underground gasification of minerals E21B43/295)

Definition statement

This subclass/group covers:

Retorts or coke ovens and details thereof, such as heating of coke ovens, doors or closures therefor, devices for charging or discharging coke ovens and mechanical treatments of coal charges, cooling or quenching coke, safety devices and other details.

Carbonising or coking processes, including pyrolysis and other methods of destructive distillation of solid carbonaceous materials, using direct heating (including the partial combustion of the material to be treated) and/or indirect heating (e.g. external combustion).

Destructive distillation specially adapted for particular types of solid raw material or for materials in special form (such as cellulose-containing materials, powdered coal, oil shale or bituminous rocks, synthetic polymeric materials e.g. tyres).

Coking mineral oils, bitumen, tar etc. with solid carbonaceous materials.

Relationship between large subject matter areas

The processes and apparatus of this subclass are generally directed to producing products that are gaseous or solid at ambient temperatures. Exceptions to this statement are shown below:

- Production of liquid hydrocarbon mixtures (e.g. turpentine, wood creosote and kerosene) from carbonaceous materials, and also from oxides of carbon, is covered by [C10G](#).
- Production of synthesis gas (syngas) from liquid or gaseous hydrocarbons is covered by [C01B 3/00](#).
- Production of combustible gases containing carbon monoxide (including producer gas, wood gas, town gas, synthesis gas, manufactured gas and water gas) from solid carbonaceous fuels, is matter for [C10J](#). This includes fixed-bed gasification of lump fuel, gasification of granular or pulverulent fuels in suspension, gasification using molten salts or metals, carbureting by pyrolysis of carbonaceous material in the fuel bed and carbureting by pyrolysis of carbonaceous material in a carburettor.
- Classification is made in [F23B](#) if complete combustion of combustible

substances (e.g. gases or coke) takes place in the same apparatus, e.g. in different parts of the same combustion chamber.

- Modifying the properties of any distillation gases outside the oven is covered by subclass [C10K](#) (doing this inside the oven is covered by this subclass).

References relevant to classification in this subclass

This subclass/group does not cover:

Cracking oils	C10G
Hydrothermal carbonisation	C10L 9/086
Underground gasification of minerals	E21B 43/295

Recovery or working-up of waste materials of organic macromolecular compounds or compositions based thereon by dry heat-treatment to obtain partially depolymerised materials	C08J 11/10
Working up tar, pitch, asphalt or bitumen by techniques including distillation and/or heat-treatment; production of pyroligneous acid	C10C
Wet carbonising of peat	C10F 5/06

Places in relation to which this subclass is residual:

Pyrolysis of sludge	C02F 11/10
Production of liquid hydrocarbon mixtures from rubber or rubber waste	C10G 1/10
Gasification combined with pre-distillation of the fuel	C10J 3/58
Torrefaction of biomass	C10L 9/083
Plant characterized by more than one engine delivering power external to	F01K 23/06

the plant, the engines being driven by different fluids, the engine cycles being thermally coupled, combustion heat from one cycle being used to heat the fluid in another cycle	
Plant characterized by the engines using gaseous fuel generated in the plant from solid fuel, e.g. wood	F02B 43/08
Gas turbine plant using a separate gas producer for gasifying the solid or pulverulent fuel before combustion	F02C 3/28
Incineration of waste; Incinerator constructions with pretreatment by pyrolysis or gasifying stage	F23G 5/027

Informative references

Attention is drawn to the following places, which may be of interest for search:

Rotary reactors	B01J 19/00
Nozzles per se	B05B 1/00
Cleaning containers, e.g. tanks by the force of jets or sprays	B08B 9/093 , B08B 9/0936
Processing of used rubber in general	B29H 19/00
Preparation of carbon black from used rubber products, e.g. tyres	C09C 1/482
Coking to produce liquid products mainly, e.g. shot coke	C10G 9/005
Partial oxidation or gasification of pyrolysis gas	C10J 3/58
Shifting devices	F15B 15/00
Drying in general	F26B 3/00
Rotary drum furnaces per se	F27B 7/00

Casings; Linings; Walls; Roofs	F27D 1/00
Making or repairing linings in general	F27D 1/16

Special rules of classification within this subclass

In the absence of an indication to the contrary, classification is made in the last appropriate place ("last place rule").

Groups [C10B 17/00](#), [C10B 19/00](#), [C10B 21/00](#) and [C10B 23/00](#) relate to heating of coke ovens.

Heating of ovens by solar heating is classified in [C10B 23/00](#).

Deheading of a delayed coking vessel is classified in [C10B 25/10](#).

Groups [C10B 31/00](#), [C10B 33/00](#), [C10B 35/00](#) and [C10B 37/00](#) relate to devices for charging and discharging coke ovens; mechanical treatments of coal charges.

Discharging devices such as decoking tools using high pressure water jets is classified in [C10B 33/00](#).

Measuring is classified in [C10B 45/00](#).

Carbonising or coking processes are covered by [C10B 47/00](#), [C10B 49/00](#), [C10B 51/00](#), [C10B 53/00](#), [C10B 55/00](#) and [C10B 57/00](#).

Delayed coking is classified in [C10B 55/00](#).

Multiple classification

The following multiple classification rule applies in [C10B 53/00](#):

Documents disclosing details of the apparatus are further classified in groups [C10B 47/00](#), [C10B 49/00](#) and [C10B 51/00](#).

Glossary of terms

In this subclass/group, the following terms (or expressions) are used with the meaning indicated:

Retort	An airtight vessel in which substances are heated for a chemical reaction producing gaseous products to be collected in a collection vessel or for further processing
Coke oven	An airless oven for driving of volatile

	<p>constituents from coal during carbonisation to produce coke. In "by-product" coke ovens, the gaseous and liquid by-products obtained during the carbonisation process are recovered, the principal by-products are coal tar and coke-oven gas. The coke oven gas is used to heat the ovens by combustion in external heating flues. In "non-recovery" or "heat recovery" coke ovens, the raw gas produced in the ovens is completely combusted and used to generate power.</p>
Beehive oven	<p>Earliest type of coke oven, developed in the 1850s; its main characteristic is that the heat necessary for coking is produced by burning the volatile constituents within the oven, whereby all the gaseous and liquid by-products are lost, together with large amounts of heat.</p>
Destructive distillation	<p>The process of pyrolysis conducted in a distillation apparatus to allow the volatile products to be collected. An example is tar making from pinewood slices (which are rich in terpenes), which are heated in an airless container causing the material to decompose, leaving charcoal and turpentine as by-products.</p>
Coke	<p>A solid, high in carbon content, and structurally in the non-graphitic state, derived from the pyrolysis of organic material (especially low-ash, low-sulphur bituminous coal) which has passed, at least in part, through a liquid or liquid-crystalline state during the carbonization process. The volatile constituents of the coal (including water, coal gas and coal-tar) are driven off by baking in an airless oven at temperatures as high as 2000 degrees C.</p>
Coking	<p>The transformation of coal or heavy oil into coke.</p>

Carbonisation	The conversion of an organic substance into carbon or a carbon-containing residue through pyrolysis or destructive distillation.
Pyrolysis	The chemical decomposition of organic materials by heating in the absence of oxygen or any other reagents, except possibly steam.
Ablative pyrolysis	Fast pyrolysis by contacting feed with hot surface, e.g. hot plate or heated wall.
Torrefaction	Pyrolysis at temperatures below 320 degrees C.

Synonyms and Keywords

In patent documents the following expressions/words "fast pyrolysis", "flash pyrolysis" and "rapid pyrolysis" are often used as synonyms.

In patent documents the following expressions/words "torrefaction", "roasting" and "mild pyrolysis" are often used as synonyms.

In patent documents the expression/word "wharf" is often used instead of "ramp" which is used in the classification scheme of this group.

C10B 1/00

Retorts

C10B 3/00

Coke ovens with vertical chambers

C10B 5/00

Coke ovens with horizontal chambers

C10B 7/00

Coke ovens with mechanical conveying means for the raw material inside the oven

C10B 9/00

Beehive ovens

C10B 11/00

Coke ovens with inclined chambers

C10B 13/00

Coke ovens with means for bringing and keeping the charge under mechanical pressure

C10B 15/00

Other coke ovens

C10B 15/02

Other coke ovens with floor heating

Definition statement

This subclass/group covers:

Non recovery/heat recovery coke ovens, i.e. distillation gases are partially combusted above the charge and further combustion takes place in flue channels below the floor, such as illustrated by US4287024, DE10201985 and WO2006103043.

C10B 17/00

Preheating of coke ovens

C10B 19/00

Heating of coke ovens by electrical means

Definition statement

This subclass/group covers:

Heating of coke by electrical means, e.g. microwave heating.

C10B 21/00

Heating of coke ovens with combustible gases

C10B 23/00

Other methods of heating coke ovens

Definition statement

This subclass/group covers:
Solar heating

C10B 25/00

Doors or closures for coke ovens

Special rules of classification within this group

Deheading of a delayed coker vessel is classified in [C10B 25/10](#).

C10B 27/00

Arrangements for withdrawal of the distillation gases

C10B 29/00

Other details of coke ovens

C10B 31/00

Charging devices

C10B 33/00

Discharging devices; Coke guides

C10B 33/003

Arrangements for pollution-free discharge

C10B 35/00

Combined charging and discharging devices

C10B 37/00

Mechanical treatments of coal charges in the oven

C10B 37/04

Compressing charges

Definition statement

This subclass/group covers:
Treatment of the coal charge in the oven such as levelling, compressing (not

maintaining charge under mechanical pressure) and forming holes in the coal charge

References relevant to classification in this group

This subclass/group does not cover:

Compressing charges during coking	C10B 47/12
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Special rules of classification within this group

If the invention concerns compressing a charge in the oven, it's classified in [C10B 37/04](#). If the oven has means for compressing, it's also classified in [C10B 13/00](#).

If the invention concerns compressed charge (compacting charge outside the oven), it's classified in [C10B 45/02](#). If the invention concerns charging the oven with compressed charges prepared outside the oven, it will be classified in [C10B 31/10](#).

C10B 39/00

Cooling or quenching coke

C10B 41/00

Safety devices, e.g. signaling or controlling devices for use in the discharge of coke

C10B 43/00

Preventing or removing incrustations

C10B 45/00

Other details

Definition statement

This subclass/group covers:

Measuring devices

References relevant to classification in this group

This subclass/group does not cover:

Controlling	C10B 41/00
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C10B 45/02

Devices for producing compact unified coal charges outside the oven

Definition statement

This subclass/group covers:

Briquetting presses	B30B
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C10B 47/00

Destructive distillation of solid carbonaceous material with indirect heating, e.g. by external combustion

C10B 49/00

Destructive distillation of solid carbonaceous materials by direct heating with heat-carrying agents including the partial combustion of the solid material to be treated

C10B 51/00

Destructive distillation of solid carbonaceous materials by combined direct and indirect heating

C10B 53/00

Destructive distillation, specially adapted for particular solid raw materials or solid raw materials in special form (wet carbonising of peat C10F)

Special rules of classification within this main group

Documents disclosing details of the apparatus are further classified in groups [C10B 47/00](#), [C10B 49/00](#) and [C10B 51/00](#).

C10B 55/00

Coking mineral oils, bitumen, tar, and the like or mixtures thereof with solid carbonaceous material (cracking oils C10G)

C10B 57/00

Other processes not covered before; Features of destructive distillation processes in general

C10B 57/08

Non-mechanical pre-treatment of the charge

Definition statement

This subclass/group covers:

Pre-treatment of coal by non-mechanical process, e.g. desulfurization.

Special rules of classification within this group

[C10L 9/00](#) takes precedence.