

## C10B

### DESTRUCTIVE DISTILLATION OF CARBONACEOUS MATERIALS FOR PRODUCTION OF GAS, COKE, TAR, OR SIMILAR MATERIALS (cracking oils [C10G](#); underground gasification of minerals [E21B 43/295](#))

#### Definition statement

*This place 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.

#### Relationships with other classification places

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, carburetting by pyrolysis of carbonaceous material in the fuel bed and carburetting 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

##### Limiting references

*This place does not cover:*

Cracking oils	<a href="#">C10G</a>
Hydrothermal carbonisation	<a href="#">C10L 9/086</a>
Underground gasification of minerals	<a href="#">E21B 43/295</a>

**Application-oriented references**

Examples of places where the subject matter of this place is covered when specially adapted, used for a particular purpose, or incorporated in a larger system:

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

**References out of a residual place**

Examples of places in relation to which this place is residual:

Pyrolysis of sludge	<a href="#">C02F 11/10</a>
Production of liquid hydrocarbon mixtures from rubber or rubber waste	<a href="#">C10G 1/10</a>
Gasification combined with pre-distillation of the fuel	<a href="#">C10J 3/58</a>
Torrefaction of biomass	<a href="#">C10L 9/083</a>
Plant characterized by more than one engine delivering power external to 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	<a href="#">F01K 23/06</a>
Plant characterized by the engines using gaseous fuel generated in the plant from solid fuel, e.g. wood	<a href="#">F02B 43/08</a>
Gas turbine plant using a separate gas producer for gasifying the solid or pulverulent fuel before combustion	<a href="#">F02C 3/28</a>
Incineration of waste; Incinerator constructions with pretreatment by pyrolysis or gasifying stage	<a href="#">F23G 5/027</a>

**Informative references**

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

Rotary reactors	<a href="#">B01J 19/00</a>
Nozzles per se	<a href="#">B05B 1/00</a>
Cleaning containers, e.g. tanks by the force of jets or sprays	<a href="#">B08B 9/093</a> , <a href="#">B08B 9/0936</a>
Processing of used rubber in general	<a href="#">B29B 17/00</a>
Preparation of carbon black from used rubber products, e.g. tyres	<a href="#">C09C 1/482</a>
Coking to produce liquid products mainly, e.g. shot coke	<a href="#">C10G 9/005</a>
Partial oxidation or gasification of pyrolysis gas	<a href="#">C10J 3/58</a>
Shifting devices	<a href="#">F15B 15/00</a>
Drying in general	<a href="#">F26B 3/00</a>
Rotary drum furnaces per se	<a href="#">F27B 7/00</a>
Casings; Linings; Walls; Roofs	<a href="#">F27D 1/00</a>
Making or repairing linings in general	<a href="#">F27D 1/16</a>

## Special rules of classification

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 place, 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 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 or 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.
Beehive oven	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.
Destructive distillation	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.

Coke	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.
Coking	The transformation of coal or heavy oil into coke.
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 words/expressions are often used as synonyms:*

- "fast pyrolysis", "flash pyrolysis" and "rapid pyrolysis"
- "torrefaction", "roasting" and "mild pyrolysis"

*In patent documents, the word/expression in the first column is often used instead of the word/expression in the second column, which is used in the classification scheme of this place:*

"wharf"	"ramp"
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## C10B 15/02

### with floor heating

#### Definition statement

*This place 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 19/00

### Heating of coke ovens by electrical means

#### Definition statement

*This place covers:*

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

## C10B 23/00

### Other methods of heating coke ovens

#### Definition statement

*This place covers:*

Any methods for heating coke ovens that is not covered in the subgroups [C10B 17/00](#), [C10B 19/00](#) and [C10B 21/00](#), e.g. Solar heating

## C10B 25/00

### Doors or closures for coke ovens

#### Special rules of classification

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

## C10B 37/04

### Compressing charges (during coking [C10B 47/12](#))

#### Definition statement

*This place covers:*

Coal charge in the coke oven chambre normally from the top, then pressed or compacted in the oven, e.g. compressing (not maintaining charge under mechanical pressure)

#### References

##### Limiting references

*This place does not cover:*

Compressing charges during coking	<a href="#">C10B 47/12</a>
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#### Special rules of classification

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, i.e. loading a compacted coal into the oven, it will be classified in [C10B 31/10](#).

Levelling charges are classified in [C10B 37/02](#) and forming holes in the charges are classified in [C10B 37/06](#).

## C10B 45/00

### Other details

#### Definition statement

*This place covers:*

Any devices not covered in the groups of the subclass, e.g. measuring devices

## References

### Limiting references

*This place does not cover:*

Controlling	<a href="#">C10B 41/00</a>
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## C10B 45/02

Devices for producing compact unified coal charges outside the oven (briquetting presses [B30B](#))

### Definition statement

*This place covers:*

Briquetting presses	<a href="#">B30B</a>
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## 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

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

## C10B 57/08

Non-mechanical pretreatment of the charge ([C10L 9/00](#) takes precedence), {e.g. desulfurization}

### Definition statement

*This place covers:*

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

### Special rules of classification

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