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KINDLER

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## UNITED STATES PATENT OFFICE

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KINDLER

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This invention relates to an igniting mixture which can be used as a fire kindler for igniting coal, coke, and other fuels in domestic fires and industrial furnaces, in furnaces of locomotive and other boilers, and the like.

It is an object of the invention to provide an improved igniting mixture which is more effective and possesses more rapid action than the fire kindlers heretofore used.

To this end, the mixture is composed of particles, such as obtained from coal and constituting a material not as readily inflammable in comparison with naphthalene, which forms a more easily inflammable substance, the latter encasing or covering said material together with a mineral oil (which is less inflammable than said material) added thereto.

Fire kindlers are already known which comprise a porous carrier consisting of a substance which burns without leaving considerable residue and does not act as an igniting agent, and an impregnating liquid with which the pores of the carrier are filled. This impregnating liquid is a mixture of substances of different ignitibility. In operation, first the readily inflammable substances ignite, then by means of these the more difficultly inflammable substances, and lastly the most difficultly inflammable ones. Generally, the impregnating liquid is a mixture of low boiling, middle boiling, and high boiling hydro-carbons. By the gradual inflammation of the said substances, the resulting heat becomes more and more intense until finally the coal, or other fuel, to be ignited is gradually brought to a state of incandescence and finally commences to burn. In kindlers of this kind, the ignition must not occur too rapidly but must extend over an interval of time whose duration is sufficient for producing the high temperature required for igniting a fuel like coal.

The necessity of providing for this comparatively long time interval before the fuel is ignited, is one of the drawbacks of the known kindlers referred to. Other drawbacks are that it is difficult to select a proper material for the porous carrier, and still another drawback is the difficulty of properly determining the temperature of the impregnating liquid. Since the pores of the carrier contain air, the temperature of the impregnating liquid must not be too high, while, on the other hand, it must not be too low since in this condition it is taken up by the fine pores of the carrier only with difficulty. Still another disadvantage is that the said carrier requires a rather toilsome and expensive process

of producing, drying and cutting said carrier (for instance peat) and that the carrier does not represent any particular calorific value, and therefore does not serve as igniting agent but provides an uneconomical ballast. Furthermore, the enormous absorbing capacity of carriers, such as peat or the like absorb up to fifteen times its own weight and leads to an unavoidable expensive waste of soaked liquid ingredients, which can be only restricted by a fast diving of the carrier into the liquids; but the adequate amount of liquid ingredients necessitated for the result contemplated can never be exactly measured when an absorbent carrier is used.

According to the present invention, these drawbacks of the known kindlers are completely removed by dispensing with the porous carrier altogether by using exclusively ignitable substances and ingredients with high calorific values. By compounding the igniting mixture of the particles of difficultly inflammable substances, and of the more readily and less inflammable substance they are covered with, the mixture becomes incandescent with extraordinary rapidity and sets the fuel on fire in a correspondingly short time.

In the accompanying drawing, the invention is illustrated by way of example only.

Referring now to the drawing, numerals 1, 2, and 3, etc., designated three different particles consisting of a difficultly inflammable substance, as described, and 4 is the partly more easily and partly less inflammable substance, or layer, covering the particles.

In a preferred embodiment of the invention, the small particles consist of coal waste, or small coal, for instance, pit coal, brown or bituminous coal, anthracite, or the like. The particles have no definite shape or form and so any desired coal waste may be used, provided its particles are not too large as this would diminish the surface available to the oxygen for combustion. Particles of the size of small chips up to grains or granules of several millimeters diameter, and up to several centimeters long, have proved to be suitable.

The particles are coated with, or embedded in, a mixture of igniting substances possessing various degrees of inflammability, or volatility. For instance, the mixture consists of a mineral oil as the less inflammable constituent, and naphthalene as the more readily inflammable constituent. If desired, heavy oil may be added. Obviously, the several constituents may also be

mixtures of substances having the same or similar, properties with respect to inflammability.

By these means an igniting mixture is formed which presents an extraordinarily large combustion surface. This large surface permits of copious access of oxygen well distributed over the whole mixture which in quite a short time brings the small pieces of waste or small coal into a state of incandescence after the more readily inflammable substance has been ignited.

The igniting mixture according to the invention may be produced by mixing the coal particles and the more readily inflammable substances, in suitable proportions, in a mixing container at elevated temperature, preferably 60° to 80° centigrade, and stirring the mixture vigorously. In this way the readily inflammable or volatile, and the less inflammable, or volatile, substances, to which a suitable heavy liquid agent, or agents, may be added, mix with one another and bind intimately with the particles which they surround as the partly more readily and partly less inflammable layer 4. Since the particles are porous to some extent, any liquid present in the constituents of the layer penetrates into the pores of the particles, but this has not any appreciable influence.

The temperature used is such that the naphthalene will melt and then when the mixture is cooled the naphthalene crystallizes into many minute particles which adhere in very small odd shaped bodies. These bodies bind within themselves the coal slack, coal dust or like material as well as a small portion of the oil. The vigorous stirring of the mixture during heating serves to distribute the coal slack, or like material, and the oil and naphthalene in proper proportions. The mixture when heated is a heavy liquid containing coal slack or the like but upon cooling it rapidly, for example by pouring it into a large pan and thus exposing a greater surface to the air, the mixture quickly assumes the form of small odd shaped bodies. These bodies are hard and dry at ordinary temperatures.

When the mixture has cooled down, it is ready for use.

The following examples are given:

#### Example 1

The igniting mixture is compounded as follows, in per cent by weight:

|                                                                             |    |
|-----------------------------------------------------------------------------|----|
| Small or waste coal particles, pit coal, brown coal, anthracite or the like | 70 |
| Mineral oil, as a less inflammable hydrocarbon                              | 5  |
| Naphthalene, as a more readily inflammable substance                        | 25 |

#### Example 2

|                             |    |
|-----------------------------|----|
| Waste coal, as in Example 1 | 70 |
| At least one heavy oil      | 5  |
| At least one mineral oil    | 8  |
| Naphthalene                 | 17 |

#### Example 3

|                                     |    |
|-------------------------------------|----|
| Waste coal, as in Example 1         | 70 |
| Tar oil made from pit or brown coal | 5  |
| Naphthalene                         | 25 |

By heavy oil is understood an oil having a very high specific gravity and which requires a relatively high temperature to inflame the same. Such particular heavy oils are used for instance in heavy oil motors.

I claim:

1. A kindler comprising a granular igniting mixture of finely divided solid ignitable material, oil, and naphthalene, said material being present in mixed oil and naphthalene at a ratio of approximately 70% to 30% by weight, said naphthalene enclosing said material and said oil, said oil being less ignitable than said material, said material and said oil being less readily ignitable than said naphthalene, said naphthalene forming the predominant constituent of said mixed oil and naphthalene which both cover said solid material.

2. A kindler comprising a granular igniting mixture of coal waste material, mineral oil, and naphthalene, said naphthalene enclosing said material and said oil, said oil being less ignitable than said material, said material and said oil being less readily ignitable than said naphthalene, said naphthalene and said oil being present in said mixture in respective proportions of approximately 25% and 5% by weight of the combined weight of the coal waste material, mineral oil and naphthalene to combinedly coat said coal material.

3. A method of preparing a kindler in granular form which consists in mixing solid particles of ignitable material with naphthalene and oil, said material being present in said mixed naphthalene and oil at a ratio of approximately 70% to 30% by weight and being more readily ignitable than said oil, heating said mixture until said naphthalene is melted, agitating said mixture vigorously, and thereafter cooling the mixture whereby said naphthalene crystallizes out thereby producing hard granules each containing particles and oil enclosed by naphthalene.

4. A kindler comprising a granular igniting mixture of solid particles of coal material, oil less readily ignitable than said coal material, and naphthalene more readily ignitable than both said material and said oil, said naphthalene enclosing said particles and said oil, said naphthalene and said coal material being present in said mixture approximately in proportions of 17% to 25% by weight and 70% by weight, respectively, the remainder of said mixture being oil.

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