Nov. 18, 1952 J. L. M. RABU 2,618,537

PROCESS FOR BRIQUETING COMBUSTIBLE MATERIALS

Filed April 19, 1949

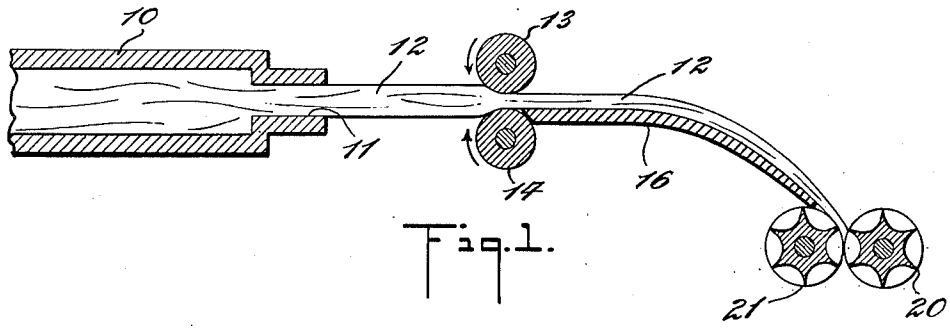


Fig. 1.

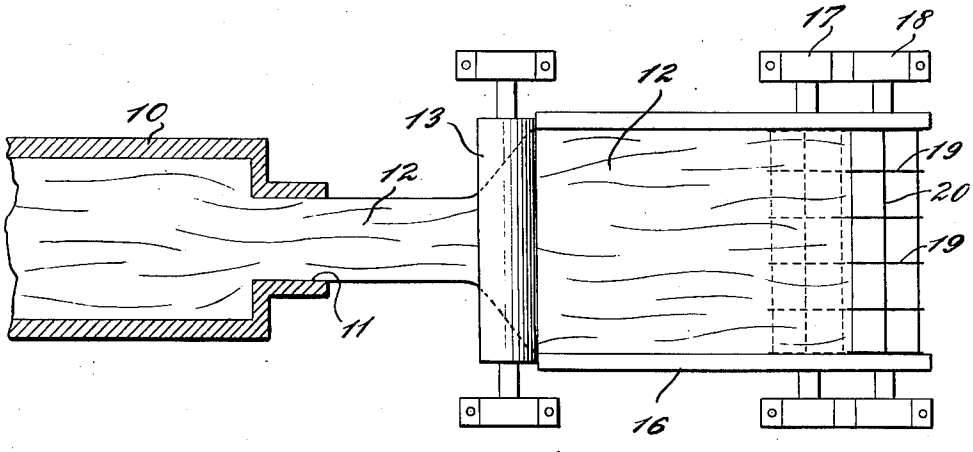


Fig. 2.

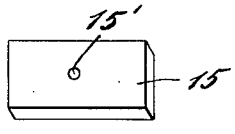


Fig. 3.

INVENTOR.
JUDES LOUIS MARIE RABU

BY

Dale A. Bauer
ATTORNEY

Patented Nov. 18, 1952

2,618,537

UNITED STATES PATENT OFFICE

2,618,537

PROCESS FOR BRIQUETING COMBUSTIBLE MATERIALS

Judes Louis Marie Rabu, Grenoble, France

Application April 19, 1949, Serial No. 88,268
In France April 27, 1948

3 Claims. (Cl. 44—23)

1

This invention relates to the briqueting of solid fuels such as coal in all its forms, gas coke dust, and metallurgical coke dust. The invention also relates to new briquettes, to a new briqueting dough, and to apparatus employed in the making of such briquettes.

Pulverized combustible materials such as coal have heretofore been briqueted by mixing such materials, for instance pulverized coal, with 6 to 8% of molten pitch at a temperature about 120° C. That process requires equipment for heating the tar, and equipment for drying the fuel particles, which must be as thoroughly desiccated as possible. The drying equipment is of necessity, large, and the relative proportion of tar employed increases the cost of the product.

An object of this invention is to briquette solid combustible materials without desiccation and with a reduced quantity of binder. Another object of the invention is to produce apparatus capable of briqueting water-wet products. Another object of the invention is to briquette wet fuels and to produce a novel watery dough capable of being briqueted.

The objects of the invention are accomplished generally speaking by mixing a wetted pulverized fuel with a water emulsion of a colloidal combustible, deaerating the wet mass, preferably under light vacuum, and producing the briquettes by extrusion of the dough and division of the extruded mass. The extruded mass is preferably compressed before division.

In the practice of the invention the dough need not contain over 2% of the colloidal emulsion. This water emulsion contains a combustible divided to colloidal fineness. Such combustibles are illustrated by bitumen, petroleum pitch, and coal tar.

The invention will be better understood by reference to the accompanying drawings, wherein Figure 1 is a vertical sectional view through apparatus for making such briquettes and Figure 2 is a plan view, also partly in section, of the apparatus of Figure 1. Figure 3 is a perspective view of a briquette.

In carrying out the invention a solid fuel is reduced to particles having a maximum dimension on the order of 2½ mm. This constitutes preferred practice although the briqueting process can be employed on larger particles. The pulverized fuel is then mixed with water. These fuels are usually carbonaceous and hydrophobic so that it is advisable to use a wetting agent in the water. Ordinary wetting agents are useful, particularly those that heretofore have been used

2

for wetting coal. Examples are the sulfonated fatty alcohols. The percentage of water in the extrusion mass, the dough, should approximate 10 to 12% as this produces a very homogeneous and satisfactory extrusion mass. When the pulverized fuel is dried the entire quantity of water may be added but when the fuel is wet only that water is added which is needed to bring the water content to approximately 10 to 12%.

An emulsion is now made up of water and a colloidal combustible. Among the colloidal combustibles may be named sludges, bitumen, petroleum pitch from the distillation or cracking of oil, and coal tar from gas works, coke works, or from the distillation of coal at low, medium or high temperature. One said emulsion contains 50% water and 50% bitumen. Another contains 30% petroleum pitch, or coal tar, 40% water and 30% of an emulsifier or plasticizer such as bentonite or oleine. 2% or less of this emulsion is all that is required for the making of said dough, and it will be observed that of 2% only about ½ is combustible and expensive.

When the dough has been prepared it is de-aerated in order to eliminate occluded gases such as air. The de-aerating can be carried out satisfactorily at normal or slightly elevated temperature under a mere 5 to 10 mm. of water vacuum pressure. The temperature used in mixing and de-aerating need not exceed 90° C. Employment of this temperature facilitates the hardening of the product after extrusion and moulding. The product is preferably maintained under vacuum until extrusion has been completed.

The extrusion and moulding is conveniently in the novel apparatus shown in the accompanying drawing wherein 10 is an extrusion nozzle having an orifice 11 through which the plastic mass 12 is extruded, being caught between two press rollers 13, 14 which expand the width in the mass at the expense of its thickness and produce close contact between all portions of the binder and the fuel particles. After issuing from the rollers 13, 14, the plastic mass may be slit lengthwise into ribbons, the ribbons being cut off from time to time, each strip thus produced being perforated so that they can be strung on wire without packaging. In Figure 3 is shown a briquet 15 having a perforation 15' which can be used for stringing. This briquette has been formed by the process which has been hereinabove described.

Coal products are sold in standard sizes to fit the grates of standard furnaces and are known by names such as buckwheat, pea, chestnut, stove

and egg, and it is desired to prepare the briquettes in sizes conforming to these established wants. The apparatus shown in Figures 1 and 2 accomplishes this. A supporting pan 16 receives the extruded material 12 and carries it to the cooperating rotating rollers 17, 18 which are provided with cooperating circular knives 19 which cut the dough into longitudinal strips, and by cooperating transverse ridges 20, 21 which cut the dough transversely. The pockets between adjacent ridges and adjacent knives in the two rollers compress and shape the dough to the required size. The pressure employed upon the dough may be on the order of 1,000 kilos per sq. cm. The products discharged are preferably dried rapidly at about 40° C. either in a drier or exposed to the air.

The agglomerated products hold together perfectly, although the proportion of binders in the dry product is less than 2%. On the other hand, when molten pitch is used for briqueting it is necessary to use 6 to 8% and to heat the dough to 120° C. Furthermore the screenings must be dried prior to mingling with the pitch, in the molten pitch process. Consequently, this process eliminates the use of driers for the powdered fuel and reduces the amount of binder to a new and lower order of magnitude. The process also affects savings in heat because of the difference in drying temperatures employed.

These advantages do not come wholly from any one step of the process alone but are a product of the combination. For instance, if de-aerating is eliminated the amount of colloidal binder employed must be increased. On the other hand, if de-aerating is used alone for a mixture of coal and molten pitch the amount of water added for pugging is 18 to 20%, producing a very soft dough which cannot be shaped in the moulding rollers. Consequently, this invention eliminates the evaporation of an additional 8 to 10% of water which otherwise would have to be removed.

An ordinary briqueting press can be used by cutting the dough to appropriate sizes for filling the press.

The following examples illustrate some of the doughs.

Example I

Appr. 87% dry pulverized coal.

Appr. 11% water mixed with wetting materials.

Appr. 2% of an emulsion composed of 50% water and 50% bitumen.

Example II

Appr. 94% crushed coal containing about 6 to 8% water.

Appr. 4% water mixed with wetting materials.

Appr. 2% of an emulsion composed of 50% water and 50% bitumen.

In the first example mixing was carried out in the cold. In the second example it was carried out at 90° C. In both cases de-aeration was carried out under a vacuum of 5 to 10 mm. of water pressure.

As many apparently widely different embodiments of the present invention may be made without departing from the spirit and scope thereon, it is to be understood that the invention is not limited to the specific embodiments.

What is claimed is:

1. The method of making a fuel briquette that comprises wetting solid carbonaceous fuel particles with an aqueous solution of a wetting agent for carbonaceous materials, mixing the wet particles with circa 1–2% by weight of an aqueous emulsion of a bituminous combustible divided to colloidal fineness, the total water in the fuel at this stage approximating 10–12% by weight, deaerating the mixture under light vacuum at a temperature in the range from atmospheric to about 90° C., extruding the deaerated mass, forming the extrusion mass into a sheet of uniform thickness with pressure, molding the said sheet thereby dividing it into sections of briquette shape under heavy pressure, and drying it with moderate and sustained heat.

2. The method of making a fuel briquette that comprises wetting solid carbonaceous fuel particles having a maximum dimension on the order of 2½ mm. with an aqueous solution of a wetting agent, mixing the wet particles with circa 1–2% by weight of a water emulsion of which about half is a bituminous colloidal combustible, the total water in the fuel at this stage approximating 10–12% by weight, deaerating the mixture under light vacuum of 5–10 mm. water at temperatures from atmospheric to 90° C., extruding the mass under continued vacuum, rolling it into a sheet, subdividing this sheet and molding the divisions under heavy pressure of about 1,000 kilos per sq. cm., and drying the mass.

3. The method of making a fuel briquette that comprises wetting solid carbonaceous fuel particles with an aqueous solution of a wetting agent for carbonaceous materials, mixing the wet particles with circa 1–2% by weight of an aqueous emulsion of a bituminous combustible divided to colloidal fineness, the total water in the fuel at this stage approximating 10–12% by weight, deaerating the mixture under light vacuum at a temperature in the range from atmospheric to about 90° C., extruding the deaerated mass, rolling and flattening the plastic extrusion mass, molding the flattened mass under heavy pressure, thereby dividing it into sections imparting density and briquette shape to said sections, and drying the briquettes at about 40° C.

RABU, JUDES LOUIS MARIE.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
66,277	Ames	July 2, 1867
209,069	Norris	Oct. 15, 1878
257,985	Siffken	May 16, 1882
790,918	Du Pont	May 30, 1905
946,745	Wadsworth	Jan. 18, 1910
1,212,291	Vogel	Jan. 16, 1917
1,549,436	Billinghame	Aug. 11, 1925
1,596,218	Wagel	Aug. 17, 1926
1,780,205	Maurel	Nov. 4, 1930
1,790,356	Smith	Jan. 27, 1931
1,811,935	Hue	June 30, 1931
2,008,147	Morrell	July 16, 1935
2,207,459	Futo	July 9, 1940
2,253,699	Goss	Aug. 26, 1941

OTHER REFERENCES

Hackh's "Chem. Dictionary," The Blakeston Co., 2nd ed., Philadelphia, 1944.