May 12, 1936. G. H. KAEMMERLING 2,040,816

APPARATUS FOR PULVERIZING MATERIAL

Filed Jan. 12, 1931

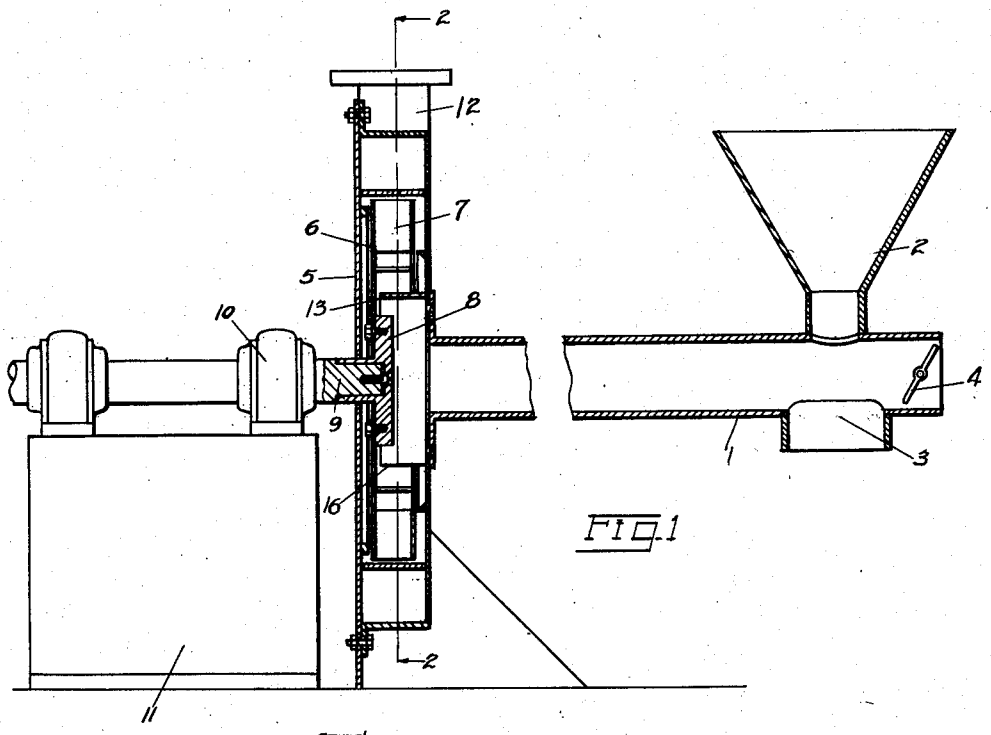


FIG. 1

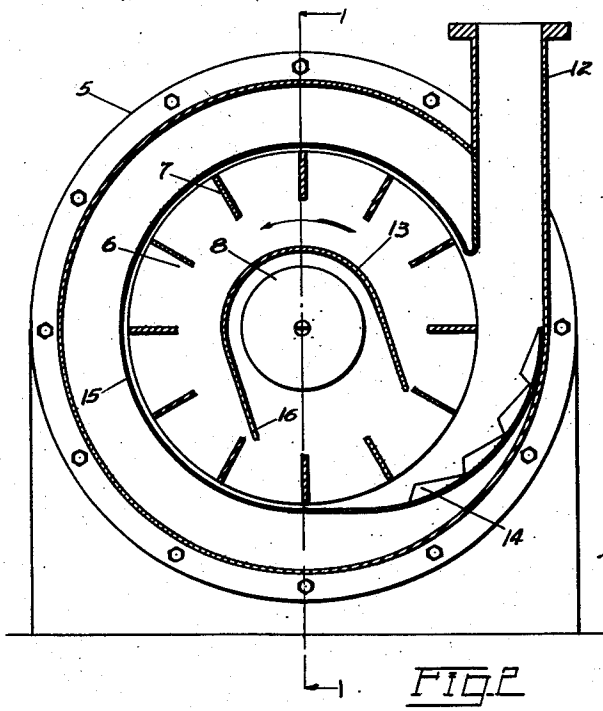


FIG. 2

Gustav H. Kaemmerling
INVENTOR.

BY W. Z. Long
ATTORNEYS.

Patented May 12, 1936 2,040,816

UNITED STATES PATENT OFFICE

2,040,816

APPARATUS FOR PULVERIZING MATERIAL

Gustav Henry Kaemmerling, Erie, Pa., assignor to Erie City Iron Works, Erie, Pa., a corporation of Pennsylvania

Application January 12, 1931, Serial No. 508,022

1 Claim. (Cl. 83—11)

Pulverizers, particularly pulverizers for coal have heretofore been made, some of them operating on the crushing system in which the coal is actually crushed by direct pressure, such as in a ball mill. Another system is one in which the coal is pulverized by attrition, the attrition being accomplished by movement on some attrition surface, or by attrition between the several particles of coal itself. Another system involves the pulverizing of coal through impact in which the coal is given a high velocity, or some anvil is given a high velocity and the impact between the coal and anvil is such as to shatter the coal and in consequence to pulverize it. The impact and attrition systems have been more or less combined in many mechanical pulverizers. An effort to pulverize coal through attrition and impact has been made by using air, or steam under pressure, utilizing this air, or steam to drive the coal through a conduit so as to give the coal the desired velocity and to subject the coal to impact through interposed anvils in the path of the coal and also to attrition due to deflecting the conduit.

With any practical development with relation to pulverizing coal, the real question involved is the power consumption necessary to effect pulverization. It is possible to effect pulverization with any of the systems heretofore used, but it is very difficult to utilize a very large proportion of the actual energy expended in effecting pulverization. In other words, the energy losses are very great.

The present invention is designed to reduce these energy losses. In the devices utilizing air, or steam, for accelerating the coal, losses have been encountered in introducing the fuel to this pressure system in quantities sufficient to fully utilize the energy of the pressure air and also in transferring the energy of the pressure air to the fuel. I have discovered that these losses may be very much reduced, if instead of attempting to drive the coal with air above atmospheric pressure the air movement is induced by a suction effort to the intake in which case the introduction of fuel is very much simplified and the energy required to attain the necessary shattering velocity of the fuel is much reduced. I have also discovered that in the mechanical breaking of the coal it may be very much more economically accomplished if the pulverization is accomplished entirely, or as near entirely as possible, by impact; and that the shattering of coal through impact to effect pulverization can be accomplished utilizing a great deal larger percentage of the energy input to the apparatus than is possible where attrition is attempted either alone, or in combination with the impact scheme. My invention, therefore, contemplates the pulverizing of coal as nearly as practical through impact alone and preferably by combining the impact system through a suction effort of air and through a beater system, or mechanical impact directly applied. Features and details of the invention will appear from the specification and claim.

A preferred embodiment of the invention is illustrated in the accompanying drawing as follows:—

Fig. 1 shows a central section through the device on the line 1—1 in Fig. 2.

Fig. 2 a section on the line 2—2 in Fig. 1.

An inlet tube 1 receives fuel from a hopper 2. The tube is preferably provided with an opening below the discharge of the hopper. The air movement through the opening 3 is sufficient to pick up and float the fuel as it is introduced to the intake tube 1, but is not sufficient to pick up and carry forward the tramp iron, or other foreign substances heavier than coal so that this separation is very readily and cheaply accomplished. In order to regulate the air intake a butterfly valve 4 is arranged at the end of the conduit, or tube 1.

The tube 1 leads to a fan casing 5. The fan is provided with a fan disc 6 on which are arranged paddles 7 which not only operate as fan blades, but also as beater paddles. The disc 6 is secured to an anvil 8 forming the hub of the fan and the anvil is fixed on a shaft 9. The shaft 9 is driven from any source of power (not shown).

The fuel as it is drawn in through the suction effort of the fan is accelerated in the tube 1 and through its inertia shattering impact is accomplished against the anvil 8. With this system it is feasible with a comparatively small amount of energy output to secure sufficient velocity of the fuel that the impact will shatter a portion of the fuel to a fineness requisite for proper burning. The proportion pulverized, of course, may be increased, or diminished by the length of the tube, the velocity of the fan, and other factors entering into the acceleration of the fuel and this manner of pulverization may accomplish complete pulverization by separating the fines and re-circulating the coarse through the apparatus a sufficient number of times to complete the pulverization, if desired. Such separating and re-circulating systems are well-known in the art with pressure pulverizing apparatus and may be

more simply applied to the present apparatus in as much as the coarse portions may be simply dumped into the hopper 2 with the fuel.

I prefer, however, to add to the action of the fan a direct mechanical shattering through impact and to best accomplish this with as little attrition as possible I provide a radial deflector 13 leading from the anvil to the inner edge of the fan blades. By this the air acted upon by the fan and with it the fuel reaches the fan blades, or beaters, by a movement approximately radial and in consequence the fuel is given a shattering blow by the beater, or fan blades. This blow shatters and accelerates the material and it is thrown against one or more anvils 14 in the periphery of the shell from which the pulverized fuel is carried out through the discharge 12. Preferably the liner 15 is circular throughout the greater portion of the periphery, that is to say, from the discharge 12 to the side 16 of the deflector. Preferably this deflector is adjustably supported so that it may be rotated so as to adjust it properly with relation to the anvils 14 and the discharge 12.

It will be noted that with this apparatus losses through attrition friction are very much reduced; that the introduction of the fuel is very much simplified in that there is no necessity for avoiding back leakage as is necessary with systems using pressure air, or steam. Thus the energy losses which are present with the pressure systems in effecting the introduction of the fuel to the moving air are entirely obviated. The velocity thus obtained of the incoming fuel is sufficient without material energy loss and with a large capacity to shatter to pulverization quite a proportion of the coal on the anvil 8 and by giving to the fuel a radial movement so that it receives with practically no attrition a shattering blow of the fan blades, or paddles a second stage of pulverization is accomplished which is still further supplemented by the shattering blow against the anvils 14. Thus pulverization is accomplished almost entirely through impact and with an energy loss very much less than with systems in which the impact is combined with attrition. Further the apparatus for accomplishing this is very much simplified.

What I claim as new is:

In a pulverizer, the combination of a rotary beater comprising beater blades; means comprising stationary guides positioned within the rotary beater and confining the material to a radial path to a point adjacent to the edges of the beater blades and feeding the material, substantially restricted against rotative movement, to the beater at an abrupt angle to the path of the beater blades; and an outer imperforate wall in close proximity to the outer edges of the beater blades throughout the major portion of the circumference, said outer wall having a discharge opening extending outwardly therefrom, the outlet in the wall being in close proximity to the radial position of the guides.

GUSTAV HENRY KAEMMERLING.