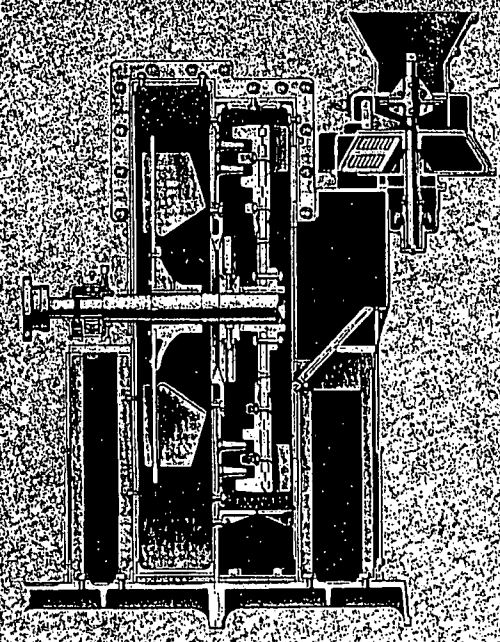
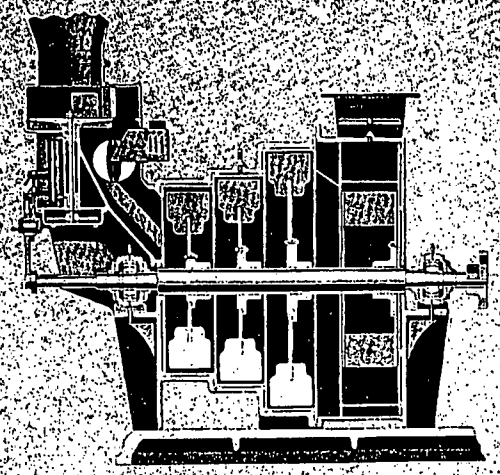
IMPACT IS THE MAJOR FACTOR HERE



7 Pulverizer combines impact, attrition forces to powder coal in two steps. Hammers in first stage supply impact and pegs in second furnish attrition.



8 Series of impact stages gives high degree of coal fineness at pulverizer outlet. Preheated air dries coal. Exhauster fan can be seen at right and

Returning oversized particles, which have already been dried, helps general operation by reducing average moisture content of coal entering the pulverizer and cuts down any tendency of incoming coal to plug at the inlet.

Crushing Action. Fig. 5 and 6 show pulverizers that grind coal between two surfaces moving in relation to each other, with crushing as the principal pulverizing force. One design, Fig. 5, employs as the moving elements balls that are held between two races. Grinding pressure is adjusted by controlled tension of springs shown in cutaway.

Coal in the raceway between and around the balls is subject to various pulverizing forces as the balls rotate. The entire mill operates under pressure. An outside fan blows a stream of preheated air through it to dry, classify and transport pulverized coal.

The mill of Fig. 6 has a grinding ring carried by a revolving bowl whose rim speed is about 1200 fpm. Stationary rolls, preloaded by springs, are set so they do not contact the ring. When incoming coal reaches the spinning bowl, centrifugal force throws it against the slant-faced grinding rim and into contact with the rolls. Ground coal is thrown from rim into annular passage surrounding it. Here partial classification takes place with heavy particles rejected back to the grinding ring by deflecting plates.

Remaining coal particles carry along on the exhauster-induced air stream into the classifier, where the stream undergoes a whirling motion to dislodge heavier particles. To a large extent, adjustable vanes on the classifier set the fineness of output.

Impact, Attrition. Fig. 7 illustrates a mill combining impact and attrition forces, working under suction. A series of hammers make up the primary pulverizing stage into which flows a stream of hot air pulled in by fan action of the hammers. Partly ground coal passes around the outside of the rotor into the final pulverizing stage, which consists of pegs on a rotating disk that travel between stationary pegs. Coal in the turbulent air stream rubs against pegs and other coal particles to be reduced by attrition. A fan pulls out the fines; rejector arms in the path of this coal-air stream return heavy particles.

Impact Pulverizer. The pulverizer of Fig. 8 consists of a series of impact stages with an exhauster fan at the mill outlet. As coal-air mix proceeds from stage to stage, individual particles become progressively finer. Preheated air enters at the left to perform its usual functions of drying and transporting.

A rather different treatment of the basic pulverizing forces shows in Fig. 9. Here raw coal from a supply hopper is pushed by a feeder shoe into the grinding chamber below the rotating element. Incoming fuel particles do not come in contact with the rotor on entering the chamber. Instead, the coal adds to a dormant body of fuel lying on the pulverizer bottom.

Into this atmosphere, under pull of the rotor, in effect a closed-end fan, comes the preheated air stream. This stream whips across the dormant fuel bed and sets up a scouring, sandblasting action between coal particles pulled up in the stream as well as those on the surface of the fuel bed.

The pulverized product passes on with the air stream into the separator above. There the mixture goes through a spinner cone, where the coal-air stream experiences several sharp changes in direction to dislodge heavier particles from the stream. These fall back for further attrition.

Fluid Pulverization. The unit of Fig. 10, introduced recently, contains no moving parts; the expensive force of steam or air is employed to create strong attrition action.

Raw coal not exceeding ¾ in., either wet or dry, enters the mill through a venturi. For wet coal, steam superheated to a total temperature of 750 F serves as the working medium, drying and pulverizing the coal simultaneously. As the coal enters the venturi it comes into the steam jet's path and is forced down into the pulverizer onto a protection cover. It falls through this cover to the pulverization zone in the bottom steam-jet block, where it is pulverized by steam issuing from several jets.

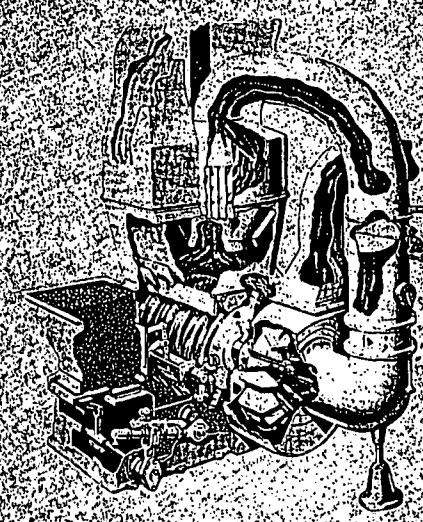
From this pulverization zone the fuel particles are carried with the steam through the uptake leg, back through the classifier where the heavier particles drop back for further pulverization. There is enough energy left in steam-coal mix for delivery to burners. No fan is needed for transport.

Fluid forces are also employed in the pulverizer of Fig. 11, which is designed for ultra-fine grinding. Raw material—minus 4-mesh or less—enters under inspirator action to be broken down still finer. Such fine pulverization goes beyond present power-field requirements, but for gas-turbine applications, and other uses such as grinding coal for colloidal fuel, it may well be the answer.

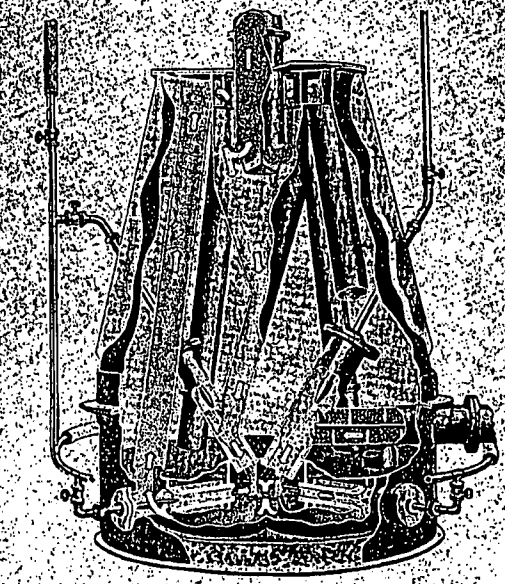
Disk Feeder. The job of delivering an uninterrupted flow of coal to the pulverizer, at the rate set by steam demand, falls to the feeder. Although details vary, feeders fall into two broad classes—disk or plate, and drum or roll.

Fig. 12 shows a totally enclosed disk feeder made in sizes for feeding from

ATTRITION DOES THE WORK HERE



9 Size reduction results from attrition produced when incoming coal, under pull of a high-speed rotor, sweeps across fuel on the pulverizer bottom.



10 Four jets of steam (or compressed air) converge to set up a low-pressure area where coal enters. Attrition between particles does the pulverizing.