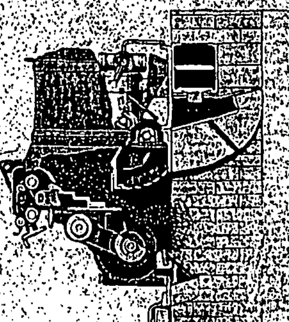
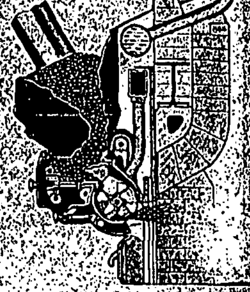
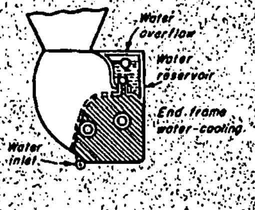
TYPICAL CONSTRUCTION DETAILS OF MECHANICAL SPREADER STOKERS



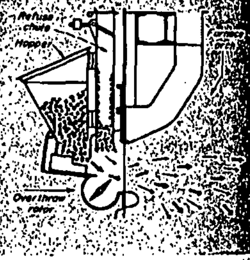
4 Sectional coal-feeder pushers, hydraulically driven, alternate in movement to deliver coal to overthrow-type rotor



5 In this design, rotor has curved blades and projects coal into furnace by underthrow action

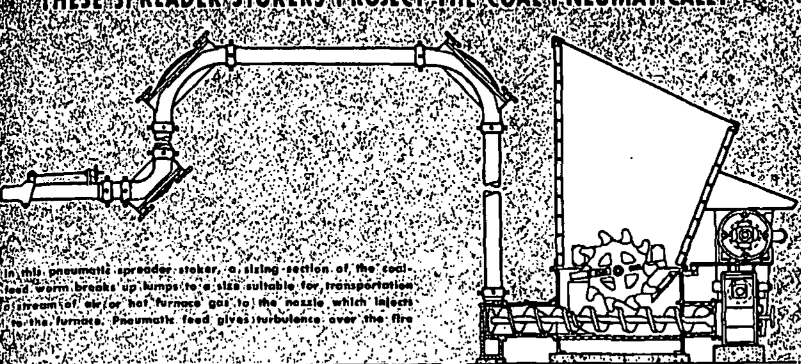


6 Detail shows a watercooled feeder. At top, reservoir extends across width; end frames have a cooled area

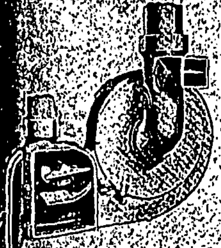


7 For firing waste fuels, this unit has separate hinged spout feeding refuse directly to an overthrow rotor

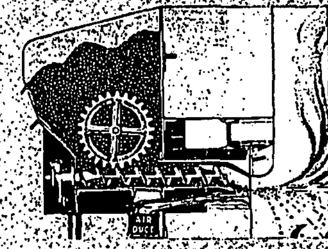
THESE SPREADER STOKERS PROJECT THE COAL PNEUMATICALLY



8 In this pneumatic spreader stoker, a sizing section of the coal-feed worm breaks up lumps to a size suitable for transportation by stream of air (or hot furnace gas) to the nozzle which injects it to the furnace. Pneumatic feed gives turbulence over the fire



9 Detail of stoker above shows the transfer housing where feed worm discharges into outlet of radial-vane fan which gives high velocity to the transporting air (or hot furnace gas)



10 In this pneumatic stoker, agitator wheel in hopper prevents piling up of coal on screw feeder. Coal from feeder falls into path of an air stream which projects it into furnace

Unit of Fig. 3 has a traveling grate that moves forward slowly toward the front, or coal-feeding end, of the furnace. It discharges ash continuously. Such designs prove well suited to large installations, and have been applied to boilers with steaming capacities of 250,000 lb per hr. Some engineers believe much larger units can be built.

Coal Feeders. Spreader stokers can handle a wide range of coal types, including lignite. As to size, they do best on coals under about 1¼ in., with preferred size of the order of ¾x0-in. nut and slack. Coarse coal tends to wear the feeders and may form clinker.

Coal is usually withdrawn from a hopper by a mechanical feeding device whose role is to insure an even, uninterrupted supply to the distributing system. A variety of means is employed: a chain feeder does the job in Fig. 1; a set of feeder rams, Fig. 2; a double-acting ratchet mechanism and rotary feeder in Fig. 6; a hydraulic reciprocating-drive working sectional pushers in Fig. 4; a series of reciprocating plates working off the main lineshaft, Fig. 5. Still another example, Fig. 10, uses a worm. All have positive uniform feed as their objective.

Rotors. In mechanical spreader units, coal feeds down from the hopper to paddle or wheel-shaped distributing rotors. These move at high speed to throw the coal out into the furnace. There are two methods in common use, both of which claim advantages—overthrow and underthrow. They are so named from the point on rotor travel where incoming coal meets blades.

Overthrow. Fig. 1-4, and 7, show various designs employing the overthrow principle. Rotors, spaced to give desired coverage, are usually designed *so individual paddles or elements can* be readily removed and replaced. Feeder assembly provides means to correct for change in coal size to maintain desired distribution pattern. For example, the unit of Fig. 3 has a spill plate. When moved forward, it causes the rotor to throw more of the fuel toward the rear of the furnace, and when moved backward does the opposite.

Underthrow. Fig. 5 shows an underthrow rotor, which consists of small blades of special curvature, suspended loosely on shafts concentric to the main impeller shaft. Blades are designed to give a hammer-mill effect, breaking up any wet coal that tends to lump. In another design, the rotor is divided into sections, each having four blades at a slight angle to the shaft. Angles are such that one blade throws coal to the right, while the next throws to the left. This crisscrossing feed is designed to give uniform fuel distribution.

Watercooling is provided on many feeding and distributing assemblies. The detail of Fig. 6 shows one arrangement, with a reservoir at the top *extending across the unit and cooled sections* in each end frame. In many designs, the feeding machine and the grate section covered by it work together with an individually controlled air supply. The number of sections depends on furnace width.

An indication of the versatility of the spreader method of firing can be seen in Fig. 7. Here firing of waste fuels is provided for by the addition of a hinged chute, down which the refuse flows, under control of a gate. Both coal and refuse are distributed over the grate by an overthrow rotor. A *series of stepped shoes set on a sharp slope, and moved by rocker action,* feeds the coal.

Pneumatic Spreader. A different method of spreader firing is shown in Fig. 8 and 10. These units employ a jet of steam or air to project the coal into the furnace. The unit of Fig. 8, which features a remotely located feeding mechanism and hopper, can readily be arranged to feed directly from a bin or bunker. Coal in the hopper moves slowly down to a feed worm, which has a sizing section to break up lumps too large for transport by pneumatic means. The worm carries the coal in a loose state to the transfer housing, Fig. 9. Here a stream of air from a high-pressure radial-vane fan picks it up and conveys it through a pipe to the burner nozzle. Hot gas from the furnace may be used as the transporting medium, if so desired.

The spreader *nozzle* is wedge shaped; front and back distribution is regulated by elevating or depressing the nozzle tip, and side distribution by movable wedge blocks in the tip. A low-pressure fan supplies air for combustion. Separate motors drive feed screw, conveying-air fan and combustion-air fan. Variable-speed transmission adjusts rate of fuel feed and an air-volume regulator maintains desired air supply.

Another Pneumatic. In the design of Fig. 10, feed screws spaced across the width of the stoker move coal from the hopper to the point of injection. An *agitator wheel in the hopper prevents* coal piling up on the screw. An air jet set just below the end of the screw catches up the coal as it falls and spreads it over the grate. At the same time, this air jet provides an overfire air stream.

Spreader Drives. Many feeder mechanisms are motor driven, with some form of variable-speed transmission to control rate of fuel feed. Usually a steam-turbine drive, and sometimes a hydraulic drive, can be applied. Dumping grates may be hand operated or powered by steam, air or hydraulic cylinders. Moving grates used for continuous ash discharge are powered by motor, with variable-speed transmission, and by hydraulic drives, with a constant-speed variable-displacement pump supplying fluid to a constant-stroke variable-speed hydraulic motor.

The stoker of Fig. 2 has an integrated hydraulic drive that serves all parts, and provides automatic fuel-air ratio control. A single pump, driven by a constant-speed motor (or turbine) supplies oil to a hydraulic motor driving the rotors, and hydraulic engines actuating moving grates, ash-discharge grates and feed rams. Fuel-air ratio control acts on proportioning valves in the discharge from the pump, regulating flow to the various drives and relief to the oil tank.

The spreader stoker has come into wide use in recent years because it is *relatively simple, low in first cost, and* insensitive to coal characteristics. With proper controls and provisions for holding cinder carryover to an acceptable level it gives highly satisfactory service under a wide variety of conditions. It has a reputation for quick response to load changes which is,