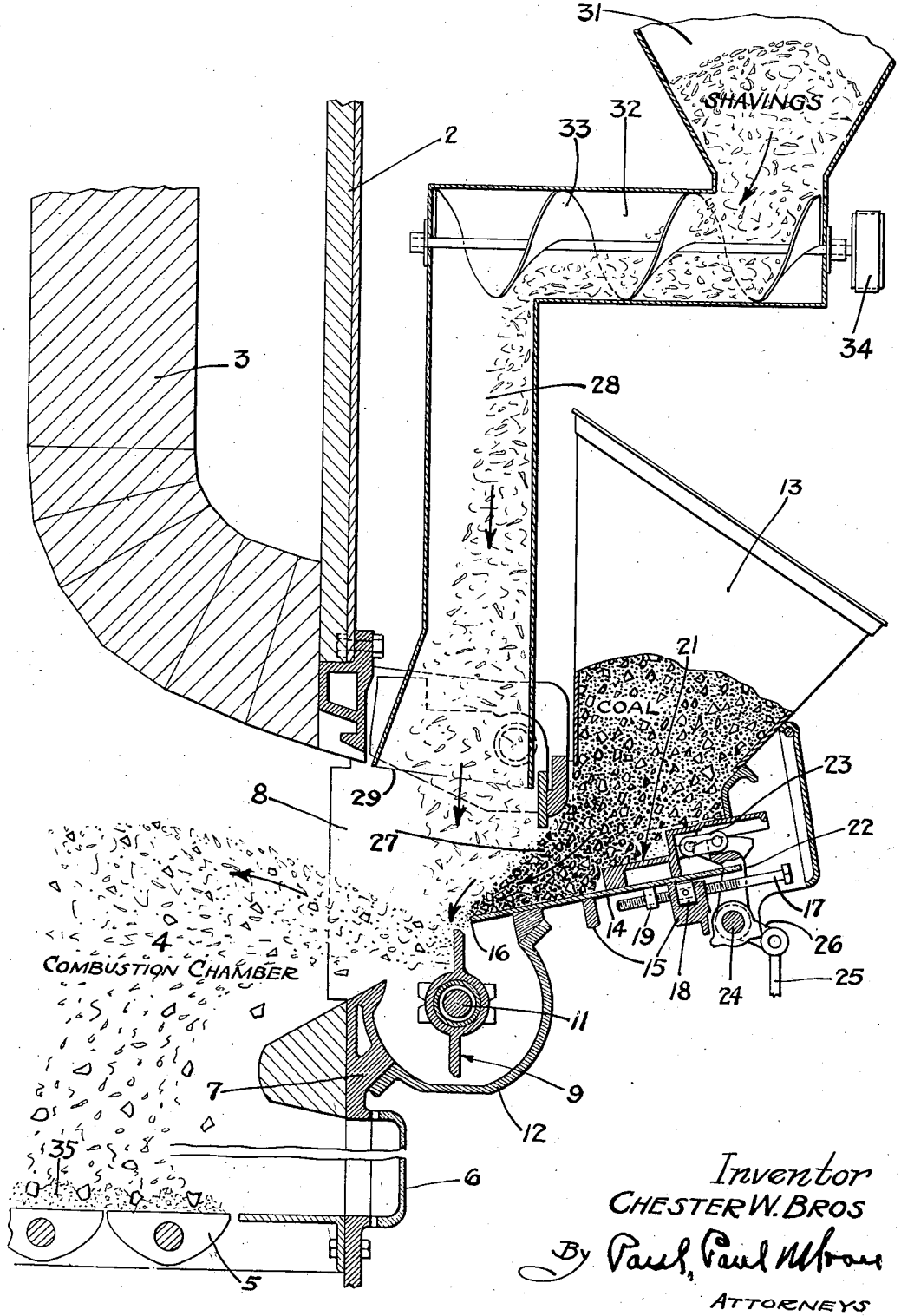
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STOKER

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Inventor
CHESTER W. BROS
By Paul, Paul & Brown
ATTORNEYS

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STOKER

Chester W. Bros, Minneapolis, Minn., assignor to Wm. Bros Boiler & Manufacturing Company, Minneapolis, Minn., a corporation of Minnesota

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This invention relates to new and useful improvements in fuel feeding apparatus, such for example, as stokers.

Heretofore it has been found to be extremely difficult and even impractical to burn such waste fuels as wood shavings, wet hogged fuel, oat hulls, chaff, or similar material in a conventional stoker in combination with coal. In the past this waste fuel has been spouted directly into the furnace where it piles up in high cones, making efficient combustion of both the coal and the waste fuel impossible. This by-product fuel is either fed into the furnace by an automatic waste fuel stoker, such as illustrated in the drawing, or by direct means from a cyclone or conveyer as the fuel is made in the plant. Usually the latter means are used, to eliminate the cost of the waste fuel feeder, and therefore the waste material dumps in slugs completely upsetting the normal fuel bed because of its piling up action. The material coming down a small diameter pipe in slugs prevents the air from penetrating the fuel as it drops on to the grate so practically no burning takes place in suspension.

The difficulty is that a great percentage of the by-product material drops through the furnace and lands on the grate, accumulating in high cones. This causes an uneven accumulation of coal and waste fuel on the stoker or grate surface tending to fuse the coal into clinkers because of the catalytic action of wood and coal when agitated.

If this material could be burned in suspension, its efficiency of combustion would be high and it would not have a tendency to mix on an agitated fuel bed as presented by an underfeed stoker. The overfeed sprinker type stoker burning coal burns a large percentage of its coal in suspension, and if the principle of the sprinkler type stoker is applied to burning this waste fuel, the type of combustion would be approximately the same as that of coal. I have found that when waste fuel is fed onto the revolving rotor of an overfeed stoker with rotor blades of different angles to provide for even spreading of the coal throughout the grate that the terrific slapping action of the rotor blades evenly blasts the waste fuel into the furnace in a fan shape permitting the air for combustion to surround each fuel particle, thereby causing much of the fuel to be burned in suspension. In the burning of dry wood shavings, such as result from the operation of a sash and door or furniture factory, approximately ninety-five percent of the fuel never lands on the grates—it being burned in the furnace proper similarly to pulverized fuel. It is therefore essential that the fuel be thoroughly aerated, when discharged into the combustion chamber, if complete and thorough combustion is to be obtained.

With such wet fuels as hogged fuel of about eighty percent moisture, a much greater percentage drops on the grate, but in passing in its flight from the rotor through the incandescent furnace much of the moisture is driven off permitting the remaining dried material to burn easier on the grate. When burning fuel with a high moisture content, it is imperative that the temperature of the furnace be maintained by coal fed through the stoker in the conventional manner. When burning dry waste fuel, coal need not necessarily be supplied to maintain ignition, but usually coal is fed in order to maintain the required steam demands and steam pressure. Undoubtedly in most cases the waste fuel will be an auxiliary feed, with the coal maintaining a majority of the fuel fed to the furnace.

I have found that waste fuel, such as wood or oat hulls, when burned alone in a furnace will accumulate in a honeycombed mass to considerable height, if fed into the combustion chamber by pipe or spout, thereby interfering with the draft. A great advantage of feeding the waste fuel into the combustion chamber simultaneously with the coal, with the overfeed sprinkler type of stoker, is that the waste fuel is thoroughly aerated, and the coal particles constantly bombard the material on the grate, preventing any such accumulation of piles of material. Further, the fuel bed is not overturned or agitated as in an underfeed stoker so that the formation of sticky clinkers is almost completely eliminated.

An object of the present invention, therefore, is to provide a fuel feeding apparatus for a furnace, comprising means for simultaneously or intermittently delivering into the furnace, a plurality of separate fuels of different characteristics.

A further object is to provide a fuel feeding apparatus comprising a fuel distributor, to which a plurality of fuels having different characteristics are simultaneously delivered from separate sources, and whereby said fuels may be intermixed and aerated by said distributor, simultaneously as they are projected into the combustion chamber of the furnace by the rotary movement thereof.

A further object is to provide in combination with a coal feeding stoker, a separate fuel supply

means whereby shavings or other such fuels may be delivered to the usual fuel distributor of the rotor simultaneously with the coal, whereby said different fuels are thoroughly intermixed before delivery into the combustion chamber of the furnace.

A further and more specific object is to provide a stoker of the overfeed type, comprising a rotary fuel distributor, a coal hopper having means for controlling and regulating the delivery of the coal to the distributor, and having an auxiliary fuel feed conduit whose discharge end is disposed in proximity to the discharge of the fuel hopper, whereby the two different fuels may be simultaneously delivered to the rotor, and by the rotary action of which they are thoroughly intermixed and simultaneously delivered into the combustion chamber of the furnace, in the form of a readily combustible fuel mixture.

A further object is to provide a fuel feeding apparatus adapted to simultaneously feed coal and shavings into a furnace in such manner that particles of coal are constantly being precipitated onto the shavings which may tend to accumulate and pile up on the grate, whereby the shavings and ash on the grate are constantly bombarded and disrupted, thereby to maintain an even fuel bed on the grate to produce efficient combustion.

Other objects of the invention will appear from the following description and accompanying drawing and will be pointed out in the annexed claims.

In the accompanying drawing there has been disclosed a structure designed to carry out the various objects of the invention, but it is to be understood that the invention is not confined to the exact features shown as various changes may be made within the scope of the claims which follow.

The single figure in the drawing illustrates a portion of a stoker with the invention embodied in the construction thereof.

In the accompanying drawing, there is illustrated a portion of a conventional furnace comprising a front face plate or wall **2**, shown secured to the usual fire-proof wall **3** of the combustion chamber **4** of the furnace. The usual grate **5** is shown defining the bottom of the combustion chamber **4**, and a door **6** is shown in the front wall of the furnace, whereby access may be had to the grate **5**.

The stoker is shown comprising a suitable frame **7**, secured to the front wall of the furnace and having an opening **8** therein, through which the fuel is fed into the combustion chamber by the stoker. A suitable fuel distributor, generally indicated by the numeral **9**, is shown mounted beneath the opening **8**, and is supported by a suitable shaft **11**, driven from a suitable power device, not shown in the drawing. A casing **12** is shown secured to the frame **7** and provides a closure for the lower portion of the fuel distributor **9**.

The supporting frame **7** of the stoker extends outwardly from the front of the furnace and has a suitable hopper **13** mounted thereon, the bottom of which is shown defined by an adjustably mounted feed plate **14**, supported upon a skeleton frame **15**. The skeleton frame **15** may or may not be integrally formed with the main supporting frame **7** of the stoker. The discharge edge **16** of the feed plate **14** is disposed over the fuel distributor or rotor **9**, and is adjustable with respect thereto by longitudinal movement of the feed plate **14** by manipulation of the adjusting screw **17**. This adjusting screw is supported in the portion **15** of the stoker frame, and is held against longitudinal movement in the frame **15** by a collar **18**. The adjusting screw is freely rotatable in the supporting frame and has a threaded connection with the feed plate **14** by means of a threaded lug **19** secured thereto.

The fuel in the hopper **13** is delivered to the rotor **9** by reciprocal movement of a stepped feed shoe, generally indicated by the numeral **21**. The feed shoe is mounted for reciprocal movement over the feed plate **14**, by an arm **22** having a link **23** operatively connecting it with the feed shoe, as clearly illustrated. The arm **22** is shown supported upon a suitable shaft **24**, to which rocking movement may be imparted by a connection **25**, pivotally connected to a small arm **26** provided on the arm **22**.

The hopper **13** is provided with a discharge opening **27**, through which the coal or fuel is fed to the rotor **9** by the reciprocal movement of the feed shoe **21**.

An important feature of the present invention resides in the provision of means whereby shavings or other similar fuels may be fed to the rotor simultaneously with the usual coal fed from the hopper **13**. In accordance with the present invention, and as illustrated in the accompanying drawing, an auxiliary fuel conduit **28** is shown interposed between the front wall of the furnace and the adjacent wall of the hopper **13**. The discharge end **29** of the fuel conduit **28** is disposed in close proximity to the discharge opening **27** of the hopper **13**, and is so arranged with respect to the rotor **9**, that the fuel discharging through the conduit **28**, will be delivered to the rotor simultaneously with the delivery of the coal thereto from the hopper **13**. The two different fuels thus delivered to the rotor or fuel distributor, are intermixed by the rotative action of the rotor **9**, whereby a highly combustible fuel mixture is provided which, when delivered into the combustion chamber **4** of the furnace, is readily and substantially completely consumed.

The shavings delivered to the rotor **9** from the conduit **28** may be received from a suitable overhead cyclone or hopper **31**, which may, if desired, be provided with a suitable conveyer **32**, one end of which communicates with the conduit **28**, as clearly illustrated. The conveyor **32** may be provided with a feed auger **33** driven by a suitable belt **34** connected to a source of power, not shown. Variation in the speed of the auger **33** may control the delivery of shavings to the rotor **9**, as will readily be understood.

The invention is comparatively simple, and when used in connection with a coal feeding stoker, makes it possible to burn shavings and/or other similar materials, together with coal, without waste. By intermixing the shavings with the coal by the action of the rotor **9**, the resultant mixture is thoroughly aerated, whereby, the shavings may be efficiently burned, because the two fuels provide a readily combustible fuel mixture which readily lends itself to combustion, when distributed over the width of the combustion chamber, as clearly illustrated in the accompanying drawing.

An advantage gained by feeding the shavings into the furnace simultaneously with the coal, is that pieces of coal are constantly being peppered against the partially burned shavings precipitated onto the grate, as illustrated at **35** in the drawing. By thus peppering the shavings and ash deposited on the grate with pieces of coal,

the shavings and ashes on the grate are constantly being bombarded or broken up, whereby they cannot accumulate or pile up thereon with such density as to interfere with the draft or circulation of air through the grate, essential in order to obtain complete and efficient combustion.

In the drawing I have shown the auxiliary fuel supply conduit 28 as being made independently of the stoker. It is to be understood that I do not wish to be limited to the specific construction shown in the drawing as obviously, various changes may be made in the construction thereof without departing from the spirit of the invention and the scope of the claims.

I claim as my invention:

1. An over-feed stoker for feeding waste fuel and coal into a furnace, comprising a rotary fuel distributor, means for separately feeding coal directly to the fuel distributor in an approximate vertical direction, and means for separately feeding waste fuel material directly to the fuel distributor in an approximate vertical direction, said rotary fuel distributor due to its rotation intermixing the coal and waste fuel material and showering it in a direction which is approximately at right angles to said feed directions as an aerated mixture of the two fuels into the furnace.

2. An over-feed stoker for feeding waste fuel and coal into a furnace, comprising a frame secured adjacent the furnace, a casing secured to the frame, a rotary fuel distributor mounted in said casing, means adjacent the side of the casing for separately feeding coal directly to the fuel distributor, a vertically disposed conduit provided above the fuel distributor for separately feeding waste fuel material directly to the fuel distributor, and means for feeding waste fuel into the vertical conduit, said rotary fuel distributor due to its rotation intermixing the coal and waste fuel material and showering it as an aerated mixture of the two fuels into the furnace.

3. An over-feed stoker for feeding waste fuel and coal into a furnace, comprising a frame secured adjacent the furnace, a casing secured to the frame, a fuel distributor mounted to rotate in said casing, a coal hopper, means beneath the coal hopper and communicating with the casing for separately feeding coal directly to the fuel distributor, and a conduit disposed vertically above the fuel distributor and having means for separately feeding waste fuel material directly to the fuel distributor, said fuel distributor due to its rotation intermixing the coal and waste fuel material and showering it as an aerated mixture of the two fuels into the furnace.

4. An over-feed stoker for feeding waste fuel and coal into a furnace, comprising a rotary fuel distributor, means for separately and directly feeding coal laterally and downwardly to the fuel distributor, and means provided above the fuel distributor for separately feeding waste fuel material directly by gravity to the distributor, said fuel distributor due to its rotation intermixing the coal and waste fuel material and showering it laterally as an aerated mixture of the two fuels into the furnace.

5. An over-feed stoker according to claim 4, in which the means for separately feeding the waste fuel material includes a vertical conduit and the means for separately feeding the coal includes a laterally disposed feed plate which projects partly under the vertical conduit whereby a portion of the waste fuel material falling by gravity in its conduit will fall on the coal on the feed plate as the latter material is fed to the distributor.

6. An over-feed stoker according to claim 4, in which the means for feeding the coal includes a plate and a stepped feed shoe, and in which means are provided to reciprocate the feed shoe on the plate to feed the coal to the distributor.

CHESTER W. BROS.