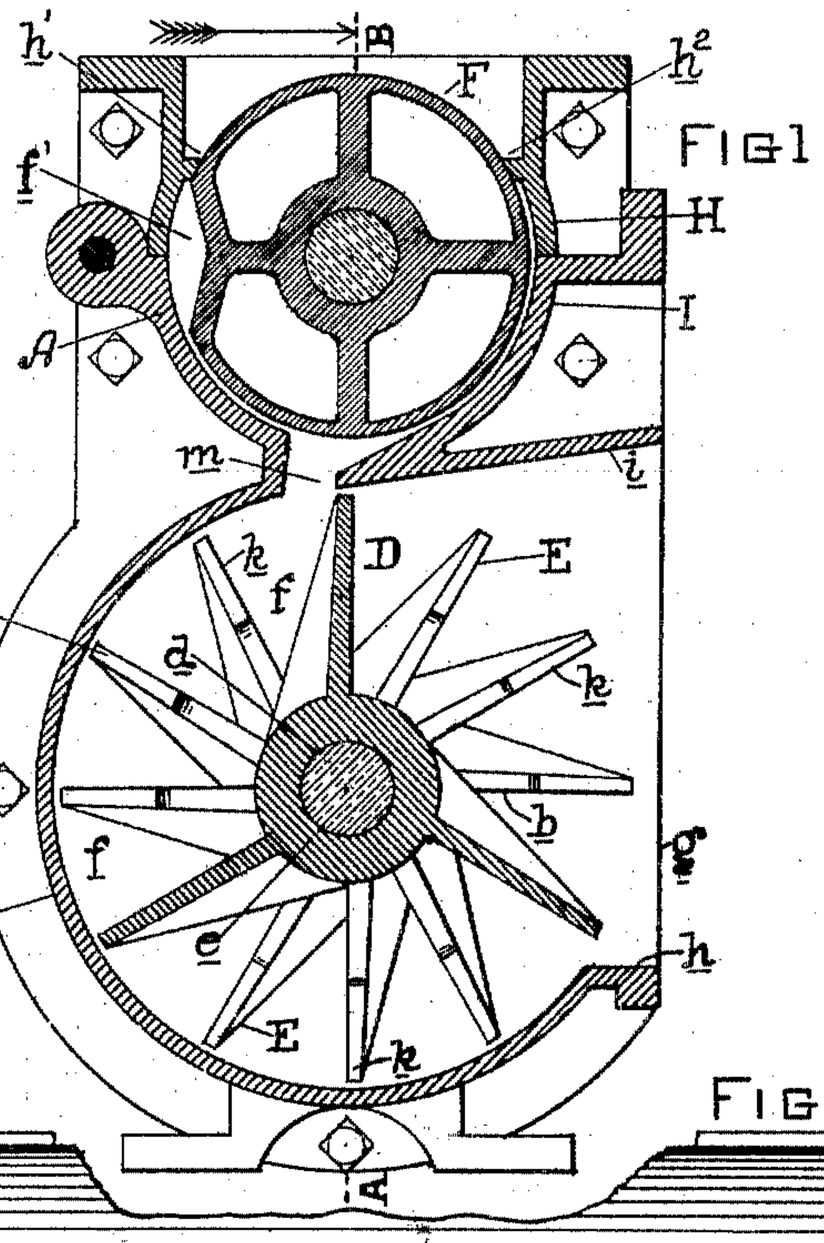
No. 767,084. PATENTED AUG. 9, 1904.

J. & W. REAGAN.

FUEL FEEDING DEVICE FOR BOILER FURNACES.

APPLICATION FILED MAR. 18, 1904.

NO MODEL. 2 SHEETS—SHEET 1.



WITNESSES:

F. G. Smith

Robert Osborne Jr.

INVENTORS:

James Reagan.

William Reagan.

By Isaac R. Clifford.

attorney.

No. 767,084. PATENTED AUG. 9, 1904.

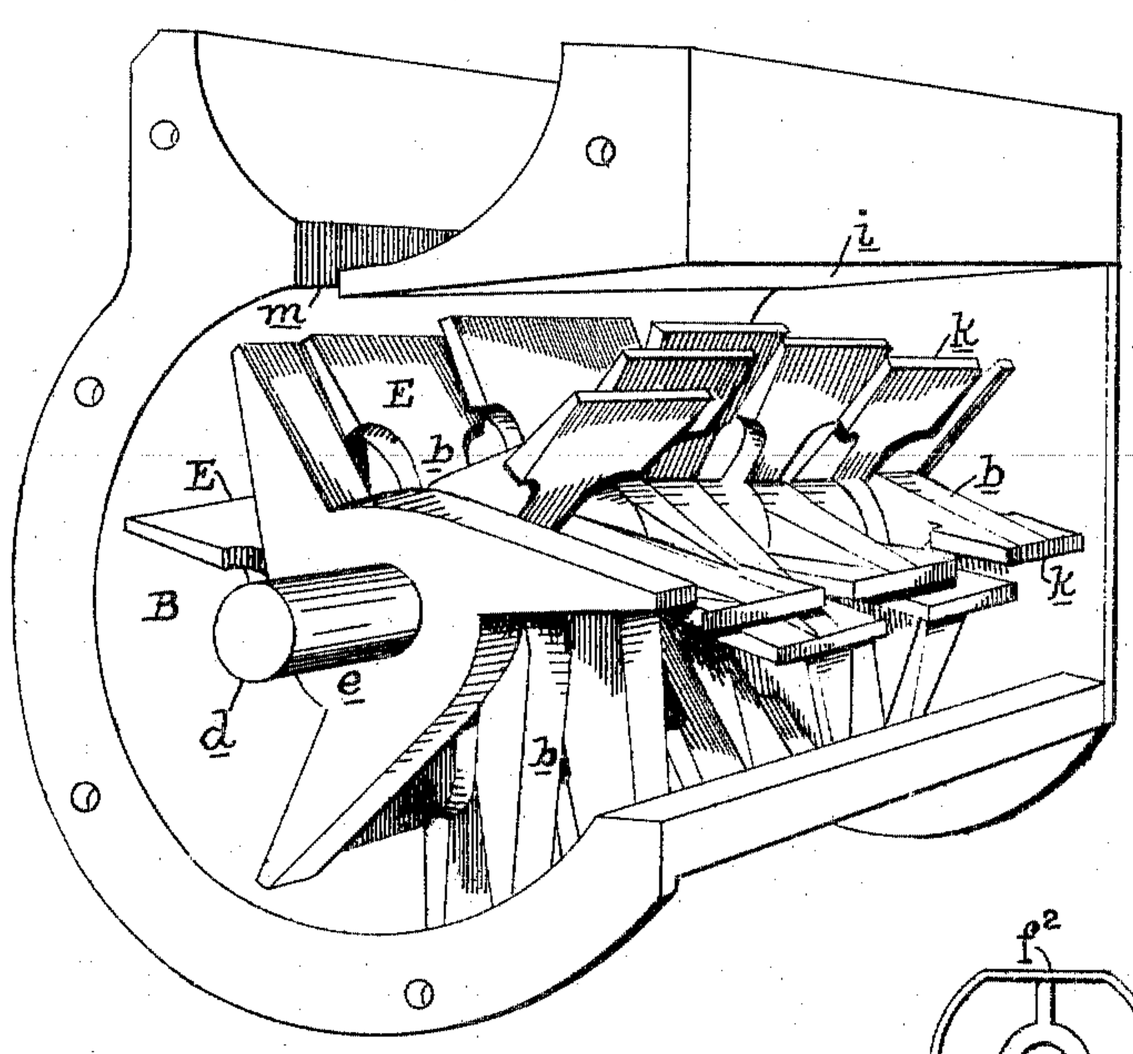
J. & W. REAGAN.

FUEL FEEDING DEVICE FOR BOILER FURNACES.

APPLICATION FILED MAR. 18, 1904.

NO MODEL. 2 SHEETS—SHEET 2.

FIG 3



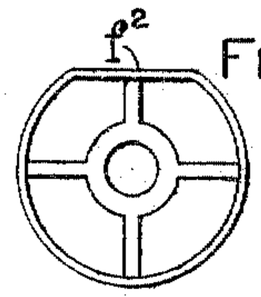


FIG 7

FIG 4

FIG 5

FIG 6

WITNESSES:

T. G. Smith

Robert Osborne Jr.

INVENTORS:

James Reagan.

William Reagan.

By Isaac R. Ashford.

attorney.

No. 767,084. Patented August 9, 1904.

UNITED STATES PATENT OFFICE.

JAMES REAGAN AND WILLIAM REAGAN, OF PHILADELPHIA, PENNSYLVANIA.

FUEL-FEEDING DEVICE FOR BOILER-FURNACES.

SPECIFICATION forming part of Letters Patent No. 767,084, dated August 9, 1904.

Application filed March 18, 1904. Serial No. 198,850. (No model.)

To all whom it may concern:

Be it known that we, JAMES REAGAN and WILLIAM REAGAN, citizens of the United States, and residents of the city and county of Philadelphia, State of Pennsylvania, have invented certain new and useful Improvements in Fuel-Feeding Devices for Boiler-Furnaces, of which the following is a specification.

The present invention is an improvement upon the fuel-feeding device of our pending application, Serial No. 193,249, filed February 12, 1904, in which we have disclosed a time feeder of novel construction, and also upon a rotary fuel-distributer, which is the subject of our pending application, Serial No. 181,421, filed November 16, 1903.

The present invention also involves a specific construction of the time feeder and the fuel-distributer whereby the devices are caused to coact in a new and advantageous manner.

The invention will be understood by reference to the following specification and accompanying drawings, in which—

Figure 1 is a transverse vertical sectional view. Fig. 2 is a front elevation, partly in section, of our whole device. Fig. 3 is a perspective view of the distributer and its casing. Figs. 4, 5, and 6 are diagrammatic views showing different arrangements of the blades of the distributer. Fig. 7 is a view of a modified form of the time-feeder cylinder.

A, Figs. 1, 2, and 3, is the casing of the time feeder, and B is the fuel-distributer, by means of which the fuel is delivered with substantial uniformity to all parts of the surface of the fire-bed. These devices may be secured to one of the feed-doors of an ordinary furnace in which a fuel-opening of appropriate size has been made, or they may be secured to any part of the front wall of the furnace in which an opening for the introduction of the fuel has been formed.

C is the casing of the distributer, within which rotates a distributing-wheel D, having an axis *d* mounted in suitable bearings in the ends of the casing. The casing has an imperforate wall and a mouth *g* and is in diameter only slightly larger than the distributing-wheel D, the blades E of which have narrow arms *b*, that are secured to the axis *d* by hubs *e*, each of which bears three or any appropriate number of blades. This construction, which is disclosed in our aforesaid application, Serial No. 181,421, prevents the feeding of air into the furnace from the outside when the wheel is revolving and, furthermore, avoids any circulation of the gaseous contents of the furnace-chamber through the casing. This latter fact has been established by rapidly rotating the wheel of the distributer (four hundred and thirty-two revolutions a minute) in close proximity to lighted gas-jets situated in front of and on a level with said wheel, when, as clearly appeared, the flames burned without flickering unless the usual amount of fuel was in the flight, in which case, however, the flames were only momentarily deflected away from the distributer by the inductive action of the moving fuel.

The lower edge *h* of the mouth *g* of the casing is somewhat higher than the bottom of said casing. This arrangement has the effect of restricting the area of said mouth, at the upper part of which extends an inclined deflector *i*, which deflects certain portions of the fuel downward upon the front part of the fire-bed.

The blades E of the distributing-wheel are provided with widened ends *k* of such width that each blade overlaps its neighbor in the manner indicated in Figs. 4, 5, and 6. In Fig. 4 the blades are equally spaced with reference to the circumference of the wheel. In Fig. 5 the blades are arranged in pairs, between which is a relatively wide space, and in Fig. 6 the blades are equally spaced and disposed in two series of steps. The overlapping of the blades is an important feature of the invention, for by means of it some portions of the intermittent stream of the fuel falling into the distributer from the feeder will be subjected to the action of more blades during a single revolution of the wheel than are other portions thereof. Thus referring to the arrangements of the blades shown in Fig. 4, in which only three sets of blades are represented, it will be observed that while

that portion of the stream of fuel falling upon the extreme left-hand end of the wheel would be hit by three blades in a given time the next adjacent portion would be hit by two blades, the next by the three blades, and the next by one blade, and so on throughout the length of said wheel. This proportion would of course hold good for an entire revolution. So in the operation of the blades arranged as in Fig. 5 portions of the descending fuel would be hit by four blades, while other portions would be hit by two blades during equal periods of time. If the blades were arranged as in Fig. 6 or were so placed as to involve a combination of the various arrangements shown in all three of the diagrammatic views, the result would vary in kind according to the nature of the arrangement. The action of the blades when made to overlap, as aforesaid, is to divide the mass of falling fuel into various small portions which even before they leave the wheel are separated into their ultimate minute fragments and which upon leaving the wheel are evenly scattered over the whole fire-bed of the furnace.

Some portions of the fuel, and especially the larger particles, will be struck by the corners and the side edges of the blades, while other portions will be hit by the outer edges of said blades. Still other portions will be held in the pockets *f* between the blades until the centrifugal force imparted by the wheel causes them to leave said pockets. The final results of these movements are the lateral deflection of some of the larger particles across the path of the projected fuel and a consequent dispersion of said projected fuel from various individual points between the wheel and the deflector *i*.

When in actual operation, the device appears to be delivering rapidly-moving streams of fine fuel which cross each other and constitute an expanding sheet of fuel, which is as wide as the entire mouth of the distributer-casing. In this manner the lateral distribution of the fuel throughout the entire width of the furnace-grate is uniformly effected.

Those portions of the projected fuel which are driven upward by centrifugal force and by contact with the outer edges of the blades will upon striking the deflector *i* be thrown downward upon the front portions of the fire-bed. Other portions may also at times reach the same destination. By making the overlaps of the blades greater or less than that shown the amount of fuel that is delivered to the front portion of the fire-bed may be varied.

The normal tendency of mechanical fuel-distributers has been to deliver the larger portion of the fuel to the more remote areas of the fire-bed and to leave the front portions of the bed without an adequate supply. Our device has been found by actual test to overcome this difficulty and to equally serve all the units of fire-surface.

The time feeder has within its casing a feed-cylinder F, which is slightly smaller than the casing and which in practice will be given such speed as will satisfy the demands of the furnace. By increasing the speed the quantity of distributed fuel will be increased, for the wheel D is always to be run at such velocity as to be able to readily throw all the fuel which reaches it, and by decreasing the speed the quantity of distributed fuel will be diminished. The feeding of the fuel is therefore always under perfect control and may be regulated as occasions require.

The furnace should be provided with a suitable shaking-grate—as, for example, the grate that is described in my Patent No. 566,093, granted August 18, 1896—so as to avoid the stoking operation, which, as is well known, produces large volumes of dense black smoke that escape through the stack into the atmosphere.

The casing A of the time feeder is made in two parts, H and I, the latter of which may be integral with the casing C of the fuel-distributer and communicates therewith through the passage *m*. The part H is hinged to the part I, so as to afford access to the feed-cylinders F and to provide for the introduction and removal of same. The casing A is provided with ribs h' and h^2, one of which, h', acts as a cutter for such portions of the fuel as protrude from the pocket f' of the feed-cylinder. This pocket f' may be either a wide shallow groove which extends the whole length of the feed-cylinder or a substantially flat surface f^2, as shown in Fig. 7, lying in the chord of an arc of the circumference, the object in either case being to allow the fuel, which is collected within the pocket when the feed-cylinder revolves, to freely fall by gravity from the same when it reaches the passage *m*. The lines representing the bottom of the pocket or pockets may be said to meet at an angle greater than a right angle. The passage *m* is situated slightly to the rear of the axis *d* of the distributing-wheel D, so that the blades E when striking the falling fuel may act to direct some of it against the deflector *i*, from which the deflected portions will pass to the near-by areas of the fire-bed. The passage *m* is made slightly narrower than the fuel-pocket f' of the feed-cylinder F, so as to prevent a charge of fuel from being dumped as a single mass upon the distributer-wheel D, the effect of this arrangement being to cause a larger number of blades to act upon any given charge and to produce a thorough distribution of the various particles.

Any suitable hopper may be used, and the fuel employed may be soft coal or any coal that is finely divided. When moderately-large lumps of soft coal are present in the hopper, the cutter *h*, coacting with the corner of the feed-cylinder, will readily sever or crush the same.

Having thus fully described our invention, what we claim, and desire to secure by Letters Patent, is—

1. The combination of a distributer-wheel, means for feeding fuel thereto situated slightly behind the axis of said wheel and a deflector for portions of the fuel impelled by said wheel, substantially as described.

2. The combination of a distributer-wheel means for feeding fuel thereto situated slightly behind the axis of said wheel, an inclined deflector for portions of said fuel impelled by said wheel, substantially as described.

3. The combination of a casing having a passage for admitting fuel thereto and a discharge-mouth, a revoluble feed-distributing wheel situated within said casing, said wheel having pockets in its periphery, and a deflector situated at the upper portion of its mouth; substantially as described.

4. The combination of a casing having a passage for admitting fuel thereto and a discharge-mouth and a revoluble fuel-distributing wheel situated within said casing, said wheel being provided with overlapping blades, substantially as described.

5. The combination of a casing having a passage for admitting fuel thereto, and a discharge-mouth, and a revoluble fuel-distributing wheel, situated within said casing, said wheel being provided with overlapping blades, which are widened at their ends, substantially as described.

6. The combination of a casing having a passage for admitting fuel thereto and a discharge-mouth, and a revoluble fuel-distributing wheel situated within said casing, said wheel being provided with sets of overlapping blades, substantially as described.

7. The combination of a distributing-wheel having overlapping blades, means for feeding fuel thereto, and a deflector for portions of the fuel impelled by said blades, substantially as described.

8. The combination of a distributing-wheel having overlapping blades, and means for supplying fuel to said wheel, in measured quantities, substantially as described.

9. The combination of a distributing-wheel having overlapping blades, and means for supplying fuel to said wheel in measured increments, substantially as described.

10. The combination of a fuel-distributer, a fuel measurer and feeder, and a stationary fuel-deflector for portions of the fuel, substantially as described.

11. The combination of a fuel-distributer and a stationary deflector for portions of the fuel, substantially as described.

12. A rotary fuel-distributer provided with independent blades along its surface having corners and edges which are adapted to disperse the various particles of the fuel, substantially as described.

13. A rotary fuel-distributer having irregularly-disposed blades provided with corners and edges which are adapted to disperse the various particles of the fuel, substantially as described.

14. A rotary fuel-distributer having a greater number of blades at some points along its length than at other points substantially as described.

15. A fuel-feeder having a casing provided with a discharge-passage in combination with a revoluble cylinder provided with a fuel-pocket whose bottom is represented by lines meeting at a greater angle than a right angle, and a fuel-distributer adapted to uniformly spread the successive portions of the fuel while falling over substantially all parts of a fire-surface, substantially as described.

16. The combination with a fuel-feeder, of a revoluble fuel-distributer provided with irregularly-disposed separated blades, casings for said feeder and said distributer, and a passage for the fuel situated between said casings, the said passage being slightly in the rear of the axis of the fuel-distributer, substantially as described.

17. A fuel measurer and distributer including in combination means for measuring the fuel and for delivering it in independent charges, means for distributing the independent charges over substantially all parts of a fire-surface, and means for causing the portions of each independent charge to be delivered at different times upon the distributing means, substantially as described.

Signed by us at Philadelphia, Pennsylvania, this 17th day of March, 1904.

JAMES REAGAN.
WILLIAM REAGAN.

Witnesses:
ANNA L. FLORINE,
ISAAC R. OAKFORD.