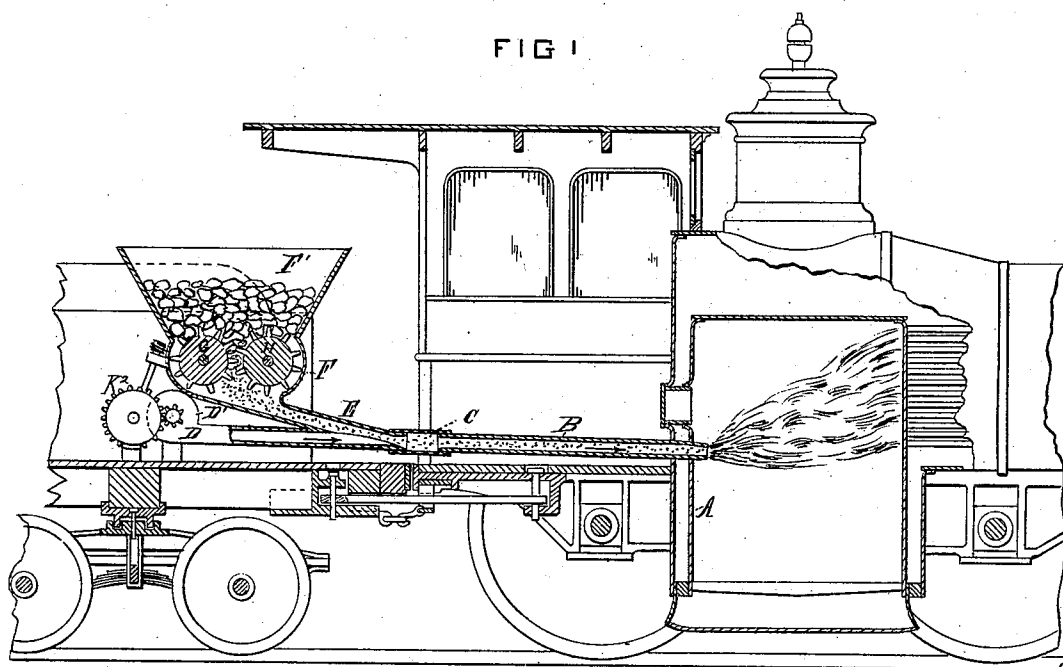
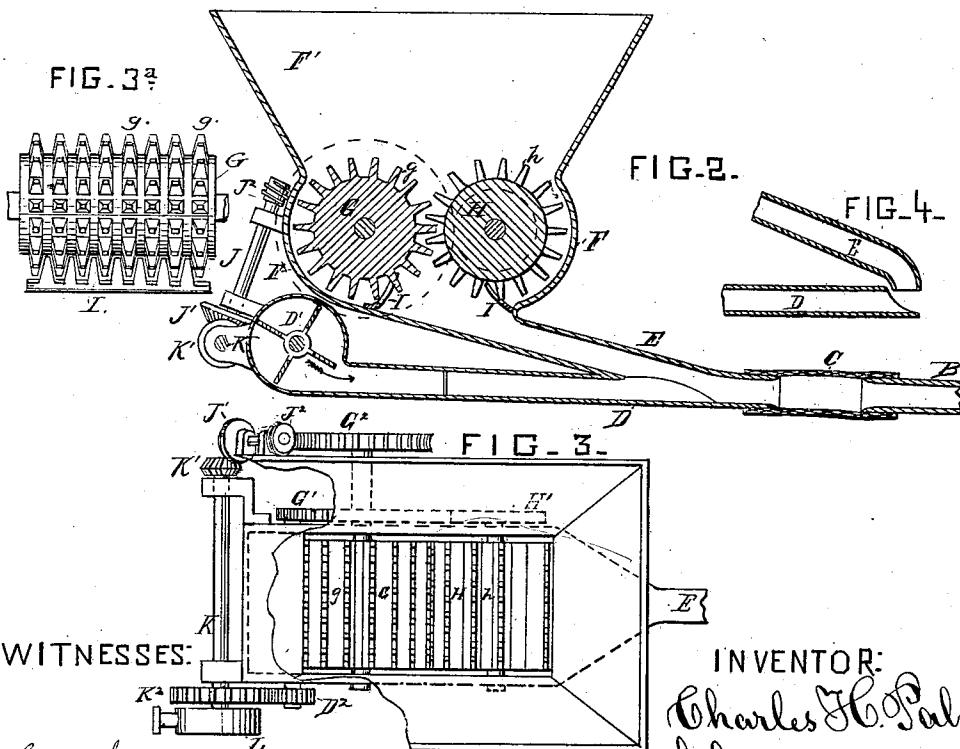


(No Model.)

C. H. PALMER.
Apparatus for Feeding Fuel.

No. 240,265.

Patented April 19, 1881.



WITNESSES:

H. A. Johnstone.
D. E. Stafford.

INVENTOR:

Charles H. Palmer,
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Thomas D. Watson.

UNITED STATES PATENT OFFICE.

CHARLES H. PALMER, OF NEW YORK, N. Y., ASSIGNOR TO JOHN P. JONES,
OF GOLD HILL, NEV., AND ABRAM M. LORVEA, OF SAN FRANCISCO, CAL.

APPARATUS FOR FEEDING FUEL.

SPECIFICATION forming part of Letters Patent No. 240,265, dated April 19, 1881.

Application filed February 18, 1881. (No model.)

To all whom it may concern:

Be it known that I, CHARLES H. PALMER, a citizen of the United States, residing in New York city, in the county and State of New York, have invented certain new and useful Improvements in Apparatus for Feeding Air and Fuel to Furnaces, of which the following is a specification.

I will describe the invention as applied to a locomotive. Some of the novel features of the invention can be applied to other furnaces, as will appear farther on.

The accompanying drawings form a part of this specification.

Figure 1 is a central vertical section, showing so much of the parts as is necessary to fully understand the invention. Fig. 2 is a corresponding section through a portion on a larger scale. Fig. 3 is a plan corresponding to Fig. 2. Fig. 3^a shows another view of one of the rollers and of the scrapers therefor. Fig. 4 represents a modification. It is a vertical section through the junction of two pipes.

Similar letters of reference indicate corresponding parts in all the figures.

The front of the furnace A, which, in common with the other parts of the locomotive, may be in other respects of any ordinary or suitable description, receives a horizontal pipe, B, which is connected by a flexible extension, C, to the junction of two pipes, D E, inclined at small angles, one over the other. The pipe D connects with a fan-blower, D'. The pipe E is connected to a device which serves both as a feeder to supply fine fuel in measured and regular quantities, and also as a mill to disintegrate any lumps therein. This device is composed of a casing, F, formed as shown, and a hopper, F', formed with flaring sides to receive the fuel. Two rollers, G and H, of cast-iron or other suitable material, are mounted within the casing F, and supported in reliable bearings turned by gear-wheels G' H', which are of unequal size, the wheel G' being the largest, and thereby inducing an inequality in the time of revolutions of the rollers. Each roller is provided with teeth arranged in rings g h, which alternate with each other—that is to say, the rings or circular series of teeth g are firmly set equidistant from each other on the roller G, with a space between each ring

or series a very little greater than the thickness of the teeth. The series of teeth h on the other roller, H, are of similar size, and are arranged to alternate with the several series g. It follows that as the rollers revolve at different rates of speed the teeth of one move faster than the other, being allowed to do so by the fact that they do not engage together, like the teeth of gear-wheels, and that they run independently, side by side, of each other. The space allowed between is so small that the fine coal or other fuel is reduced to small grains in the passage. The revolution of these rolls, by reason of the one being faster than the other, effects the grinding, and by reason of their strong grasp on the material regulates the feeding. The teeth rise with their several spaces presented toward the casing empty, but while moving in the mass of fine fuel the several spaces become filled.

I I are fixed scrapers, arranged as shown. They stand between the series of teeth on each roller, and clear the spaces from any of the fine fuel which may tend to lodge there. These scrapers are rigid, or substantially so, being made, by preference, of saw-plate or of substantial sheet-steel, and made to apply close to the respective rolls at and near the bottoms of the several grooves between the series of teeth. They are so formed and placed that they dig under or plow out any fuel which may tend to remain accumulated in the bottom of the grooves. In the removal of the material from these grooves they tend also to dislodge, by their indirect action, any material which may have lodged in the spaces between the several teeth of each series.

The fuel may be supplied constantly, or from time to time, by depositing it in the hopper F'.

On the axis of one of the rollers, G, is fixed a large worm-wheel, G², which receives a worm, J², fixed on the shaft J, which is supported in stationary bearings, and is compelled to turn by a beveled-gear wheel, J', which engages with a beveled-gear wheel, K', on the shaft K. This shaft is turned by a rotary engine, L, which receives steam from a boiler. (Not represented.) A large gear-wheel, K², on this shaft K engages with a small gear-wheel, D², on the blower.

The gearing of the mill and feeder G H and their connections to the blower D' and its connections insures a uniformity of action at all speeds—that is to say, the air driven into the furnace under a given rate of revolution will be supplied with a given quantity of fuel proper for that quantity of air, and when, from any cause, the quantity of air is lessened or increased the supply of fuel will be proportionately varied; and the fact that the gearing is driven by an independent engine, L, enables me to feed air and fuel at any required rate independently of the rate of motion of the main engine, as also to feed air and fuel, if required, while the locomotive is standing at a station or on a siding.

The furnace of the locomotive is provided with the ordinary door, grate, dampers, &c., which allows the burning of fuel upon the grate by air received from below in the ordinary manner when desired. I propose in most cases to maintain a stratum of coarse fuel on the grate, and to receive some air upward through it. The stratum of fuel burning slowly in that position serves to receive and usefully burn all the particles of fuel which are driven into the furnace through my apparatus, and which are sufficiently large and heavy to fall down before becoming entirely consumed.

The flexible pipe C may be maintained in a round, or approximately round, condition under all the bendings to which it is subjected, by equipping it with rings or spirals of elastic wire, as is commonly practiced in suction-hose. It allows the engine and tender to approach and recede from each other, and also to rise and sink relatively to each other in passing over inequalities in the track, and to assume various horizontal angles in passing over curves and switches. The action of the apparatus may be continued under all these conditions.

My invention may be applied in a similar manner to the furnaces of stationary steam-engines and to furnaces for other purposes, as metallurgical furnaces.

Modifications may be made in many of the details. I propose in some cases to put the mill

and blower nearer the furnace, and to dispense with the flexible connection C. In such case the ends of the pipes D and E are preferably joined in the manner indicated in Fig. 4, the pipe E being bent downward a little opposite the end of the pipe D. I esteem it important in such case that the bottom of the pipe D be extended as shown, so as to arrest any particle of fuel which chances to be projected downward from the pipe E with more than ordinary velocity, and to insure that it be caught and blown forward by the force of the air issuing from the pipe D.

I claim as my invention—

1. In combination with a furnace, connecting-duct, and blower, a fuel feeding and pulverizing mill and flexible pipe-connection, arranged for joint operation, as and for the purposes herein specified.

2. The flexible connection C between two sections of the conducting-passage, when the portion B is carried on the locomotive and the other portions, D E, on the tender, in combination with the fan D', feeding and grinding mill G H, and furnace A, as and for the purposes specified.

3. The feeder described, composed of the rollers G H, provided with teeth or projections *g h*, and inclosed within a casing, F, having a hopper, F', and clearers I, all combined and arranged as and for the purposes specified.

4. The mill and feeder described, having the rollers G H, provided with teeth *g h*, arranged as shown, so that they may work past each other, in combination with the casing F, hopper F', delivering-passage E, and gearing G' H', so as to work the two rollers at different speeds, as herein specified.

In testimony whereof I have hereunto set my hand, at New York city, this 16th day of February, 1881, in the presence of two subscribing witnesses.

CHARLES H. PALMER.

Witnesses:

W. COLBORNE BROOKES,
H. A. JOHNSTONE.