

J. S. BUELL & S. A. W. MARSH.  
GRAIN DRIER.

No. 45,471.

Patented Dec. 20, 1864.

Fig. 1.

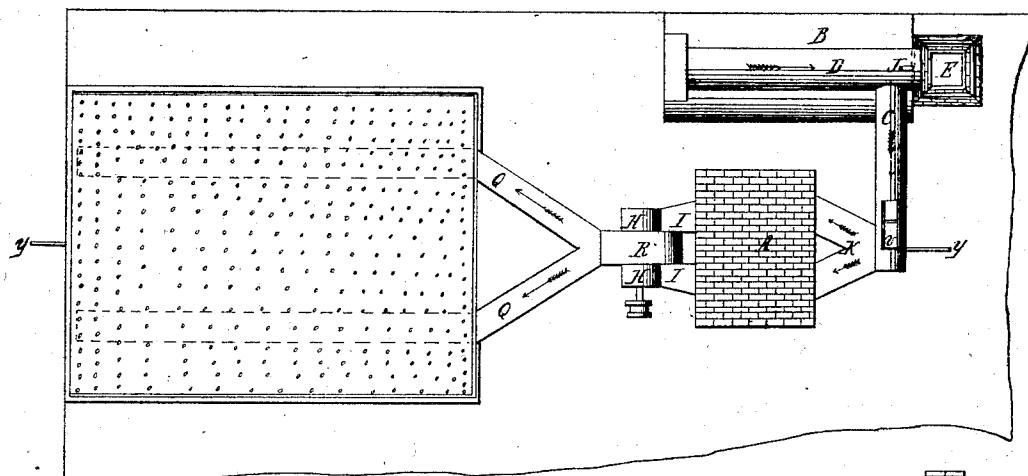
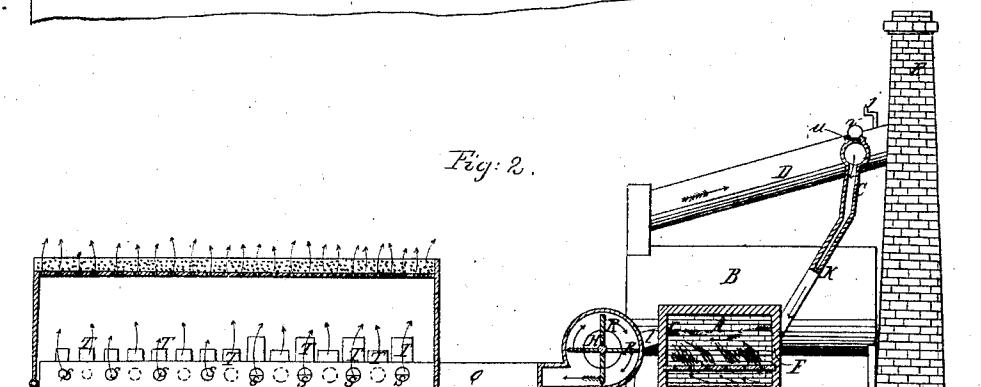


Fig. 2.



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# UNITED STATES PATENT OFFICE.

JONATHAN S. BUELL AND SAMUEL A. W. MARSH, OF BUFFALO, NEW YORK.

## IMPROVED GRAIN-DRIER.

Specification forming part of Letters Patent No. 45,471, dated December 20, 1864.

*To all whom it may concern:*

Be it known that we, JONATHAN S. BUELL and SAMUEL A. W. MARSH, of Buffalo, in the county of Erie and State of New York, have invented certain new and useful improvements in the apparatus for introducing a blast of hot air into kilns for drying grain, malt, hops, broom-corn, lumber, staves, and all similar substances; and we do hereby declare the following to be a full, clear, and exact description thereof, reference being had to the accompanying drawings and to the letters of reference marked thereon, in which—

Figure 1 is a plan or top view of the apparatus. Fig. 2 is a vertical longitudinal section through the line *y y*.

Our invention and improvement consists, first, in the combination and arrangement of apparatus by which the products of combustion from a steam-boiler furnace or other fire-place are exhausted and forced or caused to pass through a reheating fire-place, and through pipes into a kiln or grain-drier; second, in the combination and arrangement of the dampers and pipes with the furnaces and fan, by means of which the heated air is exhausted from the furnace or furnaces and forced or blown through pipes into the air-chamber of the kiln or grain-drier; third, the combination and arrangement of a pipe or pipes with graduated openings or with graduated lengths and graduated openings with a rotary fan, by means of which a blast of hot or cold air is conducted, forced, or blown into the air-chamber of a kiln or drying apparatus, and equally distributed through all parts thereof, as hereinafter more fully described; fourth, the combination of a damper or slide with the pipes by means of which the external air is admitted into the pipe when required, and the draft of the boiler-furnace thereby regulated, as hereinafter more fully described.

We construct our furnace, A, for burning coke or anthracite coal, of the usual form and of such dimensions as the size of the kiln or drying apparatus may require. We place it in convenient proximity to a steam-boiler, B, and sufficiently distant from the kiln or drying apparatus to allow the rotary fan R to be placed between said furnace and the kiln or drying apparatus.

We construct a pipe, C, leading from the smoke-pipe D of the steam-boiler B to an

opening, F, into the upper part of the furnace A above the fire, said pipe C, in connection with the smoke-pipe D and chimney E, furnishing a direct draft in the furnace A, when the fan R is not in operation. Between the point of intersection of the pipes C and D and the chimney E we introduce a damper, J, by means of which, when required, we prevent the heat from escaping from the smoke-pipe D into the chimney E. From an opening, G, on the opposite side of the furnace from the opening F, we construct a pipe, I, leading to a rotary fan, R, and connected therewith at the center of the end or side, as represented at H, motion being communicated to said fan by gearing it to the engine or to some other motive power.

If two furnaces are used the pipes I leading therefrom are connected with the rotary fan R at opposite sides at the center, as represented at H, Fig. 1, and in this case the pipe C, leading from the smoke-pipe D, is divided and connected with the furnace by branches, as represented at K, Fig. 1, so that the connection of each furnace with the rotary fan R and the smoke-pipe D may be perfect and complete. Leading from the rotary fan to the kiln or apparatus for drying is a pipe, Q, which may be extended the whole length of the air-chamber of the kiln, and which has graduated openings or apertures S in that part of the pipe which is within the air-chamber, for the egress of the heated air, said openings being larger on that part of the pipe which is nearest the end of the air-chamber at which said pipe Q enters and gradually diminishing in size as the force of the blast of hot air diminishes, so as to favor and produce a uniform and equal distribution of hot air through all parts of the air-chamber, or the pipe Q may be divided into branches of graduated or different lengths, with graduated openings, if such construction may be thought better calculated to promote a uniform distribution of the heated air, the length of the respective pipes being proportioned to the number of pipes introduced into the air-chamber. These pipes may be made of any form that economy or convenience may dictate, and the openings or apertures may be furnished with dampers or slides T, by means of which the size of the openings or apertures may be increased or diminished, as circumstances may require, or

the same purpose may be accomplished by any other known mechanical device.

The pipe C, leading from the smoke-pipe D of the boiler B, is furnished with an opening, U, which is covered or closed by a movable slide or dampér, V, through which opening the external air may be admitted to the pipe and thence to the air-chamber of the kiln or drying apparatus, as and when required.

The pipe or pipes with graduated openings, or the pipes of graduated lengths and graduated openings, which introduce the heated air into the air-chamber of the kiln or drying apparatus, should in all cases be placed at the lowest part of the air-chamber, in order more surely to secure a uniform distribution of the heated air.

The rotary fan R may be placed at any convenient point between the furnace A and the smoke-pipe D, being connected with the pipe C in a manner substantially the same as hereinbefore described, so as when in motion to exhaust the surplus heated air from the smoke-pipe D, and force or flow said heated air over the fire in the furnace A into and through the pipe Q, into the air-chamber of the kiln or drying apparatus; but to this position of the rotary fan there are many and serious objections, among which is the resistance to be overcome when the heated air has to be conducted or blown some distance, requiring additional force to propel it; and, also, the rotary fan, being thus placed, interferes with the natural draft of the furnace when the fan is not in use. Therefore we prefer to locate the rotary fan near the kiln or drying apparatus, and between the kiln and the furnace, so that when in motion the heated air may be exhausted over the fire in the furnace or furnaces and then forced or blown through the pipes with graduated openings into the air-chamber of the kiln or drying apparatus.

The object of our arrangement is to secure an equal and uniform distribution of heat throughout the air-chamber, for when the heated air is forced into the air-chamber with great velocity, without the use of pipes with graduated openings or of pipes with graduated lengths and graduated openings, it is unequally distributed and consequently the drying capacity of the kiln is greatly reduced. This difficulty may be partially overcome, however, by introducing at right angles to the direction of the blast a partition of sheet-iron in such a manner that, while a sufficient quantity of the blast may be allowed to pass beneath and beyond the partition, the balance of the blast may be stopped and caused to rise, thus being distributed over

that part of the air-chamber not before supplied. Again, when the heated air-blast is used in connection with a kiln having a perforated horizontal plate, the furnace is usually placed within and at one end of the air-chamber. By this arrangement that part of the substance to be dried which is directly over the fire receives the least portion of the heat when the fan is in motion, and if the fan is not in motion the heat rises vertically and exposes that part of the substance to be dried which is directly over the furnace to the danger of being burned.

We remove the artificial heat from the substances that have been sufficiently dried or cured by exposing in a cooling apparatus to a blast of cold air forced or driven into the air-chamber of said apparatus by means of a rotary fan R, and pipes Q, with graduated openings S, motion being communicated to the rotary fan as before described.

Having thus described our invention and improvement, and while we do not claim the process of blowing or forcing a blast of air over a coke or anthracite fire, as is set forth in Letters Patent dated January 13, 1863, issued to Sylvester Marsh, what we claim, and desire to secure by Letters Patent, is—

1. The combination, with a grain-drier and with a furnace for steam-boilers or other fire-place, of a reheating-furnace and a fan-blower, when the latter is so arranged in a pipe or pipes leading from the primary fire-place to the grain-drier as to receive or exhaust the products of combustion from the primary fire and force or cause the same to pass through the reheating fire-place into the grain-drier, substantially as and for the purpose set forth.

2. The combination and arrangement of the damper J and the pipes D, C, and I with the furnace A and the rotary fan R, substantially as and for the purpose set forth.

3. The combination of the pipe Q, or its equivalent, with graduated openings, with the rotary fan R for blowing either a hot or cold blast, substantially as and for the purpose set forth.

4. The combination of the damper V with the pipe C for the purpose of regulating the draft of the boiler-furnace, substantially as and for the purpose set forth.

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