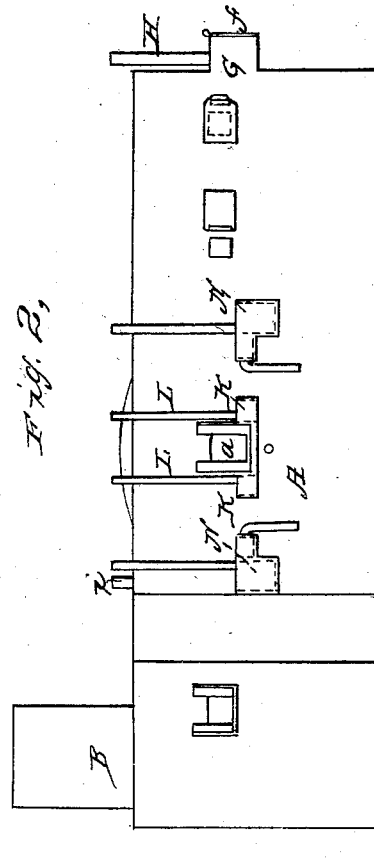
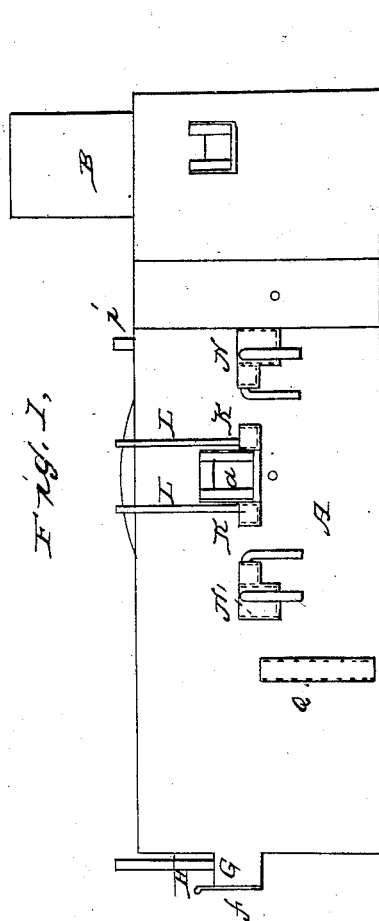


J. WILLIAMS.  
Puddling Furnace.

2 Sheets—Sheet 1.

No. 50,319.

Patented Oct. 3, 1865.



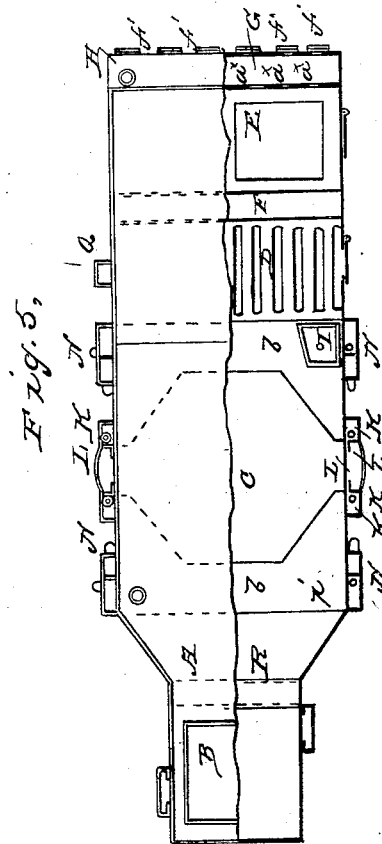
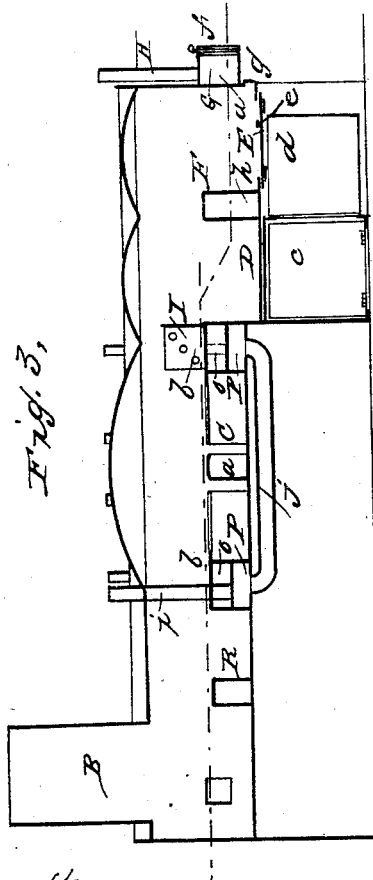
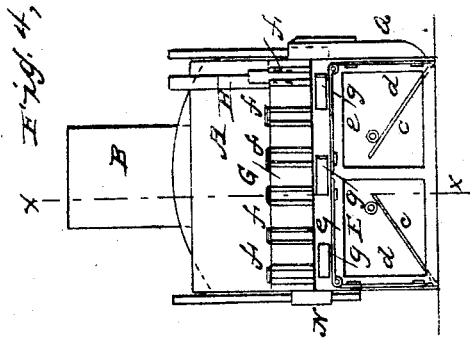
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J. WILLIAMS.  
Puddling Furnace.

No. 50,319.

Patented Oct. 3, 1865.



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# UNITED STATES PATENT OFFICE.

JOHN WILLIAMS, OF MONTREAL, CANADA EAST.

## IMPROVED PUDDLING-FURNACE.

Specification forming part of Letters Patent No. **50,319**, dated October 3, 1865.

*To all whom it may concern:*

Be it known that I, JOHN WILLIAMS, of the city of Montreal, in the Province of Canada East, have invented a new and Improved Puddling-Furnace; and I do hereby declare that the following is a full, clear, and exact description thereof, which will enable those skilled in the art to make and use the same, reference being had to the accompanying drawings, forming part of this specification.

Figure 1, Sheet No. 1, is a side view of a double puddling-furnace constructed according to my invention. Fig. 2 is also a side view of the same, the opposite to that shown in Fig. 1; Fig. 3, Sheet No. 2, a longitudinal vertical section of the same taken on the line *x x*, Fig. 4; Fig. 4, an elevation of the furnace at the grate end, and Fig. 5, a plan or top view of the same, partly in section.

Similar letters of reference indicate corresponding parts.

A represents the outside shell of the double puddling-furnace, which may be about twenty (20) feet in length by seven (7) feet in width, and six (6) feet in height, built in a substantial manner, with fire-bricks bound together with strong cast-iron plates and buckstuffs in the ordinary manner in which such furnaces are put together. Attached to the furnace will be a chimney, B, of thirty-five (35) or forty (40) feet in height.

C is the body of the double furnace, of cast-iron, with doors on each side. If a single furnace, with a door on one side, as in the ordinary puddling-furnaces now in use, with the top plates, *b*, of the bridges and jambs projecting over the sides, as shown in Fig. 3, for the purpose of receiving fire-bricks on top and a lining of ciuder-cement below.

D is a bar-grate, arranged in the manner shown in the drawings, and provided with a couple of flap-doors, *c*, forming the bottom of the first ash-pit. These doors will open upward and allow of the ashes and clinkers being deposited in a second pit below the first one. To perform this access is had to the first ash-pit by the two doors, *d d*, which will be closed when the furnace is in operation.

E is a blind grate, with its bottom made up of two flap-doors, *e e*, opening downward. The bottom of this blind grate will be a few inches

above the bottom of the bar-grate to admit of the bars being withdrawn and replaced when necessary through the doors *d d*. The flap-doors forming the bottom of this grate E will be secured by bars when in place, on the removal of which, when the grate requires cleaning, both flaps will fall and immediately deposit the ashes in the pit below.

F is a hollow cast-iron bridge between the two grates D E. It will be surrounded by fire-bricks and have a space of about seven (7) inches between the surface of the brick on top and the lower side of the roof, as a flue for the passage of the flame and products of combustion into the second grate. In front of the blind grate E there is a compressed-air chamber, G, fed with air by means of a blast-pipe, H. The compressed air is introduced from this chamber into the blind grate through the towel-holes *a\**, shown in Figs. 3 and 5. On the opposite side of the chamber G are a corresponding number of larger apertures, provided with sliding covers *f*, as shown in the various figures. The object of these holes or apertures is to permit the introduction of a rod for the purpose of cleaning out the towel-holes in the event of becoming clogged up with clinkers, &c., from the blind grate. Underneath the air-chamber G there are small doors, *g*, for breaking up and removing clinkers which form in the grate E. *h* is the space existing in bridge F.

I I are two air-discharging vessels, placed one on each end of the bridge between the bar grate and the body of the furnace. They are perforated on the sides opposite each other for the purpose of directing the compressed air into the body of the flame as it passes over the bridge. The compressed air is introduced into them by means of pipes leading up from the air-chambers in the bridge below.

K K are water receiving and discharging bosses, placed on each side of the furnace and communicating with the water-boshes of the jambs, the water being introduced into them by means of pipes L suitably arranged. They are also provided with overflow-pipes, by which means a constant current of cold water is maintained. The upper sides of the bosses are open to admit of the escape of any steam which may be generated by the heat of the furnace.

N are bosses similarly arranged and constructed with the water-boshes of the bridges of the furnace.

O O are the water-boshes of the bridges referred to, occupying the upper half of the space in the interior of the bridge, and permitting the water to circulate behind the cast-iron shell of the body of the furnace, thereby keeping it cool.

P P are air-chambers existing in the bridges immediately below the water-boshes just referred to, from which they are divided by a partition, as shown in Fig. 3. Compressed air is introduced into the air-chamber of the bridge near the chimney-end by means of two pipes, *v' v'*, passing from above down through the water-boshes, as shown in Fig. 3, and from thence, by means of a pipe, *j*, under the body of the furnace to the air-chamber under the water-bosh in the second bridge, and from thence, by means of two short pipes up through the water-bosh into the air-chambers I, from whence it passes out through the apertures into the flame.

Q is a pipe for leading compressed air underneath the bar-grate D, into which it is discharged, and R is a stove near the chimney-end of the furnace for heating the iron pigs previously to being placed in the body of the furnace. The height of the flue over the grate-bridge is about seven (7) inches, as before stated, over the next two bridges about ten (10) inches, and twelve (12) inches over the stove-bridge. A space is left between the stove-bridge and the next one to it for the collection of cinders, as shown in Fig. 3.

With the foregoing description of my improved furnace I will now proceed to describe more particularly the mode of working the same.

The furnace being constructed and arranged in the manner described, the body of the furnace is surrounded with a lining of "Williams' Patent Cinder Cement" or iron ore, the water introduced by the pipes into the bosses and boshes and the fires in the grate started. A quantity of pig-iron is placed in the body of the furnace and the blast turned on in the various air-chambers and grates. The products of combustion from the blind grate in passing over the bar-grate are entirely consumed and the benefit received in the body of the furnace on the iron being operated on, instead of being carried up the chimney to a great extent, as

in the ordinary furnace, while at the same time a fresh supply of oxygen is supplied by the air-vessels to the flame from the bar-grate as it passes through the flue over the second bridge. The constant circulation of cold water through the boshes around the furnace will keep it moderately cool, notwithstanding the intense heat to which the iron in it is subjected. An additional quantity of pig-iron having also been placed in the stove R will be in readiness when required to be placed in the body of the furnace to replace any which may be removed.

By the use of my improved puddling-furnace a ton of puddle-iron can be made with one-third less fuel than by the ordinary furnaces now in use, and at the same time with about one-half of the cement or iron ore for lining the furnace, turning out also a better class of iron in less time.

The same general arrangement of double grates, air and water boshes may be applied to ordinary single puddling-furnaces, and the double grate to heating furnaces and boilers, and result in a considerable reduction of fuel with a higher percentage of heat.

I do not confine myself to the precise details herein set forth, as they may be varied to suit circumstances; but

What I claim as new, and desire to secure by Letters Patent, is—

1. The novel arrangement in the puddling-furnace of a blind grate with the ordinary grate, together with the combination of slide-doors, trap-doors, towel-holes, and air-chamber, whereby for all the fuel consumed in the blind grate the benefit is received into the body of the furnace on the iron, with much less of the fuel passing up the chimney than in the ordinary furnaces.

2. In the different grates, the introduction of the trap-doors for letting the ashes, cinders, &c., fall into the external ash-pit, and thus saving the hauling out of ashes when the furnace is in operation, thereby effecting a saving in time.

3. The peculiar arrangement of water-boshes, whereby water may be employed without the danger of explosion from the generation of steam.

JOHN WILLIAMS.

Witnesses:

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