2 Sheets—Sheet 1.

J. GRIFFITHS.

Apparatus for Puddling Iron.

No. 48,485.

Patented June 27, 1865.

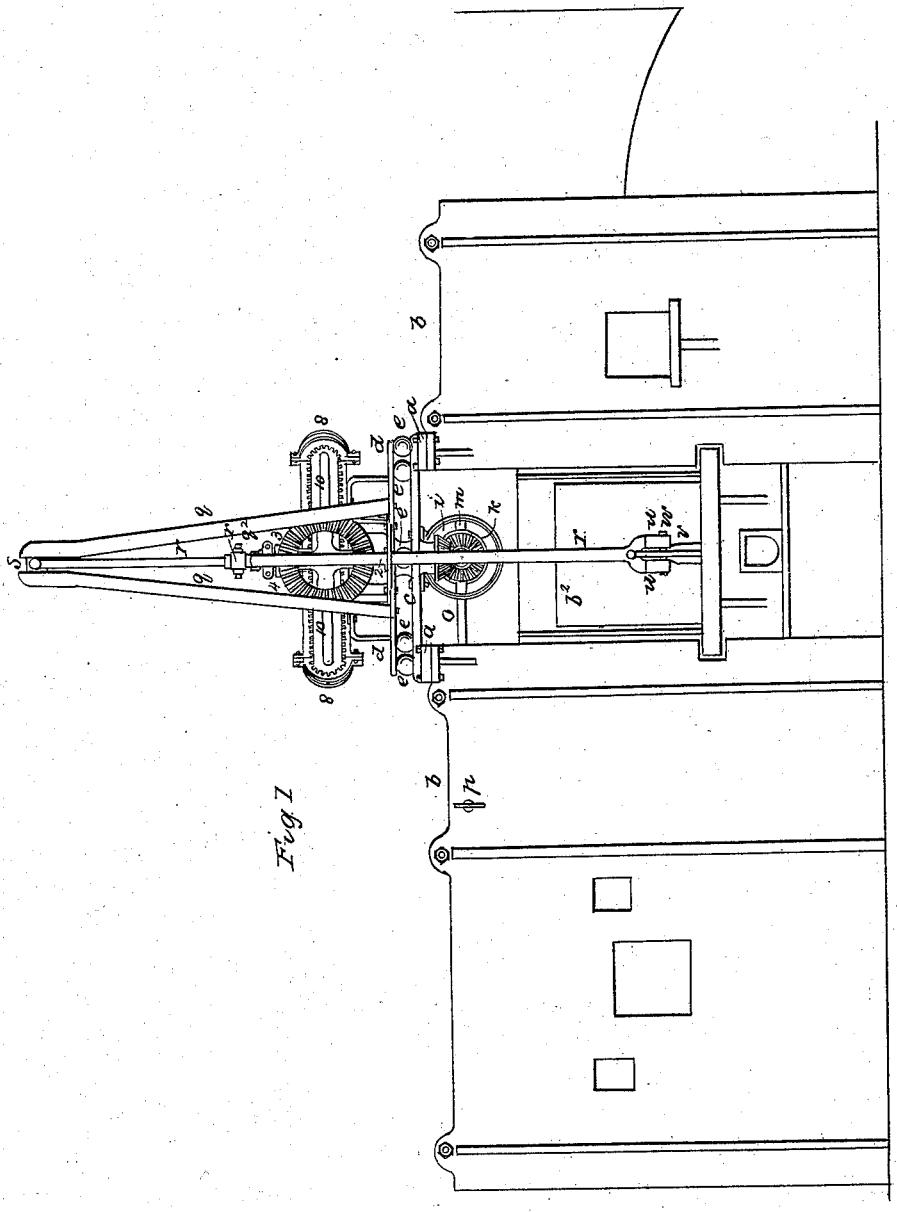


Fig. 1

WITNESSES
A. C. Bakewell
W. D. Lewis

INVENTOR
John Griffiths
by his Attorney
W. Bakewell

2 Sheets—Sheet 2.

J. GRIFFITHS.

Apparatus for Puddling Iron.

No. 48,485. Patented June 27, 1865.

Fig. 3

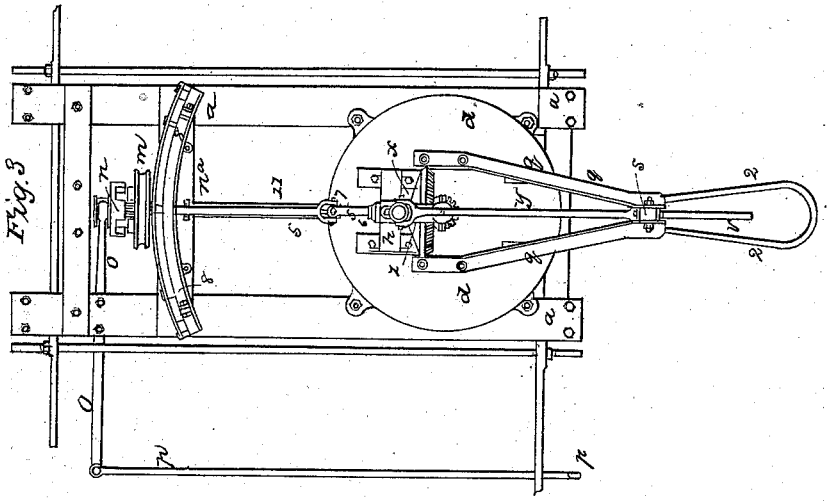
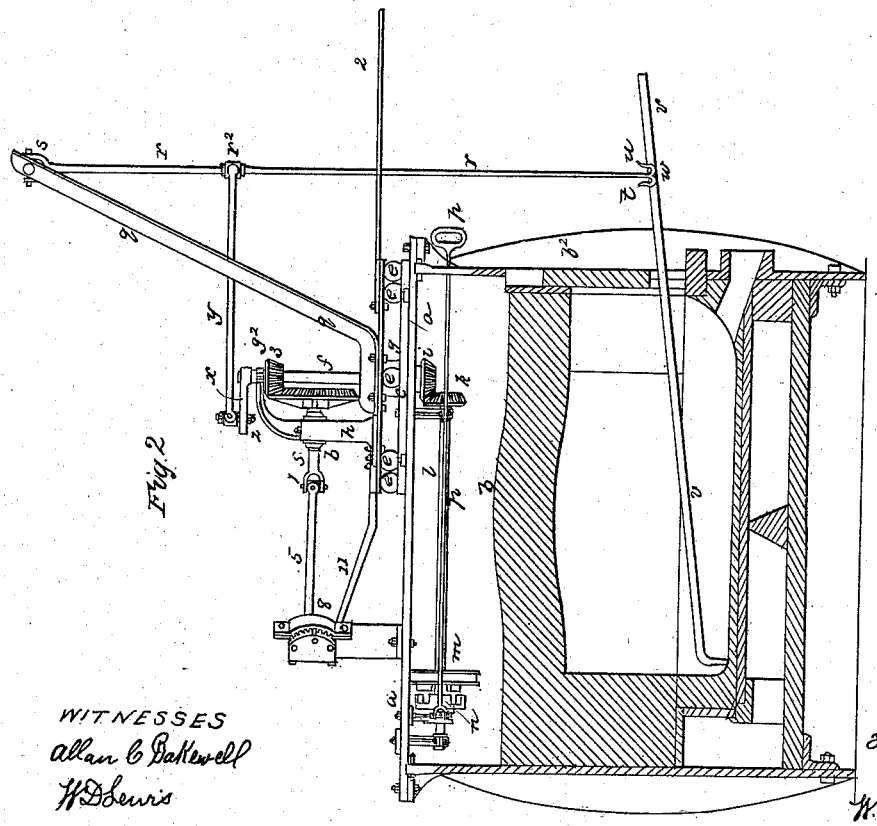


Fig. 2



WITNESSES
Allan C Bakewell
W D Lewis

INVENTOR
John Griffiths
by his attorney
W. Bakewell

UNITED STATES PATENT OFFICE.

JOHN GRIFFITHS, OF LITCHURCH, COUNTY OF DERBY, ENGLAND, ASSIGNOR TO HIMSELF AND Z. S. DURFEE, OF PITTSBURG, PENNSYLVANIA.

IMPROVED APPARATUS FOR PUDDLING IRON.

Specification forming part of Letters Patent No. **48,485**, dated June 27, 1865.

To all whom it may concern:

Be it known that I, JOHN GRIFFITHS, of Litchurch, in the county of Derby, in that part of the United Kingdom of Great Britain and Ireland called England, have invented a new and useful Machine for Puddling Iron and Steel, which may also be used for other purposes; and I do hereby declare that the following is a full, clear, and exact description of the construction and operation of the same, reference being had to the annexed drawings, making part of this specification, in which—

Figure 1 is a front elevation of the machine as placed upon a puddling-furnace; Fig. 2, a side elevation of the same, and Fig. 3 a plan view.

In the different illustrations the same letters and figures of reference indicate the same parts of the machine.

c is a circular bed-plate, provided with ears through which it is fastened to the furnace. *d* is another circular plate, rotating on balls rolling in a groove in *c*, and bearing the jib *q*, to which the puddling-rabble is suspended by the hanger *r*. This plate *d* also carries the standard *h*, which supports the main gearing of the machine.

The shaft *f* has its lower bearing at *g* in the plate *c*, its upper at g^2 in the curved end of the standard *h*, and it also works in a collar or journal on the plate *d*, so that while the plate *d* carries with it in its partial rotation the standard *h*, the proper relative position of the different parts of the machinery attached thereto with the shaft *f* is nevertheless always maintained. In fact *f* is both the main driving-shaft and a pillar round which the machinery swings in communicating the necessary traversing motion to the rabble. The shaft *f* is driven by the beveled gear *i* and *k* communicating with the motive power by the shaft *l*. The pulley *m* works loosely on the shaft *l*, and the machine is thrown in and out of gear by the clutch *n* in the usual way.

The shaft *f* might be connected directly to the shaft of a small rotary engine, or driven by any other means; but when the power for the machine is taken from a line of shafting the arrangement here shown is the most convenient.

x is a crank attached to the upper end of the shaft *f*, and giving motion to the hanger *r* by the connecting-rod *y*. The connecting-rod *y* is joined to both the crank *x* and the hanger *r* by universal joints, and as the connection *s* of the hanger with the jib *q* is of the same free character the motion communicated by the crank to the hanger, and through it to the puddling-rabble, though mainly reciprocatory, or from the front to the back of the furnace, is quite complex in its character, and resembles the movement produced by hand. The reciprocatory or back-and-forth motion of the rabble being thus obtained, it now remains to show the traversing motion from side to side of the furnace, so as to bring the rabble to bear on all parts of the metal and thoroughly stir it.

From the shaft *f* the beveled-gear wheel 3, through the corresponding wheel, 4, drives the shaft 5, on the end of which is a pinion working in the hollow endless rack 8, which is fastened firmly to the framing by which the machine is attached to the furnace. The shaft 5 has its chief support in the bearing 6, which is consequently made of extra length, and it is provided with the universal joint 7, so that its pinion may traverse round the curves at either end of the rack 8. This rack is curved horizontally to an arc described with the distance from the shaft *f* as a radius, and it has a guide-plate, 10, between the upper and lower rows of teeth, whereby the pinion of the shaft 5 is kept constantly in gear. The bar 11 is fastened at one end firmly to the plate *d*, but at the other it is forked and incloses the shaft 5, so that while the shaft is free to move vertically in traversing the ends of the rack its lateral motion from side to side produced by the pinion following the rack is communicated by the bar 11 to the bed-plate *d*, and thence through the jib *q* and hanger *r* to the rabble. The end of the jib *q*, and consequently the forked hanger *r*, carrying the rabble, thus makes a sweep from side to side in front of the furnace of precisely the same character as the curve of the rack 8, and by making this curve longer or shorter the rabble can be made to travel to a greater or less extent in the furnace.

In practice it is found unnecessary to vary the curve of the rack, as a length somewhat less than a quarter-circle fulfills all the requirements.

The bow 2 has a shape and size correspond-

ing to the manner and extent in which it may be desirable to control the movements of the hanger, and consequently the rabble, and by means of its variations the rabble may be made to work round the sides of a furnace-bottom which is quite irregular in its form. This bow 2 is not, however, absolutely necessary in the application of the machine to puddling-furnaces of the more common form.

It will be seen that the shaft *f*, around which, as before shown, all the movements of the machine are made, does not stand directly over the front of the furnace, and consequently, as the working-hole is small, when the jib *q* approaches each extremity of the curve through which it sweeps the rabble brings up against the sides of the working-hole, thus producing a leverage in its operation. At the same time that this leverage occurs—that is, when the jib is at each end of the sweep—the pinion on the shaft 5 is working up or down the curved ends of the rack 8, and as the lateral motion of the shaft, and consequently the partial rotation of the plate *d* and sweep of the jib *q*, is thereby for the time being nearly or quite suspended, during this interval the crank *x* gives the rabble a few back-and-forth strokes in nearly the same position in the furnace, and as at this time the rabble is working upon the jambs of the furnace the leverage before mentioned, combined with the repeated reciprocating strokes, and aided by the suppleness of the joints of the rabble, causes it to sweep the jambs completely clean of any particles of metal which would otherwise adhere and which could not be reached by a rigidly-operating tool.

The end of the hanger *r* has a double fork, which is used as follows: When the fettling in the furnace is new the rabble is worked in the fork *u*. After the fettling is considerably worn it becomes necessary to increase the length of the stroke of the rabble, which is done by altering the position of the crank-pin *z* in its slot in *x;* but as the front of the furnace has no fettling, and is consequently unaltered, it is only desirable to compensate for the wear at the back, and then the rabble is worked in the fork *t*. Thus while by the increase of the length of stroke the wear at the back is compensated for, by shifting the rabble forward it is still made to traverse to its original position in the front of the furnace.

Instead of the double fork on the hanger double pins in the rabble, at suitable distance apart, will, in conjunction with a single fork on the hanger, accomplish the purposes last described.

The machine can be attached to any ordinary furnace; but when new furnaces are being made I should recommend their being made larger than usual, and that the bottom be at least eleven inches deep.

Having thus described my improved apparatus and its operation, I wish it to be understood that I do not claim the use of machinery in puddling iron or steel, nor all the details of my said apparatus, as some of them are well known devices. Neither, on the contrary, do I limit myself to the precise arrangement of the parts I have herein shown; but

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

1. Attaching the jib *q*, which carries the hanger *r*, through the intervention of which motion is communicated from the crank *x* to the rabble or stirring-tool *v*, in puddling and other operations, to a base or plate, *d*, which is movable automatically in a horizontal plane, substantially as and for the purposes hereinbefore described.

2. Giving a reciprocating lateral motion in an arc of a circle to the jib *q*, and consequently to the hanger *r*, through the partial rotation of the movable plate *d*, produced by means of the curved endless rack 8 and the jointed shaft 5, having on its end a pinion working in said rack, and which carries with it the forked lever 11, substantially as hereinbefore shown.

3. Controlling the movement of the hanger and rabble by means of a bow, 2, proportioned in shape and dimensions to the character and extent of the furnace-bottom in which the rabble is to work.

4. Providing the free end of the hanger *r*, to which the rabble is attached, with a double fork, or the rabble with double pins, at suitable distance apart to compensate for the irregular enlargement of the furnace-bottom.

5. Placing the axis around which all the movements of the apparatus are made so far back of the line of the working-hole as to produce a leverage in the action of the rabble at certain stages of the operations, in order to clean the jambs of the furnace.

6. Communicating the peculiar stirring motion to a stirring-tool or rabble in puddling or other operations by loosely attaching the free end of the tool to a hanging rod, to the point of suspension of which a reciprocating motion is given from side to side, while a simultaneous but more rapid motion is given to the hanging rod or tool-holder to and fro in the direction of the tool by means of the combination of devices for that purpose, constructed and arranged substantially as hereinbefore described.

In testimony whereof I have hereunto set my hand.

JOHN GRIFFITHS.

Witnesses:
EDWARD GREEWAY,
A. GAMBLE,
Clerk to Mr. Leech, Solicitor, Derby.