No. 784,004. PATENTED FEB. 28, 1905.

W. KENT.

HOT SYSTEM ROLLING MILL.

APPLICATION FILED DEC. 22, 1902.

Fig. 1

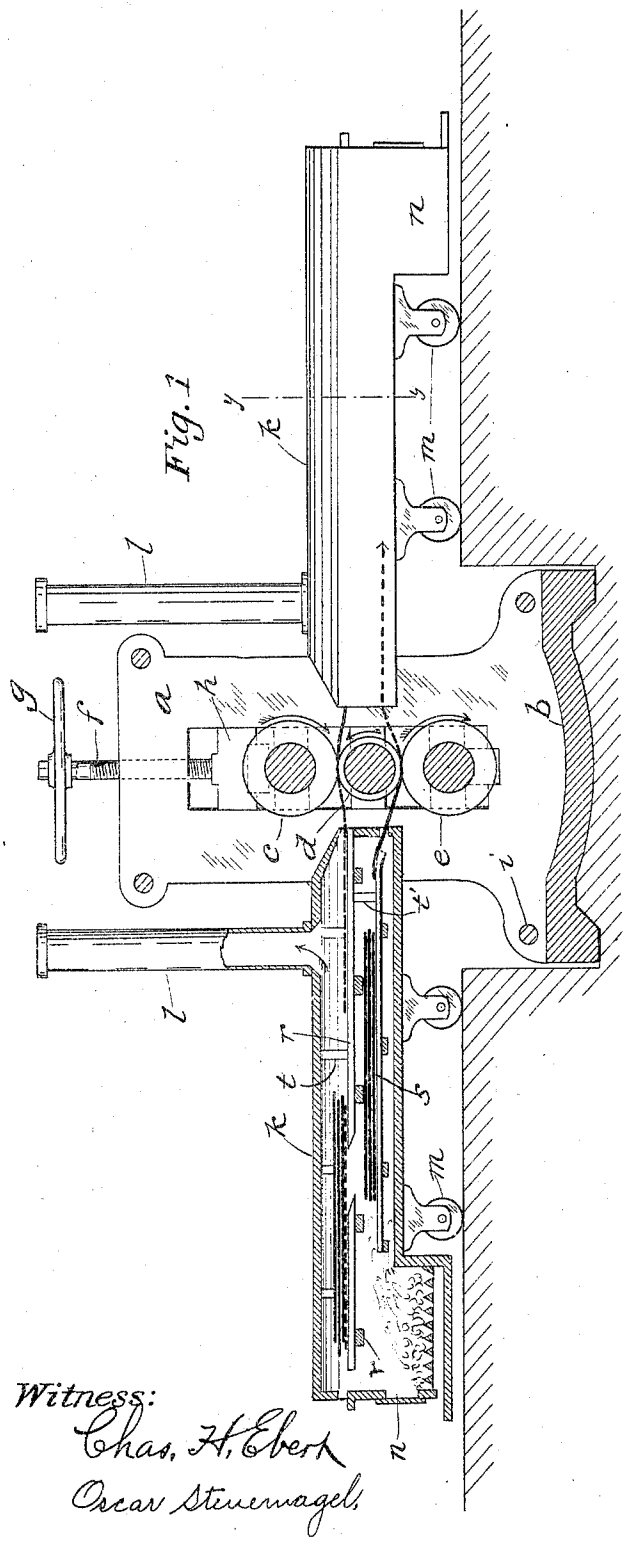


Fig. 3

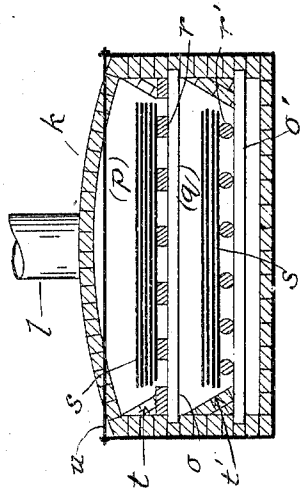
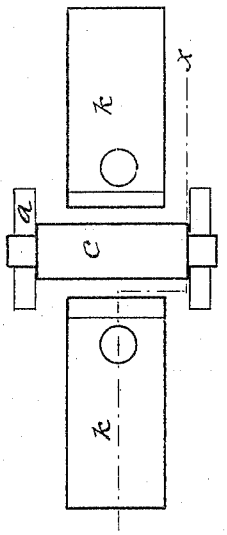


Fig. 2



Witness:
Chas. H. Ebert
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Inventor,
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Atty.

No. 784,004. Patented February 28, 1905.

UNITED STATES PATENT OFFICE.

WILLIAM KENT, OF YOUNGSTOWN, OHIO, ASSIGNOR OF ONE-HALF TO NOAH KENT, OF STRUTHERS, OHIO.

HOT-SYSTEM ROLLING-MILL.

SPECIFICATION forming part of Letters Patent No. 784,004, dated February 28, 1905.

Application filed December 22, 1902. Serial No. 136,146.

To all whom it may concern:

Be it known that I, WILLIAM KENT, a citizen of the United States, residing at Youngstown, in the State of Ohio, have invented a certain new and useful Hot-System Rolling-Mill, of which the following is a specification.

My invention relates to the iron-working art, and particularly to the art of rolling thin sheets of iron, though it is as applicable to the rolling of any other metal.

The objects of the invention are to provide means for keeping the sheets hot during the rolling process in order that they may be rolled many times and rolled very thin and in single sheets when desired and to provide means by which sheets may be rolled continuously and means for rolling two sheets at the same time without doubling. These objects, as well as other advantages which will hereinafter appear, I attain by the construction and arrangement which I illustrate in preferred form in the accompanying drawings, forming part hereof, and in which—

Figure 1 is a side elevation and partial section of the rolls and the portable furnaces I use, the section being taken on the line *x x* indicated in Fig. 2. Fig. 2 is a diagrammatic plan of the apparatus, showing the position of the furnaces relative to the rolls and the section-line of Fig. 1. Fig. 3 is a vertical section through a form of furnace which I prefer to use, showing the position of the sheets being heated therein.

In the present method of rolling thin iron sheets it is necessary to "double" or place together first two, then four, then eight sheets and run them through the mill, because otherwise as the sheets get thin they lose their heat so rapidly that they are not workable. It is frequently necessary to reheat the whole lot, and in this practice, of course, all the heat still in the metal at its last turn through the rolls is lost altogether. So far as I am aware it has not been possible to roll very thin sheets without this doubling process, and the result is that the surfaces of the sheets are not smooth unless a subsequent process of cold-rolling is gone through with for this specific purpose. I have overcome all these difficulties and others by the provision of two portable furnaces introduced close up at each side of a set of three-high rolls, so that as a sheet comes through the rolls it is at once run into a furnace and kept hot and may be run back through the upper rolls when desired. The construction of the three-high rolls and their mounting is as ordinary. The side frames *a* are joined by the tie-rods *i* and the base *b*, and the rolls *c d e* are journaled in the brass blocks in a vertical slot and pressed together at the required height by the block *h* and the screw *f* and wheel *g*, as is usual.

I provide two portable furnaces *k*, which are mounted on casters or wheels *m* and are designed to have a projecting nose to approach close to the rolls. There is a fire-box *n* and a stack *l*. The interior has two spaces or heating-chambers *p* and *q*, separated by bars *r r'* on cross-bars *o*, so that the flames may surround the sheets, if desired, and the front end of the furnace has two slits for the egress of the hot sheets, as shown. The top platform of the chamber may have its supporting-bars separated at one point, so that the sheets may be slid from the upper to the lower chamber, if desired. Also a second slit may be provided just under the front ends of the bars, so that sheets may be introduced from the front into either chamber. The apparatus is adapted to use either thin sheets to begin with or the heavy bars for the first sheet-rolling. In the preferred form of the furnace, Fig. 3, it may be built entirely of fire-brick surrounded by a metal casing held by tie-rods *u*. *o o'* are the cross-bars which support the platform-bars *r r'*, which latter may be either round rods or pipe or solid rectangular bars, as shown. At the sides of the platforms I provide the sloping ribs *t t'* in order to right up the sheets as they come in the front slits in case they come from the rolls out of alinement, as often happens from lack of homogeneity in the material.

The sheets having been heated in the ordinary furnace, the portable furnaces are loaded by introducing the sheets through the slit shown at the back and a pile made in each

chamber, entering the lower chamber through the slit at the middle of the upper platform. The two furnaces *k* then being brought close up to the rolls, a sheet may be run out under the middle roll and guided into the lower chamber of the opposite furnace *k*. It may be immediately run back over the middle roll or may be left in the furnace longer in order to heat again as much as is desired by the practice. A slot may be provided in the furnace for running the incoming sheet up onto the upper platform when desired, or a slot under the platform will allow admission directly to the lower chamber. Any desired way of handling the sheets may of course be practiced; but I prefer generally to run one sheet through the upper while at the same time another is being run through the lower pass between the rolls, and one operator can shift the sheet each time from the upper to the lower chamber, and vice versa, by means of a tool introduced at the rear, for example. By this operation much thinner sheets can be made, the rolls having two sheets in at once. Also when sheets are thus run through singly the surface is made much smoother.

It will be seen that by the use of this apparatus the sheet is practically all the time in one or the other of the furnaces, and a great saving of heat is thus attained, while the furnaces may be at the same time as the rolling used to anneal the sheets.

By this method of procedure I avoid the necessity of taking the pile of sheets back to the stationary furnaces, avoid their ever geting cold, avoid the doubling process, can roll very thin sheets, can roll each sheet separately, can anneal at pleasure without reheating, can save the employment of at least three men, double the output, improve the quality of rolling, and have rendered the loss of heat by carrying about in the cold air practically *nil*. Many other advantages will readily occur to those skilled in the use of rolling-mills.

The invention resides, broadly, in means for carrying out the method of procedure, and I do not wish to be understood as limiting it to the particular means shown. It is evident, for instance, that I might employ all automatic means for handling the sheets and guiding them into the rolls and the furnaces and may employ any form of furnace, and the invention is not limited by the use of a three-high rolling-mill, but can be used with the double roll; but,

Having thus described my invention and its use, what I claim, and desire to secure by Letters Patent, is the following:

1. The combination of a set of rolls and two portable furnaces, one on each side thereof, having each two openings, whereby to feed the rolls from one, and at the same time take from the rolls into the other, said furnaces having means to retain and heat the metal in the intervals between passages through the rolls, substantially as described.

2. The combination with a set of three-high rolls of two portable furnaces having openings for receiving and simultaneously delivering sheets to and from said rolls immediately and provided with means for retaining a pile and heating the sheets as they enter said furnaces.

3. The combination with a set of rolls, of a portable furnace having two heating-chambers, one having a slit to receive, and the other a slit to deliver sheets to said rolls, and a communicating opening between the said chambers.

4. The combination with a three-high rolling-mill of a pair of portable furnaces having heating means and provided with two slits in their front ends and designed to approach closely and receive and deliver sheets directly to and from the two passes in said rolls alternately.

5. The combination with a three-high rolling-mill of a pair of portable furnaces, each furnace having means for heating and means for righting up the sheets in position as they come from said rolls and openings for receiving sheets from one pass of the rolls and delivering to the other pass.

6. In a portable furnace, in combination with a three-high rolling-mill, two separate chambers with means for heating the same and two entry-slits in the end of the furnace, for the purpose specified.

7. The combination with a rolling-mill, of portable furnace for receiving sheets directly from a set of rolls having slanting side guides placed opposite to a receiving-platform, whereby the sheets as they enter may be automatically adjusted in line with the rolls.

In testimony whereof I have hereunder signed my name in the presence of the two subscribed witnesses.

WILLIAM KENT.

Witnesses:
F. W. H. CLAY,
CHAS. H. EBERT.