(No Model.)

C. L. TAYLOR & J. SKEWIS.

PROCESS OF ROLLING BEAMS.

No. 318,220. Patented May 19, 1885.

Fig 1.

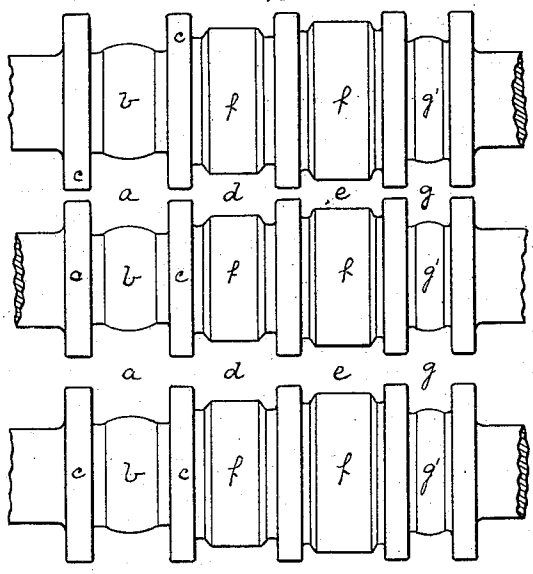

Fig 2.

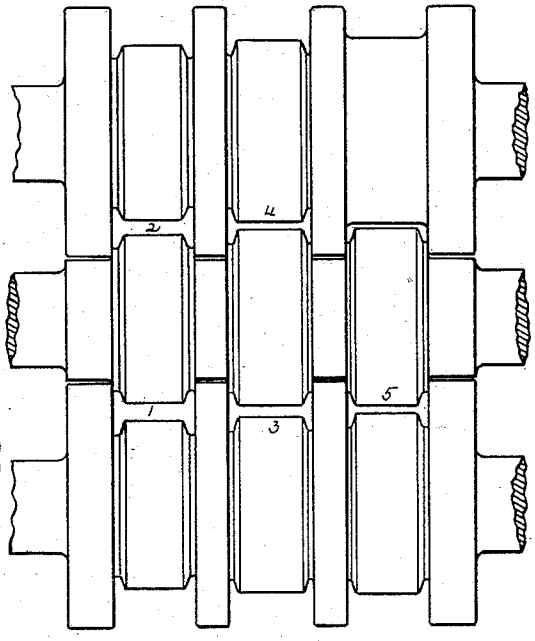

Fig 3.

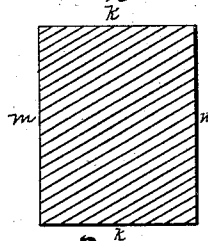

Fig 4.

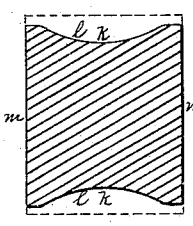

Fig 5.

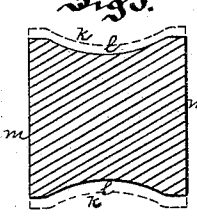

Fig 6.

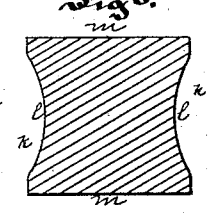

Fig 7.

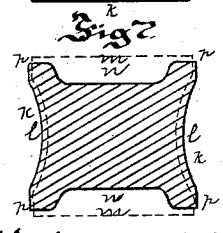

Fig 8.

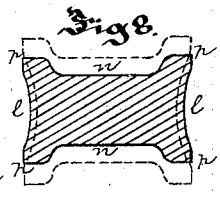

Fig 9.

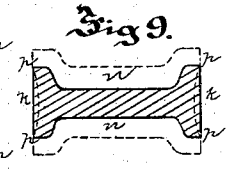

Fig 10.

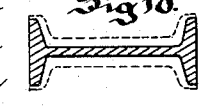

Fig 11.

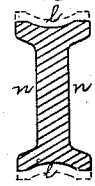

Fig 12.

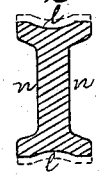

Fig 13.

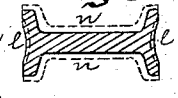

Fig 14.

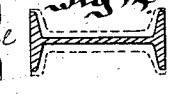

Fig 15.

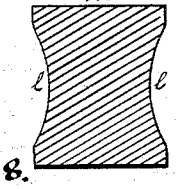

Fig 16.

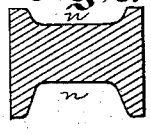

Fig 17.

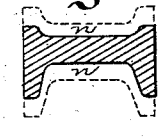

Fig 18.

Witnesses.

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Joseph Skewis

By James P. Kay

Attorney

UNITED STATES PATENT OFFICE.

CHARLES L. TAYLOR, OF SWISSVALE, AND JOSEPH SKEWIS, OF PITTSBURG, PENNSYLVANIA.

PROCESS OF ROLLING BEAMS.

SPECIFICATION forming part of Letters Patent No. 318,220, dated May 19, 1885.

Application filed September 30, 1884. (No model.)

To all whom it may concern:

Be it known that we, CHARLES L. TAYLOR, of Swissvale, and JOSEPH SKEWIS, of Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Rolling Beams; and we do hereby declare the following to be a full, clear, and exact description thereof.

Our invention relates to the manufacture of wrought-metal beams, these beams being largely employed for structural purposes, and being generally termed "I-beams." These beams are generally rolled from rectangular piles, ingots, or blooms, the entire reduction or "work" coming on the sides of the pile or ingot, and as the center forming the web is reduced and elongated much more than the edges forming the flanges of the beam, which are not reduced proportionately, they are consequently stretched by the center or web, and the beam is thrown on a strain. This stretching of the flange portions without sufficiently working or reducing them often causes the cracking or breaking of the edges of the beams, and so renders them imperfect and unfit for use, as where they sustain heavy weight or strain these cracks are liable to open and leave the web unsupported. In making these beams from ingots it is necessary to reheat the metal twice during its reduction, as without these reheatings the flange portion would become so cold and stiff as to be very liable to crack and open during reduction in the rolls.

The object of our invention is to overcome these objections in the manufacture of these beams.

It consists, essentially, in rolling these beams by first reducing and concaving the ingot or pile across the edges or flange ends thereof, and then reducing and concaving it across the sides to form the web and perfect the flanges, the metal forming the flanges being first worked and elongated and the flanges partially formed, and the center or web being next worked or elongated, and consequently as both flange and web portions receive approximately the same amount of work and elongation the beam is formed, substantially, without strain, and all liability to cracking or breaking of the edges of the flanges is overcome.

To enable others skilled in the art to make and use our invention, we will describe the same more fully, referring to the accompanying drawings, in which—

Figure 1 is an elevation of the rolls employed for rolling the beams. Fig. 2 is an elevation of the finishing-mill for rolling beams. Figs. 3 to 10 are sectional views of the ingot or pile, showing its gradual reduction to the finished beam. Figs. 11 to 14 are sectional views illustrating the rolling of beams of small diameter, and Figs. 15 to 18 are sectional views illustrating the rolling of channel-beams.

Like letters of reference indicate like parts in each.

The ingots or piles can be rolled and reduced either in a two-high reversible mill or a three-high mill with or without movable rolls. The three-high mill with adjustable middle roll shown in the drawings illustrates the most approved rolls for the purpose, the pass or passes *a* being employed to reduce the ingot or pile on the edges or across the faces of the flange portions, the convex faces *b* at the same time concaving the faces of the flange portions, and the collars *c* holding the ingot or pile in position. The passes *d e* are employed to reduce the ingot or pile across the sides and concave the sides to form the initial depressions in rolling the web of the beam, these initial depressions being formed by the enlargements *f f*. The pass or passes *g* having the convex faces *g'* are employed where it is desired to form a beam of small width or diameter, the beam being first edge-rolled in the passes *a*, then given its initial shape in the passes *d e*, and then edge-rolled to further concave the edges or flange portions and to reduce it in width according to the size of beam required.

The rolls shown in Fig. 2 illustrates the ordinary mill for rolling or finishing the beam, the beam brought approximately to shape by our improved rolls being furnished in said rolls.

In carrying on our improved method of rolling these beams the ingot or pile employed is

of greater width than the width of the finished beam—for example, the ingot or pile for a fifteen-inch beam being generally about eighteen inches in width and about fourteen inches in thickness, as shown in Fig. 3, according to the required elongation or work to be put upon it. This beam is first entered on its edge to the pass or passes *a* and gradually reduced, the elongation or work coming on the edges or flange portions *k*, and these edges being concaved, as at *l*, by the convex faces *b* of the rolls.

In forming a fifteen-inch beam the ingot or pile is reduced until slightly less in width than the width of the finished beam, generally about fourteen and one-half inches, as shown in Fig. 5, to allow for spreading. The ingot with the concave edges or flange portions is then given a quarter-turn and entered to the pass *d* in the position shown in Fig. 6, and is gradually reduced in the passes *d* and *e*, the elongation or work come on the side faces, *m*, of the ingot or pile, and the central portion of the ingot or pile being reduced by the enlargements *f f* of the rolls to form the initial depressions *n* for the web of the beam. As the metal is rolled in these passes, the pressure on the side faces forces out the metal in the center toward the edges *k*, and so gradually fills out the concavities *l*, and at the same time as the concavities are filled out by the same pressure the corner portions *p* are spread out to fill the grooves of the rolls, the previous concaving of the flange faces thus serving to assist in the formation of the flanges of the beam, and consequently on the subsequent reduction to the beam these corners forming the flanges receiving greater reduction and work or elongation. As the metal is further reduced the cavities *l* are filled entirely, and the blank so formed is then rolled to the finished beam shown in Fig. 10 through the ordinary mill, the passes from 1 to 5 in Fig. 2 being suitable for the purpose. As the edge portions of the ingot or pile are first elongated, and when it is rolled on the side faces, the corners *p* are spread, as before described, to assist in raising the corners to form the flanges, the elongation of the central portion forming the web is compensated by the previous elongation and concaving of the edge faces and the spreading of the corners, and as the flange portions of the beam have received as much, or nearly as much, work or elongation as the web portion, strain in the finished beam is prevented or reduced to a minimum, and the formation of cracks or seams along the edges of the flanges is entirely overcome.

Where it is desired to form beams of less width to overcome the necessity of special roughing-rolls for each width of beam, we employ the pass or passes *g*, and after the ingot or pile shown in Fig. 3 is gradually reduced in the manner described to about the form shown in Fig. 9, while the central portion is still of sufficient thickness to sustain end-pressure without buckling, we edge-roll it in these passes, as shown in Figs. 11 and 12, and so reduce it to the proper width for rolling to the desired width of beam, at the same time again concaving its edge faces to assist in further spreading the flanges, and it can then be rolled to beam, as shown in Fig. 14, in a mill having the proper passes. As the metal in the reduction from the ingot or pile to the finished beam receives substantially the same work or reduction throughout, it is found that it can be reduced without reheating, or, where it is subsequently edge-rolled to form a beam of smaller size, with but one reheating, and consequently we save from one to two reheatings in the manufacture of the beams.

In forming channel-beams the ingot or pile of the proper width and thickness is edge-rolled, as above described, and is then rolled to shape by pressure on its side faces, the ingot or pile being but slightly concaved on one side to assist in pressing out the flanges on the other side, as illustrated in Figs. 15 and 18, and the same advantages being obtained in forming the flanges on one side of the finished beam.

What we claim as our invention, and desire to secure by Letters Patent, is—

The method herein described of rolling beams, consisting in first reducing and concaving the ingot or pile across the edges or flange ends thereof and then reducing and concaving it across the sides to form the web and raise the flanges.

In testimony whereof we, the said CHARLES L. TAYLOR and JOSEPH SKEWIS, have hereunto set our hands.

CHARLES L. TAYLOR.
JOSEPH SKEWIS.

Witnesses:
JAMES I. KAY,
JAS. U. COOKE.