No. 860,896. PATENTED JULY 23, 1907.

T. S. BLAIR, Jr.

ROLLING MILL.

APPLICATION FILED MAR. 16, 1907.

2 SHEETS—SHEET 1.

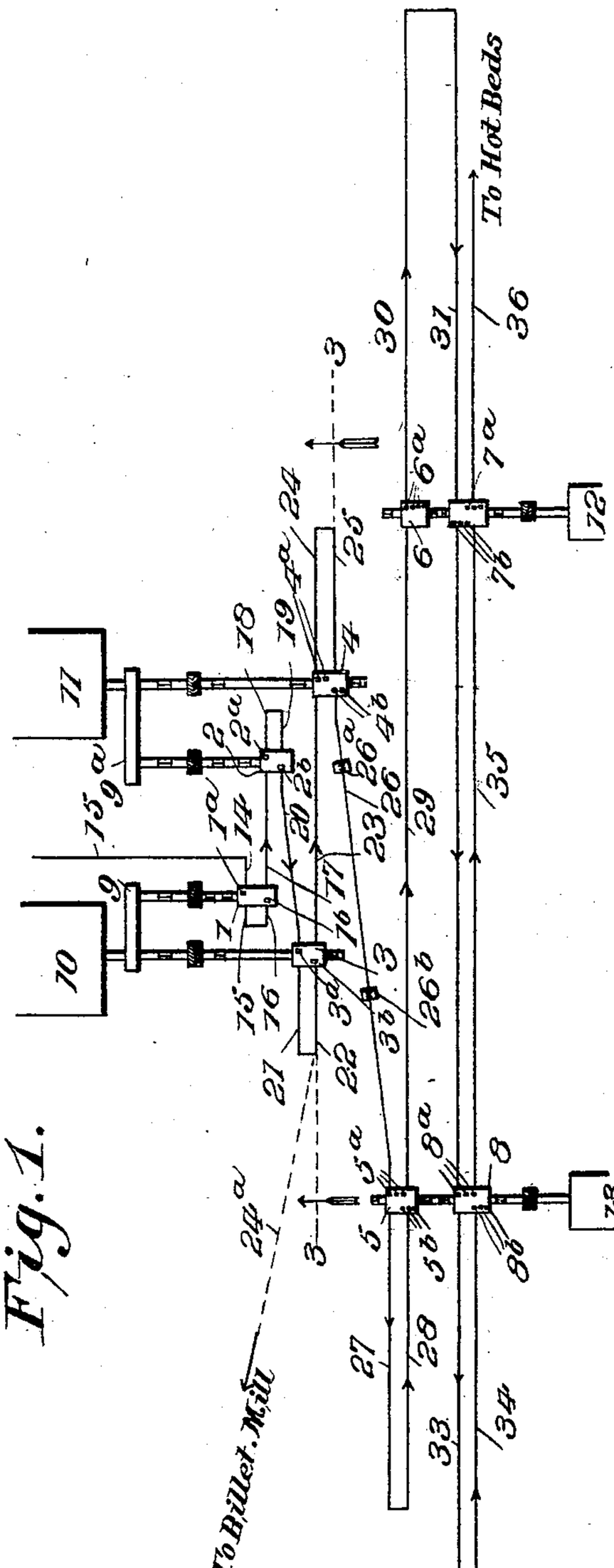

Fig. 1.

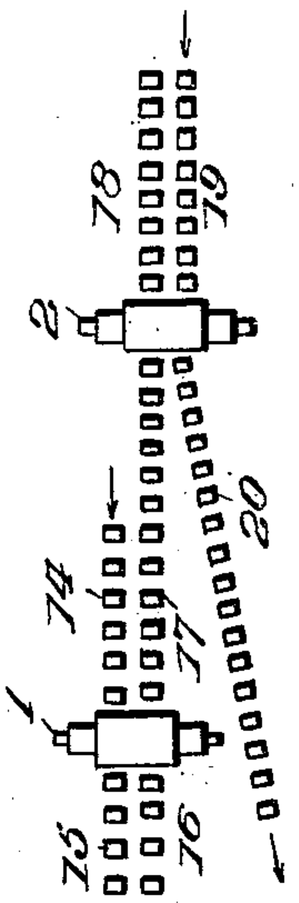

Fig. 2.

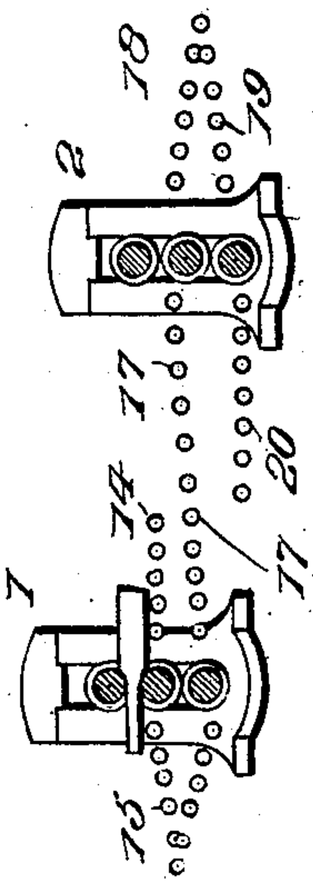

Fig. 3.

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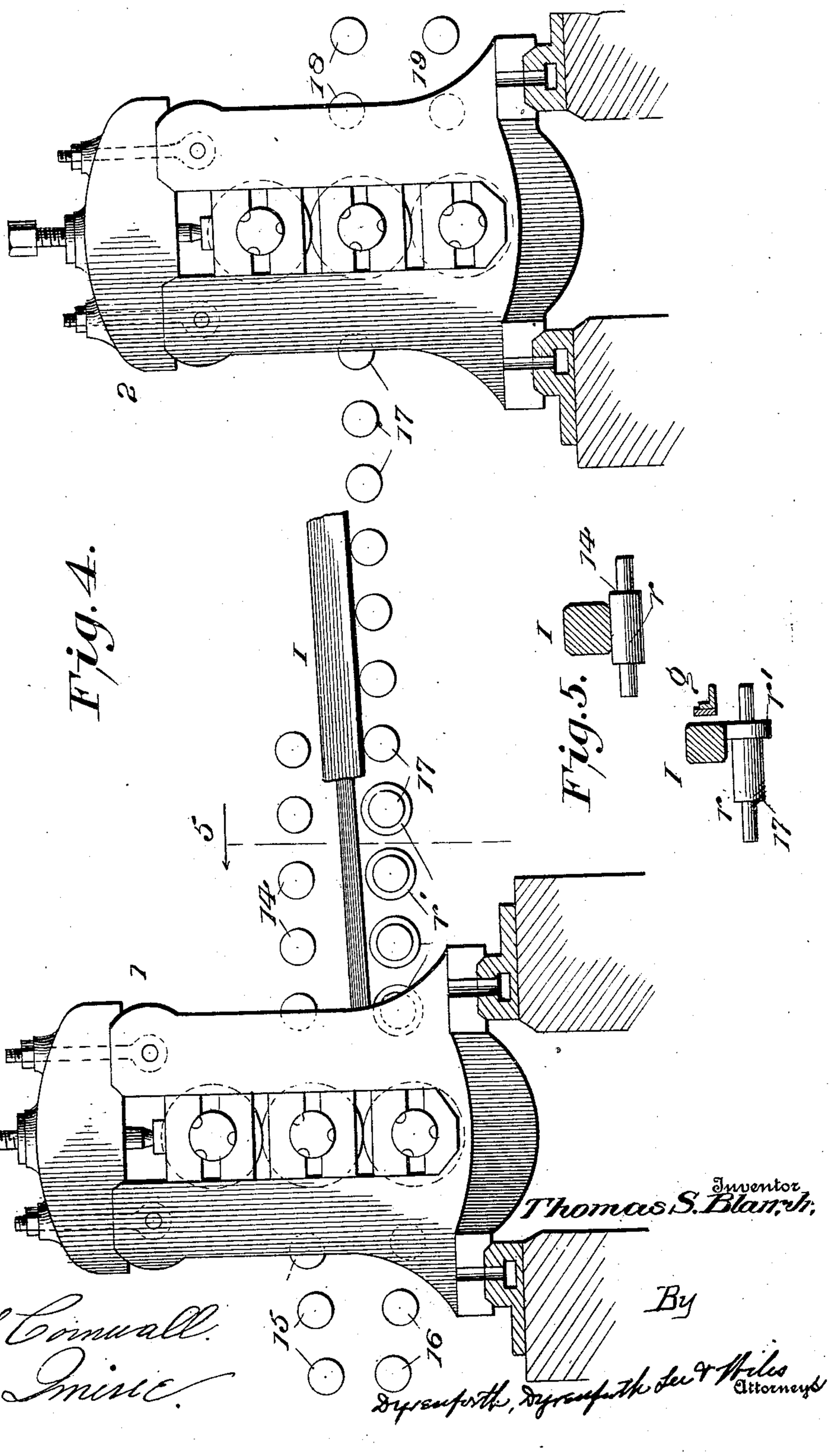

Fig. 4.

Fig. 5.

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UNITED STATES PATENT OFFICE.

THOMAS S. BLAIR, JR., OF ELMHURST, ILLINOIS.

ROLLING-MILL.

No. 860,896. Specification of Letters Patent. Patented July 23, 1907.

Application filed March 16, 1907. Serial No. 362,762.

To all whom it may concern:

Be it known that I, THOMAS S. BLAIR, JR., a citizen of the United States, residing at Elmhurst, in the county of Dupage and State of Illinois, have invented certain new and useful Improvements in Rolling-Mills, of which the following is a specification.

My invention relates to certain new and useful improvements in rolling-mills, and the object of my invention is to produce a rolling-mill which will have a much greater capacity than any mill now known, and one in which the billets, blooms or blanks to be rolled are passed through the mill simultaneously and continuously.

In all rolling mills heretofore known to me in which the roll stands comprise three or more rollers and in which the piece operated on is supported between the roll stands it has been necessary to use vertically movable and reversibly acting feed-tables, "manipulators" and a "transfer" for each roll-stand, involving, for operating them, cumbersome hydraulic electric or pneumatic mechanism, which is expensive both to install and maintain.

A still more important objection is, that the operation of rolling is essentially slow, owing to the fact that the work, in undergoing rolling, must be fed back and forth through a plurality of passes in each, or in each of different roll-stands in the series thereof employed, before another piece of work can be subjected to the action of the same stand. This is because the tables on opposite sides of a roll-stand have to be brought to the level of each pass, the one for feeding into it from one side and the other for receiving the work as it emerges from that pass on the opposite side, whence the receiving-table is moved, with the work upon it, to the level of a second pass, through which the work is fed by the reverse action of the table in the opposite direction and emerges upon the first table, which has meantime been moved to the level of the second pass to receive therefrom the work. Obviously, therefore, the vertically movable feeding tables preclude the use, at one time, of more than one roll stand on each piece of work until the entire rolling operation of that stand is completed preparatory to transferring the work, for its further reduction, to the next roll-stand, where it is acted upon in the same way, to prepare it for further reduction in another roll-stand; and so on to the end. By this precluding the feeding of ingots or blooms in continuous succession to the first roll-stand, delay ensues which materially diminishes the capacity of the mill; and, moreover, the interruption in feeding is liable, particularly when stoppages occur by reason of disorganization of the cumbersome machinery referred to, to expose the work unduly to the cooling influence of the surrounding atmosphere and necessitate reheating it, in transit, to adapt it to be further rolled.

The primary object of my invention its to avoid this delay by enabling the work to be fed through the entire system of roll-stands, and back and forth through successive passes in stands, in uninterrupted or continuous succession; and my invention consists in the mechanism I have devised for accomplishing this and other objects.

Preferably I employ an ordinary roll-stand equipment used in rolling-mills, but peculiarly arranged relative to each other and with stationary, non-reversible feed-tables which, for performing the work to the best advantage, should be modified in particulars of construction hereinafter explained.

Referring to the accompanying drawings—Figure 1 is a plan diagram of a rolling-mill system showing the roll-stands and tables relatively arranged in accordance with the preferred form of my invention. Fig. 2 is a similar, enlarged view showing the first two roll-stands and the tables that coöperate with them. Fig. 3 is a diagrammatic section taken at line 3 on Fig. 1, viewed in the direction of the arrow and enlarged. Fig. 4 is an enlarged view in side elevation, partly sectional, of the two stands and the tables represented in Fig. 3; and Fig. 5, a section taken at the line 5 on Fig. 4 and viewed in the direction of the arrow.

The representation of the machinery employed is, for the most part, diagrammatic to avoid unnecessarily multiplying the drawings to illustrate details, the mechanism, except as to the feature presented in Fig. 5 and as to the stationary roller-tables hereinafter described, being the same as that with which it is common to equip rolling-mills, and therefore familiar to those skilled in the art to which my invention relates; so that this well-known mechanism does not require further illustration, nor description as to details of construction.

The first or initial roll-stand is represented at 1 as a three-high-roll stand, with one groove in the pass between the upper and middle rolls, indicated at 1^a, and one groove in the pass between the middle and lower rolls, indicated at 1^b. The second roll-stand, represented at 2, is similar to the stand 1 and is in line with but somewhat offset from the latter to leave its upper-pass groove 2^a in the line and bring the lower-pass groove 2^b beyond it for feeding therefrom to the upper-pass groove 3^a of a third roll-stand 3, like the stands 1 and 2 and located adjacent to the stand 1, with its lower-pass groove 3^b in position to feed toward the upper pass of a fourth roll-stand 4, placed adjacent to the stand 2 and like the others, but represented as containing two

grooves 4^a in its upper pass and two grooves 4^b in its lower pass. A fifth roll-stand, indicated at 5 in Fig. 1, and like the preceding stands except that it is represented with three grooves 5^a in its upper pass three grooves 5^b in its lower pass, is placed adjacent to the stand 3 in line with a sixth roll-stand, 6, which may be a two-high-roll stand with four grooves 6^a in its pass, as indicated in Fig. 1. A seventh roll-stand, represented at 7 in Fig. 1, having three rolls, with one groove 7^a in its upper pass and two grooves 7^b in its lower pass, is located adjacent to the stand 6, and is shown to be endwise coincident with the latter. An eighth roll-stand represented at 8 in Fig. 1, like and located adjacent to the stand 5, is shown to be endwise coincident with the latter, and may be provided with two grooves 8^a in its upper pass, and three grooves 8^b in its lower pass, as indicated. The relative positioning of the roll-stands shown in Fig. 1 enables the rolls of the stand 1 to be connected by suitable gearing, indicated at 9, with those of the stand 3 for driving the rolls of both stands by the same engine, represented at 10; the rolls of both stands 2 and 4 to be connected by suitable gearing, indicated at 9^a, to be driven by one engine, 11; the rolls of both stands 6 and 7 to be driven by one engine, 12; and those of both stands 5 and 8 to be driven by one engine, 13; The ingot to be rolled takes the following-described course, indicated by arrows on Fig. 1: A stationary roll table indicated at 14, and of the ordinary construction, leads to the upper pass of the roll-stand 1 and is supplied with ingots, as usual, along the larry-track, indicated at 15 in Fig. 1.

On the opposite side of the roll stands I provide a supporting table having a supporting section 15 in line with the pass groove 1^a, and a second supporting section 16 adapted to feed the piece into the pass groove 1^b. As shown, these sections are formed of rollers, and are arranged so that a piece can be transferred from a position on the section 15 to a position on section 16. A table 17 takes and leads the work to the upper pass-groove 2^a of the stand 2. This last-named table has each of several of its rollers nearest the stand 1 provided on one end with a circular flange or collar r^1 reaching to the line of feed through the pass-groove 1^b, for the ingot-turning purpose hereinafter explained. As the work emerges from the pass-groove 1^b, it encounters, near one edge-portion, and moves along the periphery of the narrow collars r^1 in its path until it fully clears and therefore becomes released from the bite of the rolls forming that pass; whereupon it turns, by gravity, sidewise with its adjacent side upon the lower surfaces of the rollers r. Each, or any desired number, of the succeeding tables, hereinafter mentioned, may be provided, near their delivery-ends, like the table 17, with a set of collars r^1 to produce automatically, in the manner described, this required turning between roll-stands, of the work being rolled.

On the other side of the stand is provided a stationary roller table composed of a receiving section 18 in line with the upper pass groove 2^a, and a feeding section 19 in line with the lower pass groove 2^b. From the lower pass groove 2^b another roller table 20 leads to the upper pass groove 3^a of the roll stand 3, the work emerging upon the receiving section 21 of a table from which it passes to the section 22 of said last mentioned table, and by which it is fed into the lower pass 3^b of the stand 3. From this last named pass the work emerges upon the table 23 which carries it to the upper pass groove 4^a of the stand 4, and it emerges from that pass upon a section 24 of a stationary table from which it is transferred to the section 25 of said last mentioned table, by which it is fed into the lower pass groove B^4 of the stand 4.

The delivery-table 26, which leads from the lower-pass groove 4^b to the upper-pass groove 5^a in the roll-stand 5, may have interposed in it a shearing-device, indicated at 26^a of common construction, for cutting off the rear end of the work, and a similar shearing-device may be interposed in the path of the work, at 26^b, for cutting off the forward end of the work. The table 26 carries the work to the upper-pass groove 5^a, from which it emerges upon a table 27 and is transferred to the table 28, which carries it to the lower-pass groove 5^b, whence it emerges upon a table 29 to be carried to the upper-pass groove 6^a in roll-stand 6. From the last-named pass a table 30 receives the work and delivers it to a table 31 leading to the lower-pass groove 7^b in the stand 7. To all intents and purposes the upper pass of stand 6 and the lower pass of stand 7 are upper and lower passes in the same stand, but the two stands are provided because of the change of direction required at that point of the moving work, to avoid unduly lengthening out the system of roll-stands, and, more especially, to avoid objectionable roll-changes. From the pass-groove 7^b the work is carried on a table 32 to an upper pass-groove 8^a of stand 8, emerging therefrom upon a table 33 to be delivered upon a table 34 leading to a lower-pass groove 8^b of said stand 8. The work emerges from the pass-groove 8^b upon a table 35 leading to the upper-pass groove 7^a in roll-stand 7, and from the delivery-side of that pass it is carried off on a table 36, as to the hot bed.

Guides, such as the guide shown at g in Figs. 4 and 5, are provided, as usual, for directing the course of the work on the tables from one pass to another; and, of course, the lengths of the tables vary, increasing in succession, to accommodate the increasing length of the work in its progress. Moreover, as will be understood, the system of roll-stands and stationary tables may be curtailed or extended according to requirement for particular work.

The work leaves the upper pass of roll-stand No. 3 as a billet, and instead of running all billets through the succeeding roll-stands, alternate billets may be run off, over an extension 24^a of the table 22, to be rolled in a billet-mill, which is not shown, but involves substantially the same arrangement, as to mechanism, as that shown and described of the rolling-mill.

From the foregoing, it will be seen that my invention involves a mechanism for passing the work initially through a pass of the first roll-stand and thence uninterruptedly through the entire roll-system, thereby rendering the operation continuous from beginning to end, with the advantages of avoiding delay, removing all need of re-heating the work, and greatly simplifying the rolling-mill equipment.

While I have described what I believe to be the preferred form of my invention, I desire to have it understood that many changes may be made in the form,

construction and arrangement of parts without departing from the spirit of my invention.

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

1. In a rolling mill the combination with a roll stand having an upper and a lower pass, a first supporting table arranged in working position relative to the upper pass, a second supporting table on the opposite side of the rolls from the first table, the said second table having a supporting portion in working position relative to the upper pass and a supporting portion in working position relative to the lower pass, the said supporting portions constructed and arranged so as to permit a piece being operated upon to be transferred from a position on one supporting portion to a position where it can be supported by the other supporting portion and from thence guided to the lower pass, a third supporting table on the same side of the rolls as the first table but in a working position relative to the lower pass, the tables all constructed and arranged so that a piece can be passed in one direction through one of the passes while a second piece can be passed at the same time through the other of the passes, and both pieces be properly supported by the respective supporting members.

2. In a rolling mill the combination with a roll stand having an upper and a lower pass, a first supporting table arranged in working position relative to the upper pass, a second supporting table on the opposite side of the rolls from the first table, the said second table having a supporting portion in working position relative to the upper pass and a supporting portion in working position relative to the lower pass, the said supporting portions constructed and arranged so as to permit a piece being operated upon to be transferred from a position on one supporting portion to a position where it can be supported by the other supporting portion and from thence guided to the lower pass, a third supporting table on the same side of the rolls as the first table but in a working position relative to the lower pass, the tables being stationary and constructed and arranged so that a piece can be passed in one direction through one of the passes while a second piece can be passed at the same time through the other of the passes, and both pieces be properly supported by the respective supporting members.

3. In a rolling mill the combination with a three high roll stand having an upper and a lower pass, a first supporting table arranged in working position relative to the upper pass, a second supporting table on the opposite side of the rolls from the first table, the said second table having a supporting portion in working position relative to the upper pass and a supporting portion in working position relative to the lower pass, the said supporting portions constructed and arranged so as to permit a piece being operated upon to be transferred from a position on one supporting portion to a position where it can be supported by the other supporting portion and from thence guided to the lower pass, a third supporting table on the same side of the rolls as the first table but in a working position relative to the lower pass, the tables all constructed and arranged so that a piece can be passed in one direction through one of the passes while a second piece can be passed at the same time through the other of the passes, and both pieces be properly supported by the respective supporting members.

4. In a rolling mill the combination with a three high roll stand having an upper and a lower pass, a first supporting table arranged in working position relative to the upper pass, a second supporting table on the opposite side of the rolls from the first table, the said second table having a supporting portion in working position relative to the upper pass and a supporting portion in working position relative to the lower pass, the said supporting portions constructed and arranged so as to permit a piece being operated upon to be transferred from a position on one supporting portion to a position where it can be supported by the other supporting portion and from thence guided to the lower pass, a third supporting table on the same side of the rolls as the first table but in a working position relative to the lower pass, the tables being stationary and constructed and arranged so that a piece can be passed in one direction through one of the passes while a second piece can be passed at the same time through the other of the passes, and both pieces be properly supported by the respective supporting members.

In testimony whereof I affix my signature in presence of two witnesses.

THOMAS S. BLAIR, JR.

Witnesses:
A. U. THORIEN,
W. B. DAVIES.