

No. 803,673.

PATENTED NOV. 7, 1905.

P. E. DONNER.
APPARATUS FOR ROLLING SHEET AND TIN PLATE.

APPLICATION FILED SEPT. 14, 1904.

2 SHEETS—SHEET 1.

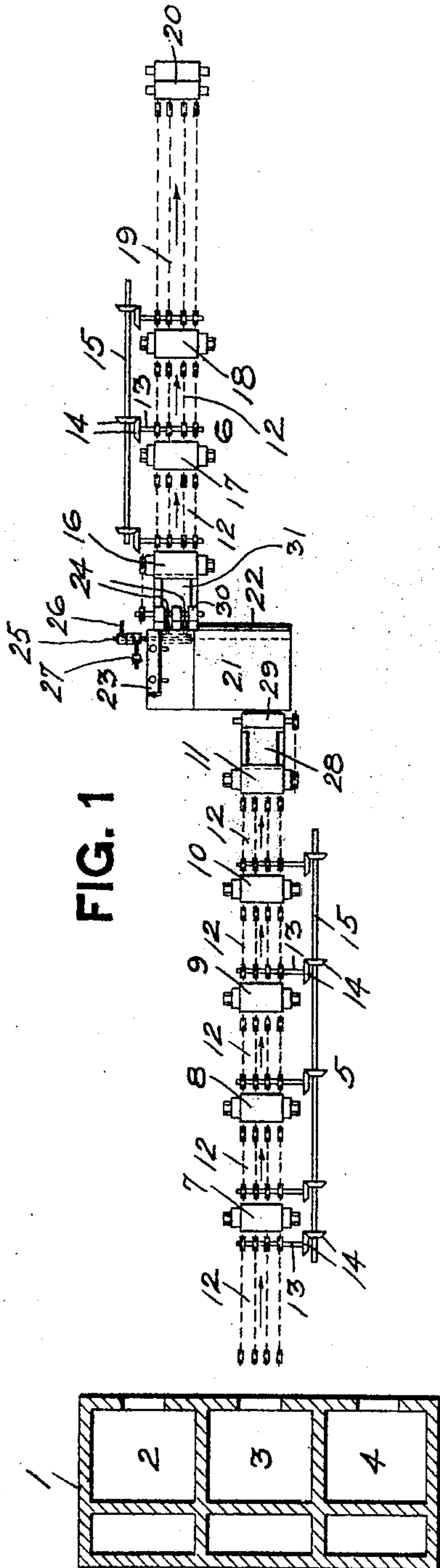


FIG. 1

WITNESSES.

J. R. Keller
Robert C. Lott

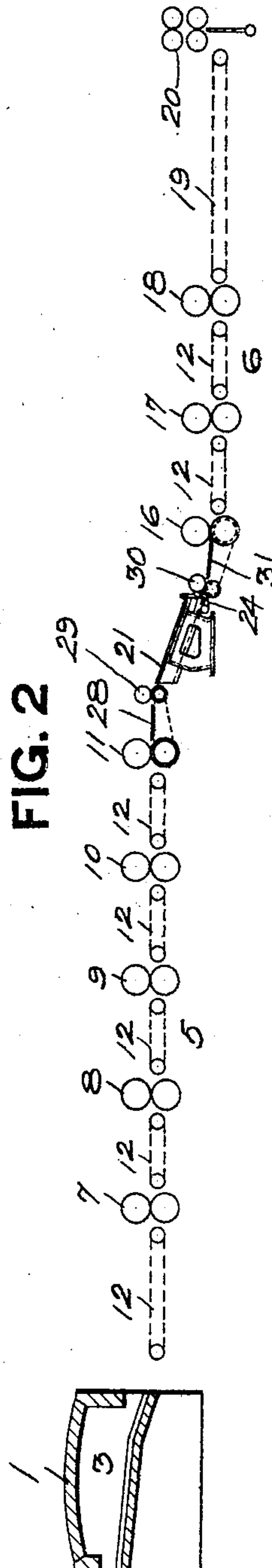


FIG. 2

INVENTOR.

Percy E. Donner
By Kay Lott & Winter
attorneys

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2 SHEETS—SHEET 2.

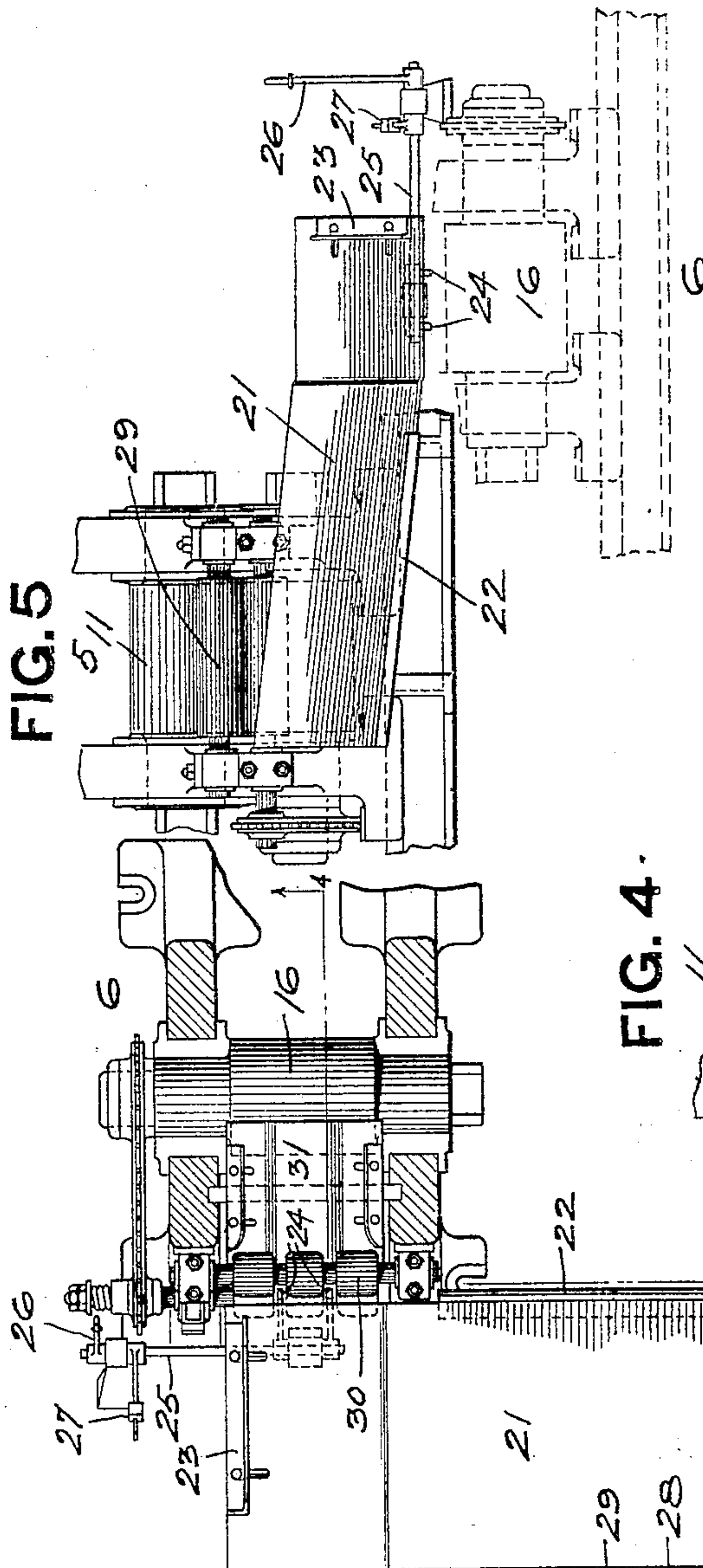


FIG. 5

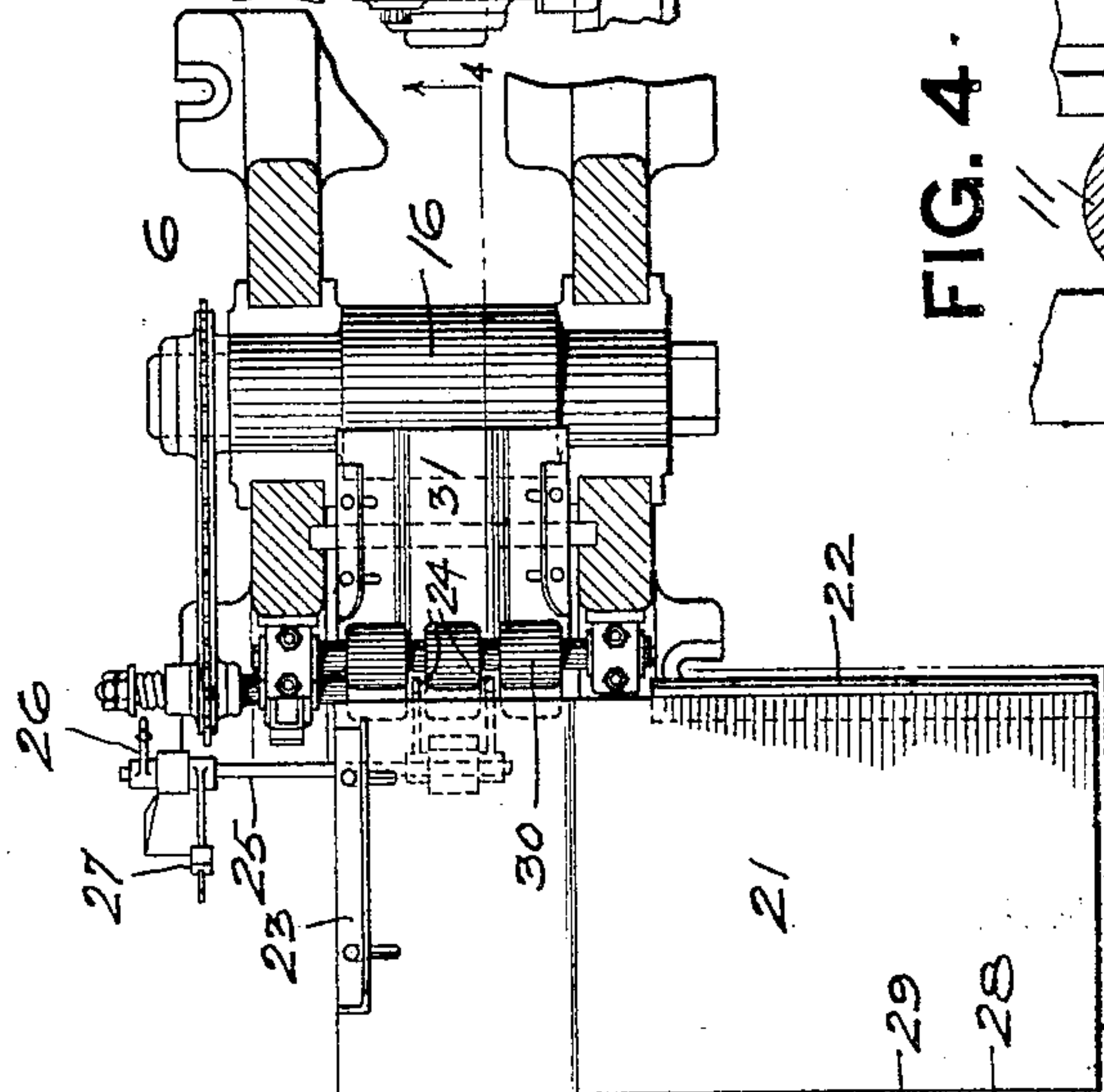
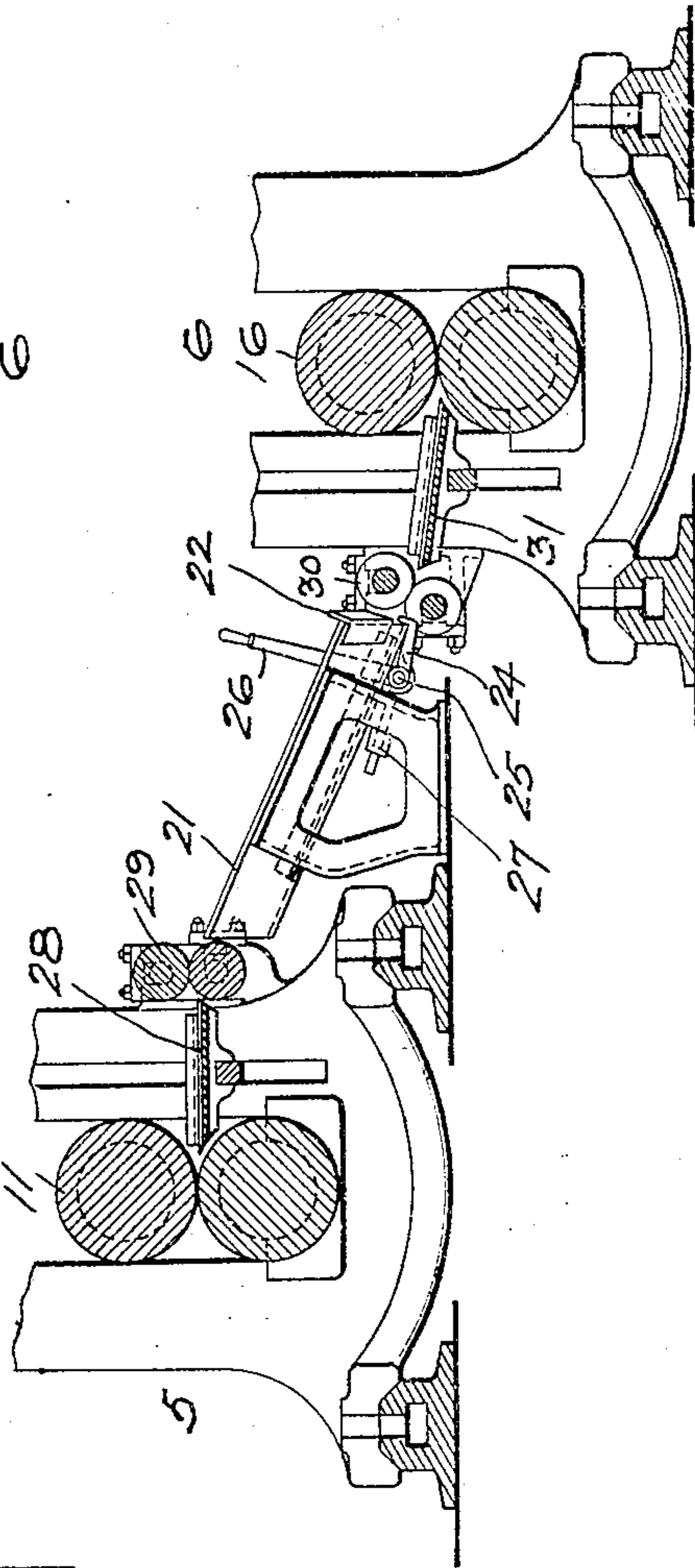


FIG. 3

FIG. 4



WITNESSES.

J. R. Keller
Robert C. Lottan

INVENTOR.

Percy E. Donner
By King Lottan & Winter
attorneys

UNITED STATES PATENT OFFICE.

PERCY E. DONNER, OF COLUMBUS, INDIANA.

APPARATUS FOR ROLLING SHEET AND TIN PLATE.

No. 803,673.

Specification of Letters Patent.

Patented Nov. 7, 1905.

Application filed September 14, 1904. Serial No. 224,452.

To all whom it may concern:

Be it known that I, PERCY E. DONNER, a resident of Columbus, in the county of Bartholomew and State of Indiana, have invented
5 a new and useful Improvement in Apparatus for Rolling Sheet and Tin Plate; and I do hereby declare the following to be a full, clear, and exact description thereof.

My invention relates to apparatus for rolling sheet metal; and it is designed to provide improved apparatus whereby ordinary sheet bars are reduced at a continuous operation to such a gage that they can afterward with one heating and at one operation be reduced
15 to such lighter gages as are used for tin-plating and similar purposes.

In the rolling of sheet metal it has been proposed to use a continuous mill having a plurality of pairs of two-high rolls arranged
20 in tandem, through which the plate-bar passes in succession and is gradually and progressively reduced in thickness. Metal sheets, however, when run singly through rolls cannot be advantageously reduced beyond a certain gage and not sufficiently thin for most commercial uses, this being due to the fact that after the plate has been reduced a certain amount sufficient pressure cannot be exerted by the ordinary adjusting mechanism
25 of the rolls to further reduce the same. Consequently it has always been the custom to match up two or more partially-reduced plates—that is, place one upon the other—and then pass the pile through reducing-rolls.
35 In this way the rolls develop sufficient pressure to further reduce the plates. This matching of the plates has also been proposed with reference to continuous reducing-mills, it being the custom to provide a gap or space between two contiguous pairs of rolls of the continuous mill, or, more strictly speaking, to have two continuous mills with a gap or space between the same, in which gap or space is placed mechanism provided with stops for
45 matching up two or more plates. All apparatus of this kind heretofore proposed has necessitated the placing of the second continuous train in the same line with the first train and has also necessitated manually-operated mechanism for matching the edges of the plates. There are numerous objections to the old arrangement, one being the manual work necessary for edging up the sheets, which to some extent delays the entrance of the
55 matched-up sheets into the second reducing-train, thus giving the sheets an opportunity

to unduly cool. Another objection is that the matcher is difficult to get at for purposes of repair, because it is hedged in between the two reducing-trains. Still another objection is that not all mill-floors and ground-sites are such that the second reducing-train can advantageously be placed in line with the first reducing-train.

The object of my invention is to provide
65 apparatus of the general character above described and in which the objections named are avoided.

To this end the invention consists, generally stated, in placing the second reducing-train out of line with the first reducing-train
70 and in providing a matching device at the exit end of the first train and the entrance end of the second train and having side stop mechanism in line with the second train, said
75 matching device being preferably inclined in two directions from the horizontal, one inclination being downwardly in the line of travel of the sheets and the other at right angles thereto, the arrangement being such
80 that the sheets as they emerge from the first reducing-train will of their own weight and by gravity slide downwardly, both endwise and sidewise, to the first pair of rolls of the second reducing-train, suitable stops being
85 provided against which said sheets slide, so as to match up not only their ends, but also their side edges. In this way no manual manipulation is necessary in order to match up the side edges of the sheets and no delay will
90 occur in their at once entering into the second reducing-train. The matcher also is simpler and more easily gotten at for purposes of repair than prior devices of this kind.

The invention also consists in details of construction and arrangement hereinafter described and claimed.

In the accompanying drawings, Figure 1 is a diagrammatic plan view of a rolling plant embodying my invention. Fig. 2 is a diagrammatic side elevation of the same. Fig. 3 is a plan view, on an enlarged scale, of the matcher. Fig. 4 is a side elevation of the same, the rolls being in section; and Fig. 5 is an end elevation of the same.
105

In the drawings, 1 represents a heating-furnace having chambers 2, 3, and 4, in which the plate-bars are heated. This furnace may be of any known type, heated in any suitable way, and having any desired arrangement for
110 charging the plates into and drawing the plates out of the same. This furnace will be

provided with as many chambers as are necessary, or, if preferred, a number of separate furnaces may be employed. In this furnace the plate-bars are brought to the proper rolling heat and are then reduced in the apparatus to be described.

My rolling-mill comprises two continuous tandem trains 5 and 6, each of which may be made up of as many pairs of two-high rolls as is necessary. I have shown the first train made up of five pairs of two-high rolls arranged in tandem and numbered 7, 8, 9, 10, and 11, respectively; but I may vary this number without departing from my invention. Placed in front of each pair is a feed table or conveyer 12, which may be of any suitable type, those shown consisting of a series of sprocket-chains passing at their ends over sprocket-wheels. The sprocket-wheels at one end of the chains are mounted upon a shaft 13, driven by suitable beveled gears 14 from a counter-shaft 15, extending along the side of the train. In this manner the chains will be positively driven to feed the bar in succession through the several pairs of rolls. The second train is shown as consisting of three sets of two-high rolls numbered 16, 17, and 18, respectively; but the number thereof may be varied as desired. Between these sets of rolls likewise are placed feed-tables 12 of the same character as just described in connection with the first train and driven in the same way. From the last set of rolls of the second train a conveyer 19 carries the sheets to a doubler 20, which may be of any known form of apparatus for this purpose and by means of which the sheets are doubled. They are then conveyed to a reheating-furnace, wherein they are again raised to the desired temperature and then passed through further reducing or finishing rolls. They will be doubled and reheated and re-rolled as many times as necessary to bring them to the desired gage. As the apparatus for performing the latter steps of the operation is not new with me it is neither shown nor described.

The two tandem trains 5 and 6 are parallel to each other, but they are not in line. I have shown the preferred arrangement, in which the second train is an extension of the first train and carrying the sheets in the same direction as the first train. The placing of the two trains out of line with each other is chosen partly for the reason that on many mill-floors there are obstructions to the placing of the second train in line with the first train and partly for the reason that the matcher can be more easily gotten at for purposes of repair and the like. At the exit end of the first train and entrance end of the second train is placed the matching device for matching up two or more sheets so that they can be piled and passed in double or treble thickness through the second reducing-train.

The train 5 is at a higher level than the train 6. This matching device may be of any suitable or desirable form, that shown in the drawings being so arranged that the sheets will by gravity slide from the first train into position to enter the second train. This matcher has a double inclination downwardly, one inclination being in the direction of the travel of the plates and the other being sidewise with reference thereto. The matcher is supported upon a suitable frame and comprises plates or bars 21, sloping downwardly from the rolls 11, as shown in Fig. 4, and also having a slope sidewise, as shown in Fig. 5. At the lower end of the matcher is a stop 22 to arrest the endwise travel of the plates, and thus permit the plates to fall down upon the preceeding plates and have their ends matched. The side edge of the matcher also is provided with a suitable stop or stops 23, which will match up the side edges of the plates as they slide over sidewise against the same. That portion of the stop 22 which is in front of the rolls 16 is made movable, so that it can be withdrawn in order to permit the matched-up sheets to enter the second reducing-train. Accordingly that portion of the stop is shown as a pair of fingers 24, connected to a rock-shaft 25, which may be manipulated by any suitable means, such as the lever 26. A counterweighted arm 27 on the rock-shaft holds the fingers 24 normally elevated.

The matcher described matches the sheets not only at their ends, but also at their side edges, and accomplishes this wholly by gravity and without any manual manipulation. The side stop 23 also serves as a gage for positioning the matched-up sheets for their entrance into the second reducing-train, and for this purpose it is adjustable by any suitable means, such as the bolts or slots shown.

As the bars or plates emerge from the last set of rolls 11 of the first train they pass over a supporting-plate 28 into the bite of a pair of feed-rollers 29, which act to feed them into the matching device, the plates passing by gravity from said feed-rollers down the matcher and into position to enter the first set of rolls of the second train. At the entrance of the second train is placed another pair of feed-rollers 30, which feed the plates into said second train over a suitable stationary table or plate 31. Both the feed-rollers 29 and 30 will be positively driven by any suitable mechanism, such as by sprocket-chains from the contiguous roll-shafts.

The operation of the apparatus is as follows: The plate-bars are raised in the furnace 1 to the desired temperature and are then fed to or placed upon the feed-table 12 in front of the first pair of rolls of the first reducing-train. They pass singly and in succession through the several sets of rolls of the first reducing-train, being carried from one set of rolls to the other by the feed-tables described.

The plates as they emerge from the last set of rolls of the first train pass over the table 28 and through the feed-rollers 29, which serve to feed the same forward and into the matcher. They pass by gravity down upon the matcher, sliding down the same until the ends of the plates strike the stationary stop 22 at the lower edge of said matcher and then slide sidewise until the edges thereof strike against the side stop 23. After one plate has come to rest in this position the next succeeding plate will slide down in the same manner and on top of the first plate with its edges also bearing against the side stop 23. The lower portion of the matcher is slightly depressed, as shown, so that the plate will slide on top of the preceding plate or plates. This depressed portion of the matcher is horizontal, so that the plates will be parallel to the roll-pass. In this position the plates are accurately matched both at their ends and their side edges. The stop 23 is so placed that the sheets will be in proper position for at once passing into the second reducing-train. The operator will then manipulate the lever 26 to depress the stop-fingers 24, and as the sheets in this position are inclined they will slide into the bite of the feed-rollers 30, by which they are fed into the second reducing-train. To facilitate this movement, the feed-rollers 30 are grooved, as shown in Fig. 3, and the ends of the stop-fingers 24 lie in these grooves, so that the ends of the plates while held by said fingers are almost in touch with the faces of the rollers. As a consequence when the fingers are depressed the plates need slide but slightly in order to come into the bite of the rollers. The counterweight 27 will at once return the stop-fingers 24 to their elevated position, so as to hold in place the next succeeding plates until such time as they are to be admitted to the second reducing-train. The piled sheets will pass through the second reducing-train continuously and will then be fed to the doubler 20, by means of which they are doubled and then manipulated in the same manner as has heretofore been the practice—that is, reheated and rerolled and redoubled as often as necessary to reduce the same to the desired gage. The sheets as they emerge from my mill will be about sixteen to twenty-six gage, depending upon the thickness and character of sheet-bar used, and in this condition will be suitable for certain purposes, and therefore need not be doubled and reheated and rerolled. For tin-plate, however, and many other purposes the gage will often have to be further reduced, and consequently said-sheets will be doubled, reheated, and rerolled.

The advantages of my rolling apparatus result from the practically automatic action thereof. No manual operation is necessary from the time the bars enter the first set of reducing-rolls until they leave the last set, ex-

cept that necessary to depress the stop-fingers 24. In all other particulars the operation is perfectly automatic. The plates are accurately matched both at their ends and on their side edges, and in being matched are placed in position for immediate entry into the second reducing-train. In this way no delay occurs during matching and the sheets will lose practically no heat during this operation. Since the two trains are out of line, the matcher is easily gotten at for purposes of repair or alteration.

In the drawings the two reducing-trains are shown in exact parallelism and in the claims they are described as being "parallel." I wish it understood that by this term I do not exclude an arrangement in which the two trains are at a slight angle to each other, but not so great but that the plates in sliding down the matcher sidewise can swing sufficiently to come into line with the second train.

What I claim is—

1. In apparatus for rolling sheet metal, the combination of two continuous trains each consisting of two or more pairs of rolls arranged in tandem, said trains being parallel but out of line with each other, and a matching device located at the exit end of the first train and entrance end of the second train and arranged to receive the plates from one train and deliver the same to the other train, said matcher being provided with suitable side-stop mechanism in line with the second train.

2. In apparatus for rolling sheet metal, the combination of two continuous reducing-trains each consisting of two or more pairs of rolls arranged in tandem, said trains being parallel but out of line with each other, and a matching device located at the exit end of the first train and entrance end of the second train and arranged to receive the plates from one train and deliver the same to the other train, said matcher being provided with suitable front-stop mechanism and suitable side-stop mechanism in line with the second train.

3. In apparatus for rolling sheet metal, the combination of two sets of reducing-rolls arranged parallel but out of line with each other, and a matching device located at the exit side of the first set and entrance side of the second set of rolls and arranged to receive the plates from one set of rolls and deliver the same to the other set of rolls, said matcher being provided with suitable side-stop mechanism in line with the second train and end-stop mechanism arranged to match the side and end edges of the plates.

4. In apparatus for rolling sheet metal, the combination of two sets of reducing-rolls arranged parallel but out of line with each other, and a matching device located at the exit side of the first set and entrance side of the second set of rolls and arranged to receive the plates from one set of rolls and deliver the

same to the other set of rolls, said matcher being provided with a stop for squaring up the ends of the plates and also with a stop for squaring up the side edges of the plates, said
5 last-named stop being arranged to act as a guide for the second set of rolls.

5. In apparatus for rolling sheet metal, the combination of two sets of reducing-rolls arranged parallel but out of line with each other,
10 and a matching device located at the exit side of the first set and entrance side of the second set of rolls and having a double downward inclination from the horizontal, whereby the plates are moved downwardly in the direction
15 in which they are to be fed to the second set of rolls and also sidewise with reference to said direction, said matcher being provided with suitable stop mechanism.

6. In apparatus for rolling sheet metal, the
20 combination of two sets of reducing-rolls arranged parallel but out of line with each other, and a matching device located at the exit side of the first set and entrance side of the second set of rolls and having a double downward in-
25 clination from the horizontal, whereby the plates are moved downwardly in the direction in which they are to be fed to the second set of rolls and also sidewise with reference to said direction, said matcher being provided with a
30 stop for squaring up the end edges of the plates and also with a guide or stop for squaring up the side edges of the plates.

7. In apparatus for rolling sheet metal, the combination of two sets of reducing-rolls ar-
35 ranged parallel but out of line with each other and located at different levels, and a matching device located at the exit side of the first set and entrance side of the second set of rolls and having a double downward inclination with its
40 higher end in proximity to the rolls at the higher level and its lower end in proximity to the rolls at the lower level, whereby the plates are caused to move downwardly in the direc-
45 tion in which they are to be fed to the second set of rolls and also sidewise with reference to

said direction, said matcher having a suitable stop to limit the endwise movement of the plates and also a suitable stop to limit the sidewise movement thereof.

8. In apparatus for rolling sheet metal, the
50 combination of two sets of reducing-rolls arranged parallel but out of line with each other and located at different levels, and a matching device located at the exit side of the first set and entrance side of the second set of rolls and
55 having a double downward inclination with its higher end in proximity to the rolls at the higher level and its lower end in proximity to the rolls at the lower level, whereby the plates are caused to move downwardly in the direc-
60 tion in which they are to be fed to the second set of rolls and also sidewise with reference to said direction, said matcher having a suitable stop to limit the endwise movement of the plates and also a suitable stop arranged to act
65 as a guide for the second set of reducing-rolls and in position to have the plate side edges impinged against the same.

9. In apparatus for rolling sheet metal, the
70 combination of two sets of reducing-rolls arranged parallel but out of line with each other, and a matching device located at the exit side of the first set and entrance side of the second set of rolls and having a double downward in-
75 clination from the horizontal, whereby the plates are moved downwardly in the direction in which they are to be fed to the second set of rolls and sidewise with reference to said direc-
80 tion, a suitable stop to limit the sidewise movement of the plates, and a suitable stop for limiting the endwise movement of the plates, that portion of the last-named stop at the lower end of the matcher being retractable.

In testimony whereof I, the said PERCY E. DONNER, have hereunto set my hand.

PERCY E. DONNER.

Witnesses:

ROBERT C. TOTTEN,
G. C. RAYMOND.