No. 709,972.

Patented Sept. 30, 1902.

V. E. EDWARDS.

ROLLING MILL.

(Application filed Aug. 8, 1900.)

(No Model.)

4 Sheets—Sheet 1.

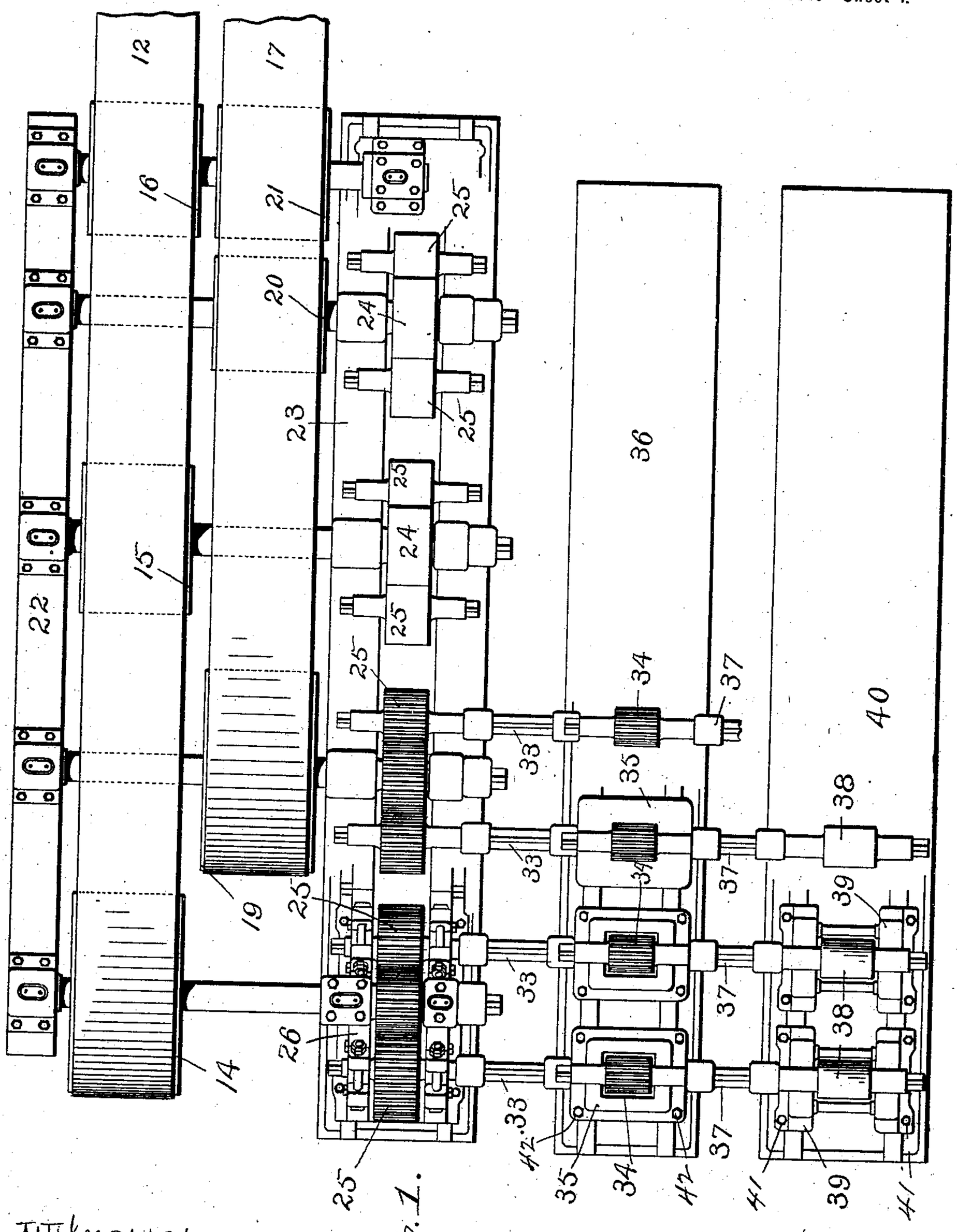

Fig. 1.

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(No Model.) 4 Sheets—Sheet 2.

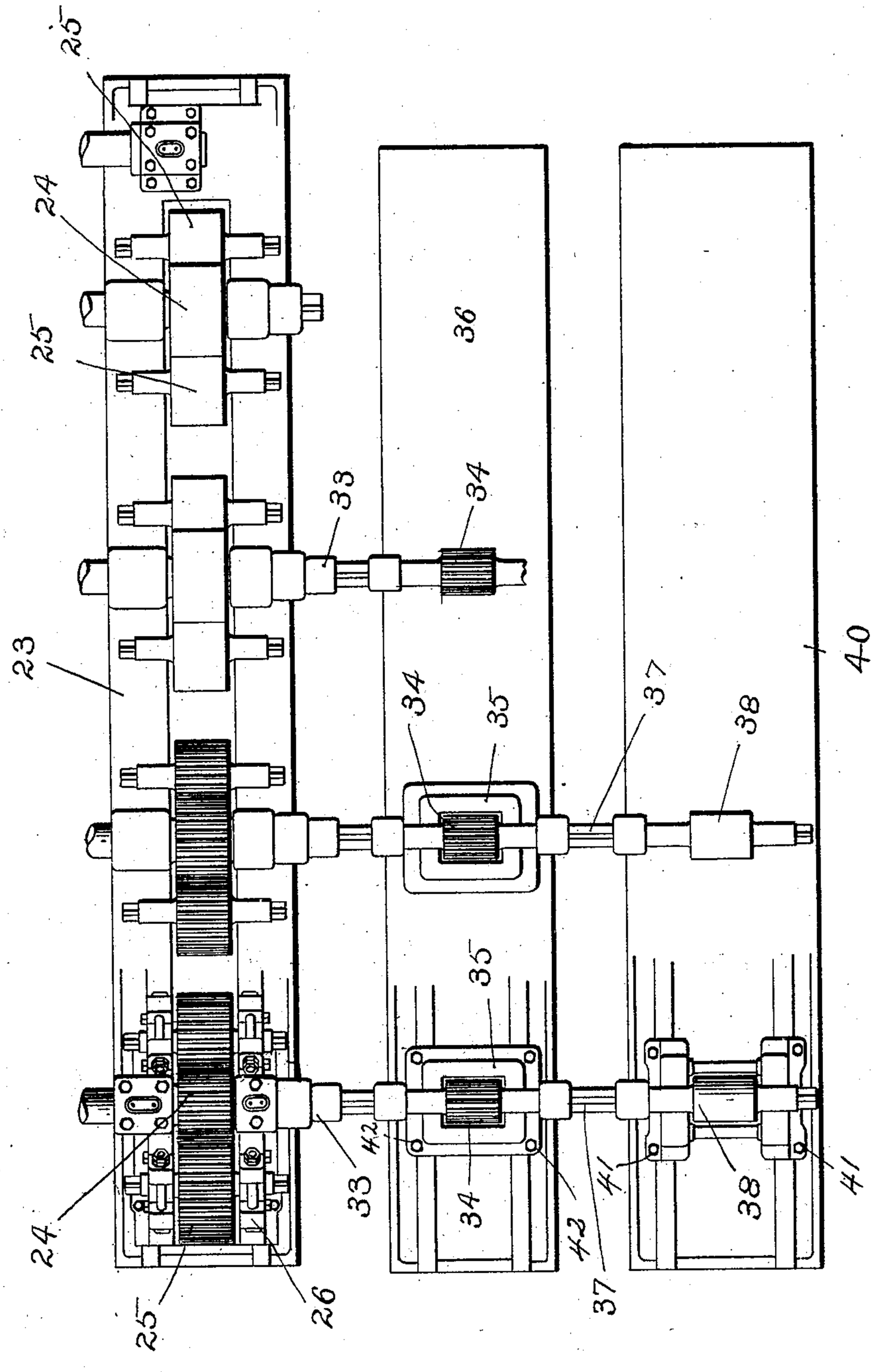

Fig. 2.

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4 Sheets—Sheet 3.

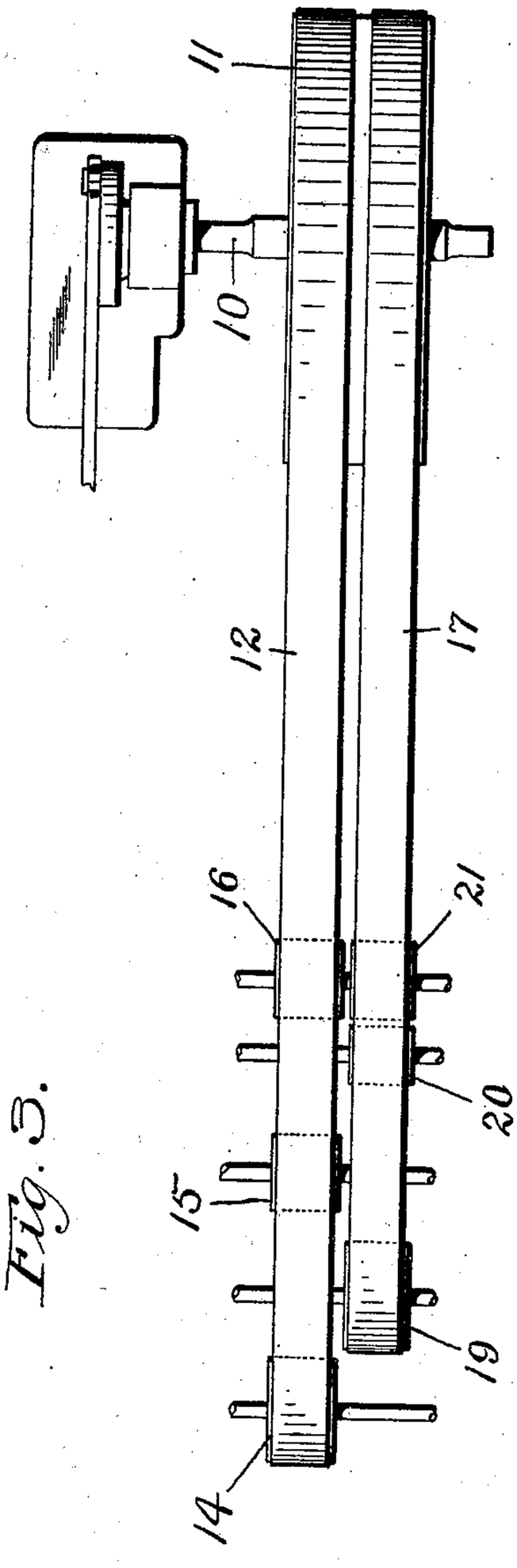

Fig. 3.

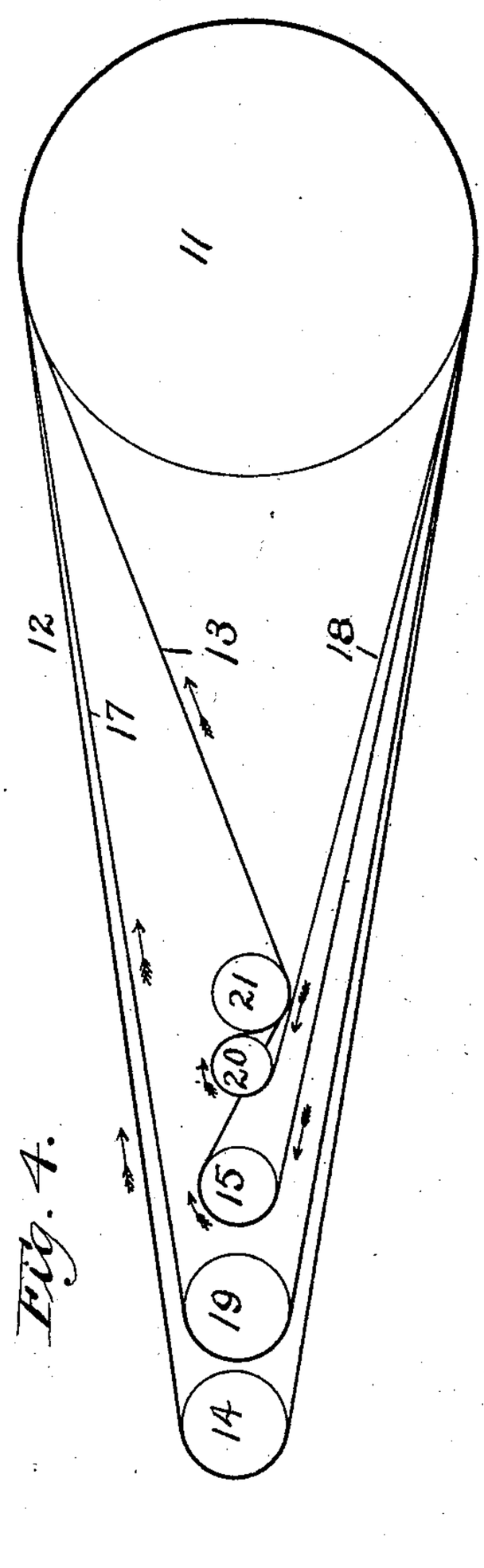

Fig. 4.

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(No Model.) 4 Sheets—Sheet 4.

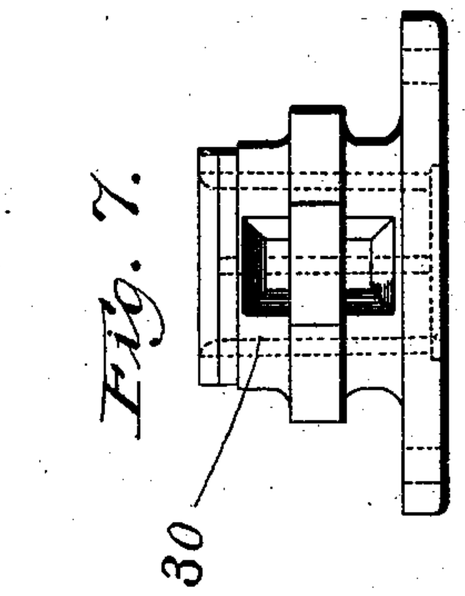

Fig. 7.

Fig. 5

Fig. 6.

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Witnesses.
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UNITED STATES PATENT OFFICE.

VICTOR E. EDWARDS, OF WORCESTER, MASSACHUSETTS.

ROLLING-MILL.

SPECIFICATION forming part of Letters Patent No. 709,972, dated September 30, 1902.

Application filed August 8, 1900. Serial No. 26,258. (No model.)

To all whom it may concern:

Be it known that I, VICTOR E. EDWARDS, a citizen of the United States, residing at Worcester, in the county of Worcester and State of Massachusetts, have invented a new and useful Rolling-Mill, of which the following is a specification.

This invention relates to an improved form of continuous rolling-mill; and the object of this invention is to provide a form of rolling-mill which may be adjusted or adapted to produce more than one form of product, to provide improved driving connections for the rolling-mill, and to improve the arrangement of parts and details of construction, as hereinafter described, and more particularly pointed out in the claims at the end of this specification.

In the accompanying four sheets of drawings, Figure 1 is a partial plan view of a rolling-mill constructed according to this invention. Fig. 2 is a plan view with the driving-belts omitted, showing the parts adjusted to preduce a product of a different kind from that which would be produced when the parts are arranged as illustrated in Fig. 1. Fig. 3 is a plan view illustrating the arrangement of driving-belts which is preferably employed. Fig. 4 is a diagrammatic side view thereof. Fig. 5 is an enlarged side view of one of the gear-casings, and Figs. 6 and 7 are detail views of one of the boxes which are mounted in the gear-casings.

In continuous rolling-mills the successive sets of rolls have to be driven at increasing speeds to compensate for the increasing length of the product which is being rolled out or produced. The relative speeds at which the successive rolls must be turned or driven depend upon the character of the section which is being rolled—that is to say, the degree of lengthening due to successive reductions between sets of rolls will vary with the shape of the cross-section produced. For example, the lengthening or increase of speed necessary in a rod-mill for rolling round wire or rods is different from the increase of speed between successive sets of rolls of a rolling-mill which produces flat wire, such, for example, as bale-tie stock. On this account it has heretofore been the practice to employ separate rolling-mills for producing each distinct kind of product.

One especial object of the present invention is therefore to provide a form of rolling-mill which may be adjusted or set so that the successive sets of rolls may have different relative speed ratios, so as to adapt the machine to produce more than a single kind of product.

In practice rolling-mills constructed according to this invention have been designed so that they may be employed as rod-mills for rolling round rods or wire or as rolling-mills for producing flat wires or bale-tie stock. To accomplish this object, a rolling-mill constructed according to this invention is preferably provided with an arrangement of driving-gears in which either the main spindles may be coupled to turn the sets of rolls of the rolling-mill or secondary spindles which are geared to and driven from the primary spindles may be coupled to drive said rolls. To drive the gearing, I preferably employ an arrangement of driving-belts in which two belts are mounted one on top of the other and in which one of said driving-belts is preferably arranged to engage with an idle pulley or belt-tightener.

Referring to the accompanying drawings and in detail, I will first describe the arrangement of driving-belts which I prefer to employ. This construction is most clearly illustrated in Figs. 3 and 4. As shown in these figures, 10 designates the main shaft of a steam-engine or other motor. Secured on the shaft 10 is a wide-faced pulley 11, and running on the pulley 11 are belts mounted one on top of the other. In the present instance I have illustrated a construction employing two sets of tandem belts or belts one on top of the other, although for operating the smaller-sized rolling-mills a single pair of driving-belts may be used, if desired. As illustrated, at the inner side of the pulley 11 are mounted the driving-belts 12 and 13. The driving-belt 12 passes around a driven pulley 14, and the belt 13 passes around a driven pulley 15 and under an idle pulley or tightener 16.

The idle pulley or tightener 16 is preferably arranged so as to give the belt 13 a large arc of wrap around its pulley 15. Near the other edge of the pulley 11 are mounted the

belts 17 and 18. The belt 17 passes around a driven pulley 19, and the belt 18 passes around a driven pulley 20 and under a belt-tightener or idle pulley 21, which is preferably so located that the belt 18 will have a large arc of wrap around its pulley 20. The tighteners or idle pulleys 16 and 21 are arranged in line with each other and may, if desired, be mounted on the same shaft, as shown in Figs. 1 and 3. By means of this arrangement I have provided an exceedingly compact arrangement of belting for driving a number of pulleys at different relative speeds, one especial advantage of this arrangement being that the load is divided substantially evenly between the several belts employed. As shown most clearly in Fig. 1, the shafts of the driven pulleys are journaled in boxes upon a frame or bed 22 and in boxes carried by gear-casings mounted on a bed or frame 23.

The construction of the gear-casings which I preferably employ is most clearly illustrated in Fig. 5. As shown in this figure, each gear-casing comprises a side plate or frame 26, having end plates 27 for bolting successive gear-casings together. The box or bearing for the pulley-shaft is formed with a lower bearing 28 and a removable cap 29. At each side of and at a lower level than this main bearing the gear-casing is preferably provided with a split and bored-out socket for receiving a box in which one of the secondary spindles is journaled. The boxes 30, as shown most clearly in Figs. 6 and 7, are each provided with an end flange, and their body portions are turned to fit the bored frames. Each of the boxes 30 is secured in place by means of bolts 31, while the boxes are clamped in their sockets by bolts 32. By means of this construction I have provided a gear-casing in which the boxes are set so that they may be accurately centered or fixed, while at the same time they may be adjusted to compensate for wear and may be taken out whenever they require rebabbitting or renewal.

As shown most clearly in Figs. 1 and 2, the shafts of the driven pulleys or the main spindles are provided with gears 24, which mesh with and drive gears 25, secured on secondary spindles at each side. In practice the driving-gearing as thus constructed is so proportioned that the main spindles will turn at proper relative speeds to drive the rolls of a rolling-mill employed for producing flat wires or bale-tie stock, while the secondary spindles will be driven or turned at the proper relative speeds to drive the rolls of a rod-mill or rolling-mill employed for producing round rods or wires.

To adapt the rolling-mill for adjustment so that its rolls may be driven either from the primary spindles or from the secondary spindles, the housings in which the rolls of the rolling-mill are journaled are adjustable upon their bed-piece, while the pinion-housings are also adjustable upon their bed-piece.

In Fig. 1 some of the rolls of a rolling-mill are shown as set to the position they occupy when the mill is to be used as a rod-mill for rolling round wires or rods. As shown, the secondary spindles of the driving-gears are connected by coupling-pieces 33 to the bottom pinions 34, which are journaled in housings 35, adjustably mounted on a bed-piece 36. Each set of pinions 34 is connected by couplings 37 to the rolls 38 of the rolling-mill. The rolls 38 are journaled in housings 39, which are adjustably mounted on a bed-piece 40.

When the rolling-mill is to be employed for producing flat wire—such, for example, as may be employed for bale-tie stock—a much more rapid reduction can be accomplished in flattening or rolling out the wire than can be accomplished in reducing the diameter of round rods or wires.

As shown in Fig. 2, to adapt the mill for producing flat stock only every other set of rolls need be employed, and when the mill is to be used on this class of work the rolls are coupled so as to be driven from the primary spindles or the shafts of the driven pulleys, so that the rolling-mill may be employed to produce a different product than when the parts are set or adjusted as illustrated in Fig. 1—that is to say, the primary spindles of the driving-gears are connected by the coupling-pieces 33 to the top pinions 34. In this connection it is to be noted that the primary spindles and the secondary spindles being directly geared together turn in relatively opposite directions; but by arranging the primary spindles at a proper elevation to be connected to the top rolls of the rolling-mill and the secondary spindles at the proper elevation to be connected to the lower rolls the rolls will turn in the same direction whether driven from the primary or secondary sets of spindles. To permit the adjustment of the housings 39 upon their bed-piece 40 and to hold the housings in their adjusted position, I preferably employ tap-bolts 41, which may be threaded in holes tapped into the bed-piece 40 at different points, according to the adjustment required, and to secure the adjustment of the pinion-housings 35 upon their bed-piece 36 I preferably employ tap-bolts 42, which are threaded in holes tapped into the bed-piece 36 at the required points.

I am aware that numerous changes may be made in the construction of rolling-mills by those who are skilled in the art and that certain features of my invention may be applied and used in different locations and in different combinations from those herein shown and described without departing from the scope of my invention as expressed in the claims. I do not wish, therefore, to be limited to the construction herein illustrated; but

What I do claim, and desire to secure by Letters Patent of the United States, is—

1. The combination of a continuous rolling-mill comprising a plurality of sets of rolls,

driving connections, and means for coupling the rolls with different members of the driving connections, so that successive sets of rolls may be driven at different relative speed ratios to adapt the rolling-mill to the production of different products.

2. In a continuous rolling-mill, the combination of a bed plate or frame, roll-stands adjustably mounted thereon, and driving connections having spindles turning at different relative speeds, said parts being arranged so that the rolls may be coupled to and driven from different sets of spindles to adapt the rolling-mill to the production of a variety of products.

3. In a continuous rolling-mill, the combination of a bed plate or frame, roll-stands adjustably mounted thereon, a second bed plate or frame, pinion-housings adjustably mounted thereon, and driving connections having shafts turning at different relative speeds, said parts being arranged so that by adjusting the roll-stands and pinion-housings the rolls may be driven from different sets of shafts to adapt the rolling-mill to the production of a variety of products.

4. The combination of a set of primary shafts, a set of secondary shafts geared to turn at different speeds from the primary shafts, and a continuous rolling-mill arranged so that its roll-stands may be adjusted to have the rolls thereof driven from either the primary or secondary set of shafts, as desired.

5. The combination of a set of primary shafts, a set of secondary shafts arranged below and geared to turn at different speeds from the primary shafts, a continuous rolling-mill and driving-pinions therefor arranged so that the upper pinions may be driven from the primary shafts or the lower pinions driven from the secondary shafts, as desired.

6. In a continuous rolling-mill, the combination of a bed plate or frame, roll-stands adjustably mounted thereon, a second bed plate or frame having pinion-housings adjustably mounted thereon, a primary set of driving-shafts, and a secondary set of driving-shafts geared to turn at different speeds from the primary shafts, said parts being arranged so that the rolls may be coupled to and driven either from the primary or secondary set of shafts, as desired.

7. The combination of a set of primary shafts, a pulley, belts for driving the shafts from said pulley, a set of secondary shafts geared to turn at different speeds from the primary shafts, and a continuous rolling-mill arranged so that its roll-stands may be relocated to have its rolls driven from either the primary or secondary set of shafts, as desired.

8. The combination of gears for turning the rolls of a continuous rolling-mill, gear-housings therefor, consisting of side plates, each of which has a main box or center bearing, and a tapering split socket at each side thereof, tapered flanged boxes fitting into said sockets, bolts extending through the flanges of the boxes, and clamping-bolts for clamping said boxes in place, substantially as described.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

VICTOR E. EDWARDS.

Witnesses:
JOHN F. CROWELL,
PHILIP W. SOUTHGATE.