(No Model.)

5 Sheets—Sheet 1.

F. I. FREEMAN.

ROLLING MILL.

No. 492,352. Patented Feb. 21, 1893.

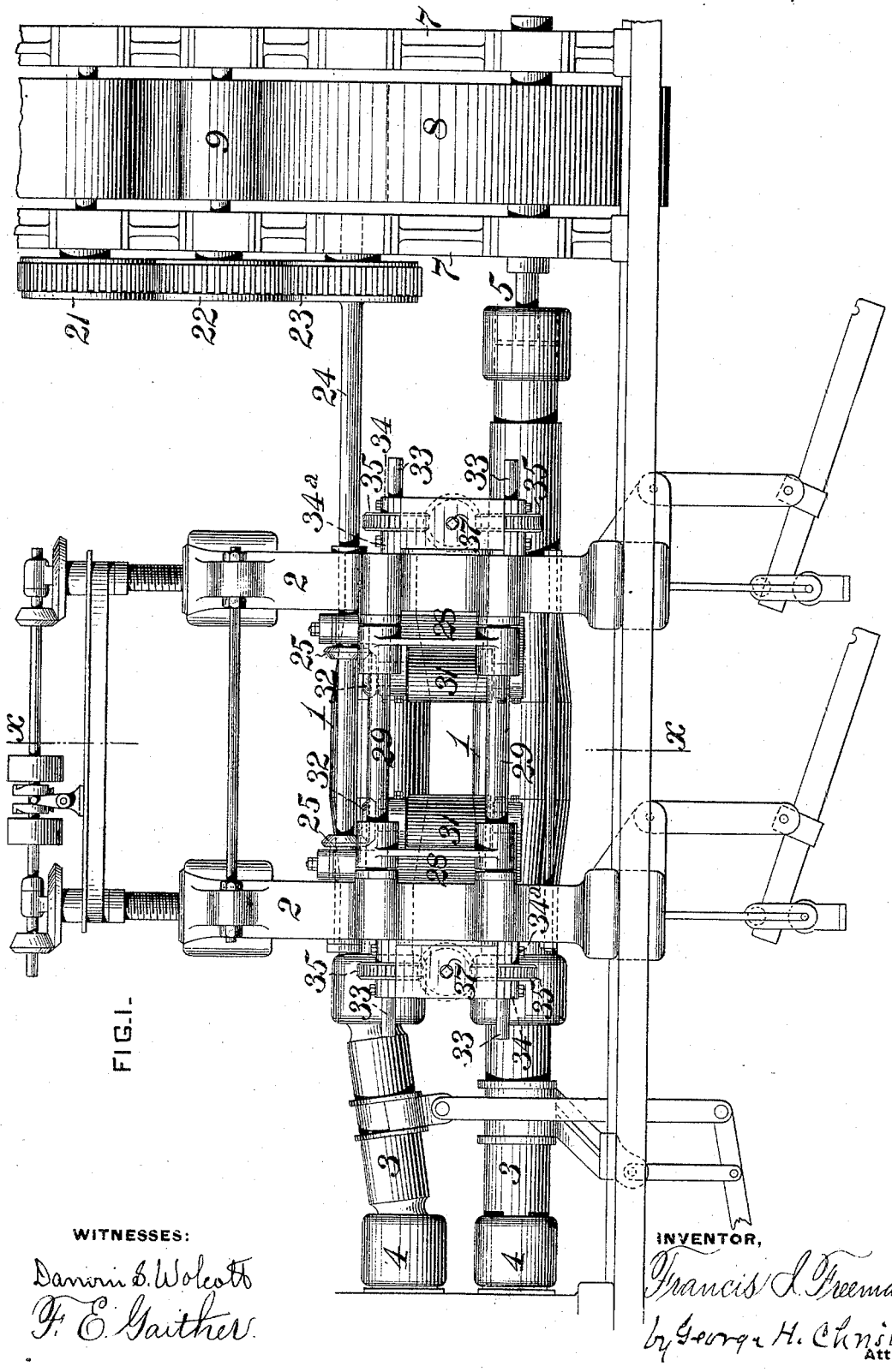

FIG. 1.

WITNESSES:

Damon S. Wolcott

F. E. Gaither

INVENTOR,

Francis I. Freeman

by George H. Christy Att'y.

(No Model.)

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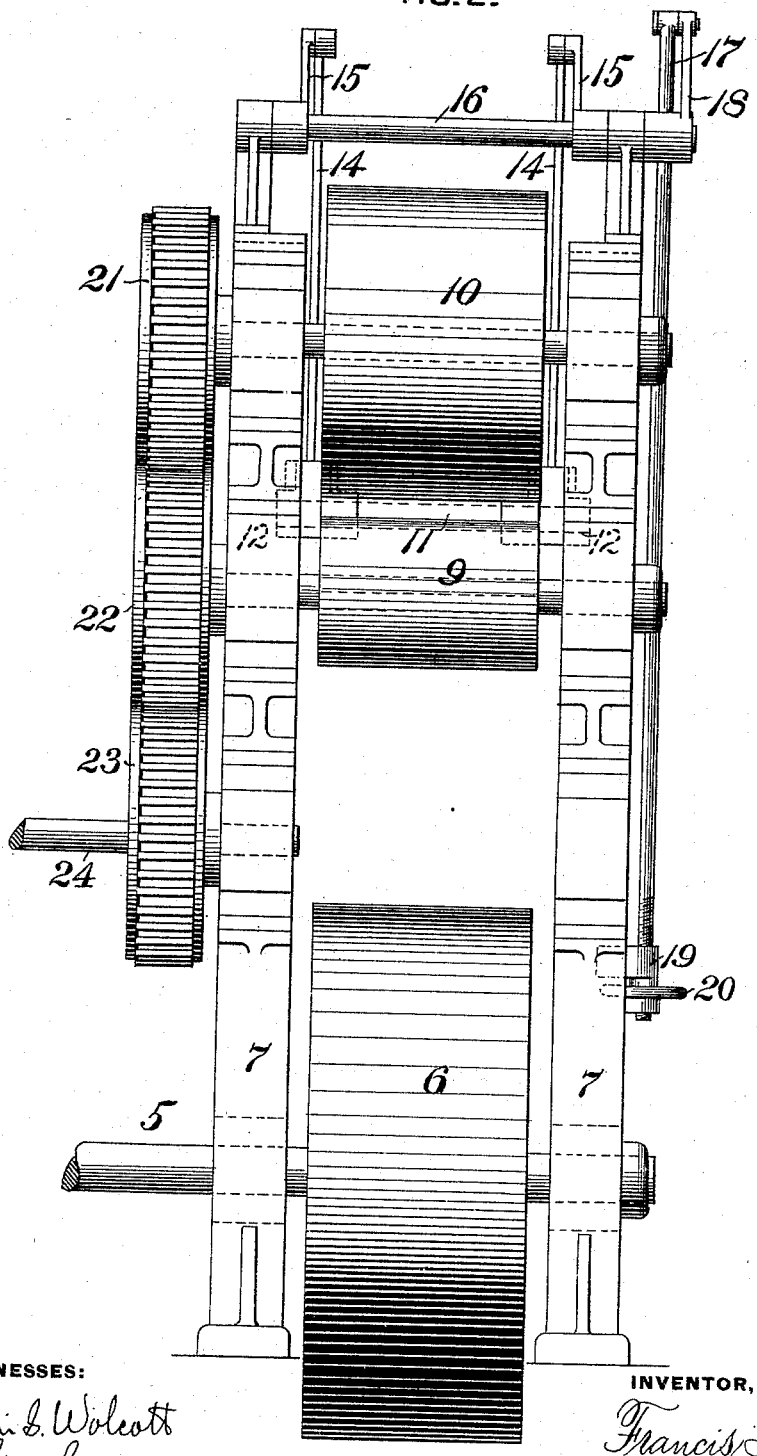
FIG. 2.



WITNESSES:

Darwin S. Wolcott

F. E. Gaither

INVENTOR,

Francis I. Freeman

by George H. Christy

Attly.

(No Model.)

5 Sheets—Sheet 3.

F. I. FREEMAN.

ROLLING MILL.

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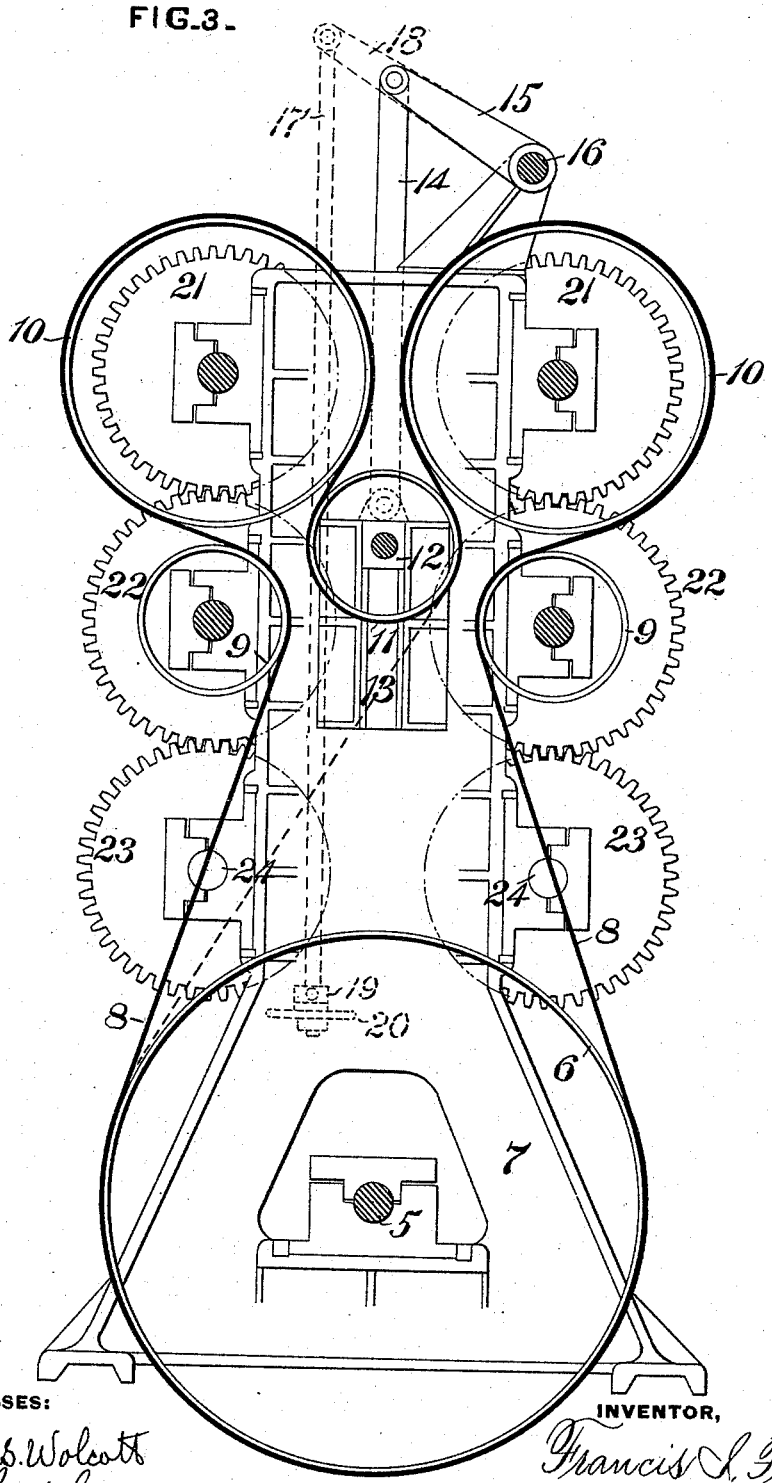
FIG. 3.



WITNESSES:

Dannie S. Wolcott

F. E. Gaither

INVENTOR,

Francis I. Freeman

by George H. Christy Att'y.

(No Model.)

5 Sheets—Sheet 4.

F. I. FREEMAN.

ROLLING MILL.

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FIG. 5.

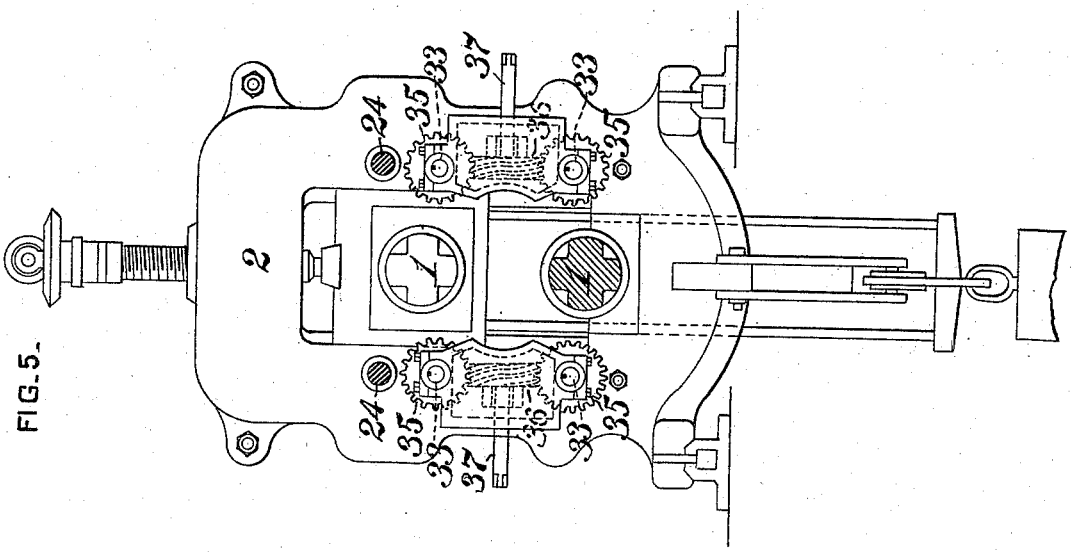
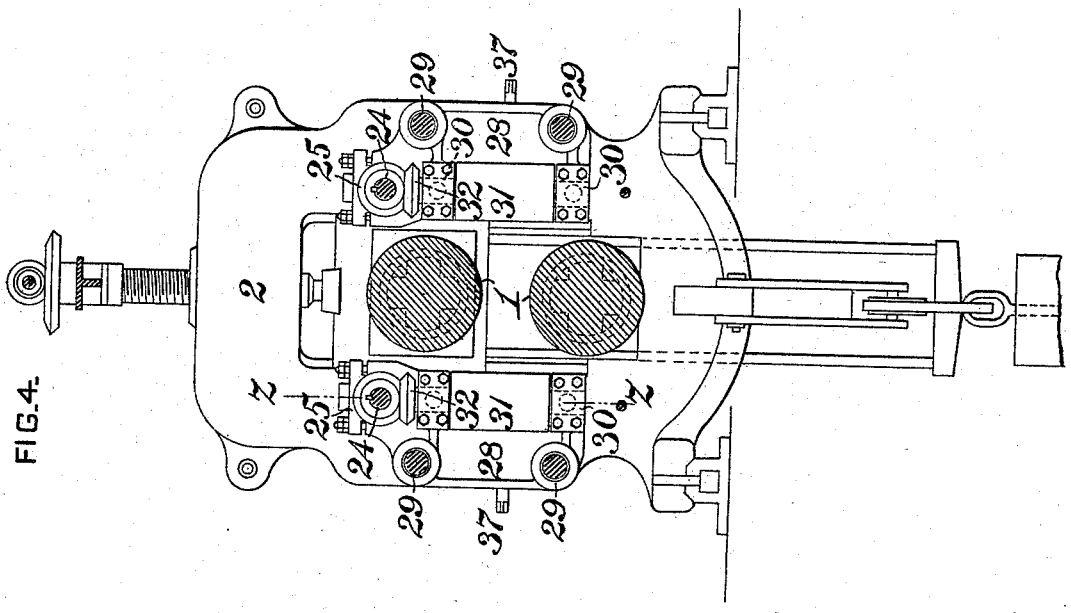


FIG. 4.



WITNESSES:

Darwin S. Wolcott
F. E. Gaither

INVENTOR,

Francis I. Freeman.
by George H. Christy
Att'y.

No Model.)

5 Sheets—Sheet 5.

F. I. FREEMAN.

ROLLING MILL.

No. 492,352. Patented Feb. 21, 1893.

FIG. 6.

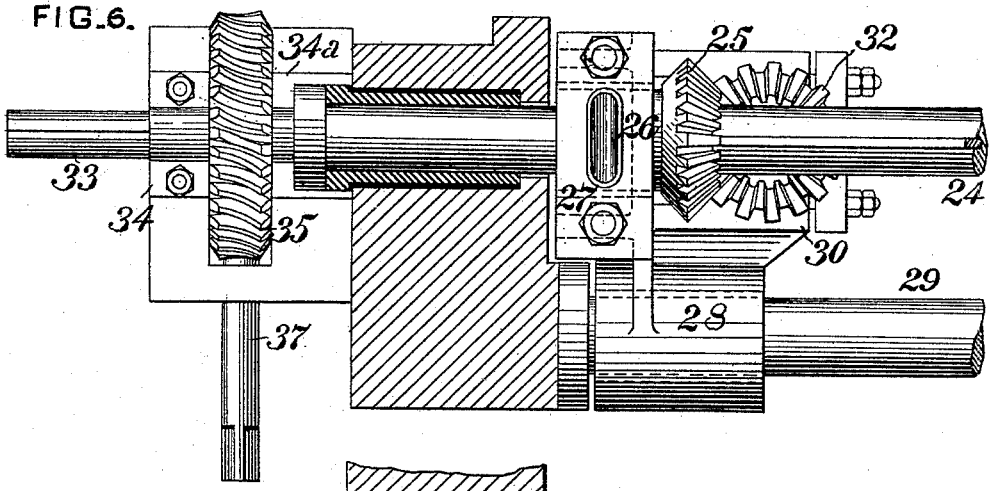
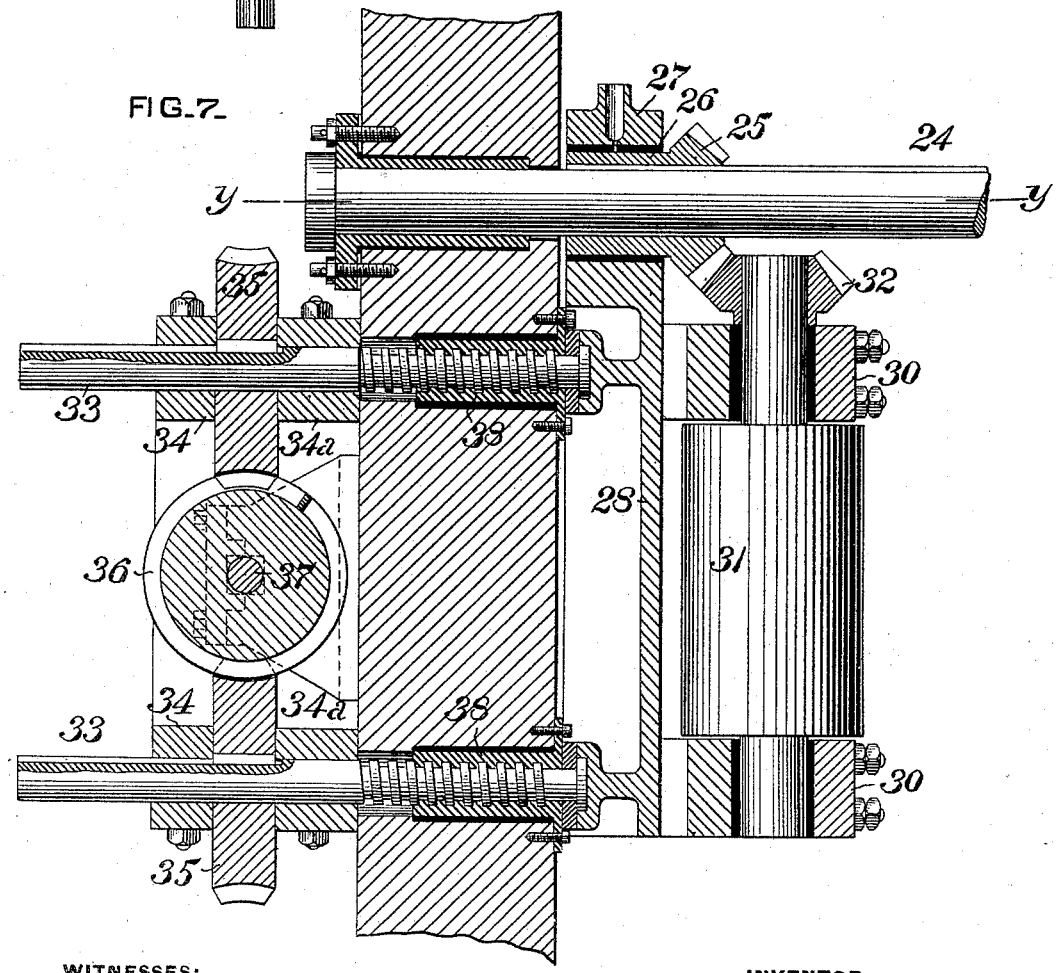


FIG. 7.



WITNESSES:

Dannie L. Wolcott

F. E. Gaither.

INVENTOR,

Francis I. Freeman

by George N. Christy Att'y.

UNITED STATES PATENT OFFICE.

FRANCIS I. FREEMAN, OF PITTSBURG, PENNSYLVANIA, ASSIGNOR TO THE TOTTEN & HOGG IRON AND STEEL FOUNDRY COMPANY, OF SAME PLACE.

ROLLING-MILL.

SPECIFICATION forming part of Letters Patent No. 492,352, dated February 21, 1893.

Application filed April 22, 1892. Serial No. 430,212. (No model.)

To all whom it may concern:

Be it known that I, FRANCIS I. FREEMAN, a citizen of the United States, residing at Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented or discovered certain new and useful Improvements in Rolling-Mills, of which improvements the following is a specification.

The invention described herein relates to certain improvements in universal mills, and has for its object a construction of driving mechanism for the vertical rolls, whereby the speed of such rolls is automatically adjusted in accordance with the rapidity of feed of the articles passing through the mill.

In general terms the invention consists in the construction and arrangement, substantially as hereinafter more fully described and particularly claimed.

In the accompanying drawings forming a part of this specification, Figure 1 is a front elevation of a universal mill embodying my invention. Fig. 2 is a side elevation of the mechanism for driving the vertical rolls. Fig. 3 is a sectional elevation of the same. Fig. 4 is a sectional elevation of the mill, the plane of section being indicated by the line *x*, *x*, Fig. 1. Fig. 5 is an end elevation of the mill. Fig. 6 is a horizontal section, the plane of section being indicated by the line *y*, *y*, Fig. 7, and Fig. 7 is a vertical section on the line *z*, *z*, Fig. 4.

In the practice of my invention the horizontal rolls 1 are mounted in the housings 2 in the usual or any suitable manner, and have suitable connections 3 with the driving shafts 4. As shown in Fig. 1, the neck of the lower roll is connected to the shaft 5 of the pulley 6, said shaft being mounted in suitable bearings in a frame 7, secured to suitable foundations adjacent to the mill. A belt 8 is passed around the pulley 6 loosely mounted guide pulleys 9, and pulleys 10, whose shafts are mounted in suitable bearings at the top of the frame. The tension of the belt is regulated by a pulley 11, having the ends of its shaft mounted in blocks 12 arranged in guides 13 formed in the sides of the frame, as shown in Figs. 2 and 3. These blocks are moved up and down by means of rods 14, having their upper ends connected to arms 15 on the shaft 16. This shaft is oscillated by means of a rod 17 having its upper end connected to an arm 18 on the shaft 16, and its lower end guided by a lug 19, against which the wheel nut 20 on the threaded lower end of the rod 17 bears. On one end of the shafts of the pulleys 10 are keyed gear wheels 21, which intermesh with idlers 22 and these in turn mesh with the gear wheels 23, on the shafts 24. These shafts 24 extend through and have suitable bearings in the housings 2, as shown in Figs. 1 and 6. On the shafts 24 within the housings are keyed the bevel pinions 25 in such manner that while rotating with the shafts they will be free to move along them. These pinions have hubs 26 which are mounted in bearings 27 formed on the upper ends of the carriages 28, which are supported by and slide along round rods 29, having their ends secured in the housings, as shown in Figs. 1 and 3. On the inner faces of the carriages are formed bearings 30 for the vertical rolls 31, having beveled pinions 32 adapted to intermesh with the pinions 25, secured to their upper ends.

The carriages are adjusted in and out by means of threaded rods 33 passing through nuts 38 arranged within the housings and through bearings 34, attached to the outer faces of the housings, and on the rods 33 between the bearings 34, 34ª, are placed the worm wheels 35 which are so keyed to the rods as to rotate them, while permitting the rods to slide along. The worm wheels intermesh with the worms 36 on the shafts 37, which are rotated by a wrench or other suitable means.

It will be observed by reference to Figs. 2 and 3 that the pulleys 10 being smaller than the pulley 6, will be driven at a higher speed than the pulley, which is rotated at the same speed as the horizontal rolls 1. As the gear wheels 21, 22 and 23 have equal diameters, it follows that both pairs of vertical rolls 31 will be normally driven at the same speed and that such speed will be higher than that of the horizontal rolls. The relative speeds of the horizontal and vertical rolls are so adjusted that the higher speed of the vertical rolls will compensate for the elongation of an article passing through the mill.

As compensation is only necessary in the set of rolls operating after the horizontal rolls it follows that the pair of vertical rolls operating prior to the horizontal rolls will be driven at too high a speed, *i. e.* faster than the metal can pass through the horizontal rolls, but as both pairs of vertical rolls are frictionally driven by the belt 8, the pulleys connected with the pair of vertical rolls operating prior to the horizontal rolls, can slip on the belt when said rolls are retarded by the article in the horizontal rolls. As each pair of vertical rolls have independent connections to the belt, it is evident that the slipping of the driving pulleys of one set of vertical rolls will not affect the speed of the other set of rolls. And as both pairs of vertical rolls are normally driven at a higher speed than the horizontal rolls, and as said rolls will automatically adjust themselves to the speed of the article, it is immaterial from which side of the mill the article is fed.

It is a characteristic of this invention that by employing a mechanism dependent upon friction for its operation, for driving the vertical rolls, both sets or pairs of rolls may be driven by the same power, and provision is made for the automatic adjustment of the speeds of the rolls as circumstances may require.

As each vertical roll is independently adjustable it is evident the rolls of one pair may be adjusted for non-use if desired. In mills having only one pair of vertical rolls, one set of pulleys and gearing of the frictional driving mechanism is employed, the belt being arranged if desired as indicated by dotted lines in Fig. 3.

By reference to Figs. 6 and 7, it will be observed that the bearings 27 and 30 for the vertical rolls and their driving shafts are provided with removable caps to facilitate the adjustment of said parts. By forming the bearings 27 and 20 in the carriage, the bevel pinions 25 and 32 are held firmly in engagement with each other.

It is preferred to form the guide rods 29 round in cross-section, as scale and other dirt will not readily lodge therein, and such rods are cheaper in construction.

I claim herein as my invention—

1. In a rolling mill the combination of a pair of horizontal rolls, a pair of vertical rolls, driving mechanism and a frictional connection for transmitting motion from the driving mechanism to the vertical rolls and constructed to drive the vertical rolls at a normally higher peripheral speed than that of the horizontal rolls, substantially as set forth.

2. In a rolling mill, the combination of two pairs or sets of vertical rolls, a pair of horizontal rolls arranged between the pairs of vertical rolls, driving mechanism and a frictional connection from the driving mechanism to the vertical rolls, and adapted to drive the vertical rolls at a normally higher peripheral speed than that of the horizontal rolls, substantially as set forth.

3. In a rolling mill, the combination of a pair of horizontal rolls, a pair of vertical rolls and a frictional mechanism connecting the vertical and horizontal rolls, and constructed to drive the vertical rolls at a normally higher speed than that of the horizontal rolls, substantially as set forth.

4. In a rolling mill, the combination of two pairs of vertical rolls, a pair of horizontal rolls arranged between the pairs of vertical rolls and frictional mechanism connecting the vertical and horizontal rolls and constructed to drive both pairs of vertical rolls at the same peripheral speed, which is normally higher than that of the horizontal rolls, substantially as set forth.

In testimony whereof I have hereunto set my hand.

FRANCIS I. FREEMAN.

Witnesses:
DARWIN S. WOLCOTT,
R. H. WHITTLESEY.