(No Model.)

4 Sheets—Sheet 1.

L. D. YORK.

ROLLING APPARATUS.

No. 410,724. Patented Sept. 10, 1889.

Fig 9.

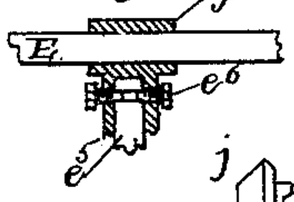


Fig 1.

WITNESSES:

Wm. H. Robinson

C. R. Ferguson

INVENTOR

Levi D. York.

BY Gifford & Brownell

ATTORNEYS

(No Model.) 4 Sheets—Sheet 2.

L. D. YORK.

ROLLING APPARATUS.

No. 410,724. Patented Sept. 10, 1889.

Fig 7.

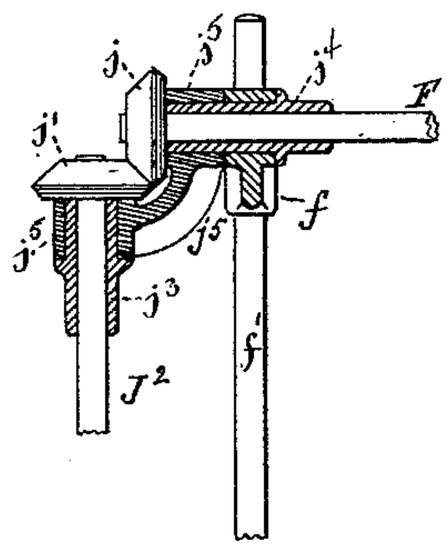


Fig 8

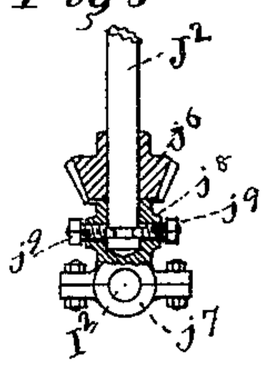


Fig 2.

WITNESSES:

Wm. H. Robinson

C. R. Ferguson

INVENTOR

Levi D. York.

BY Gifford & Brown

ATTORNEYS

(No Model.)

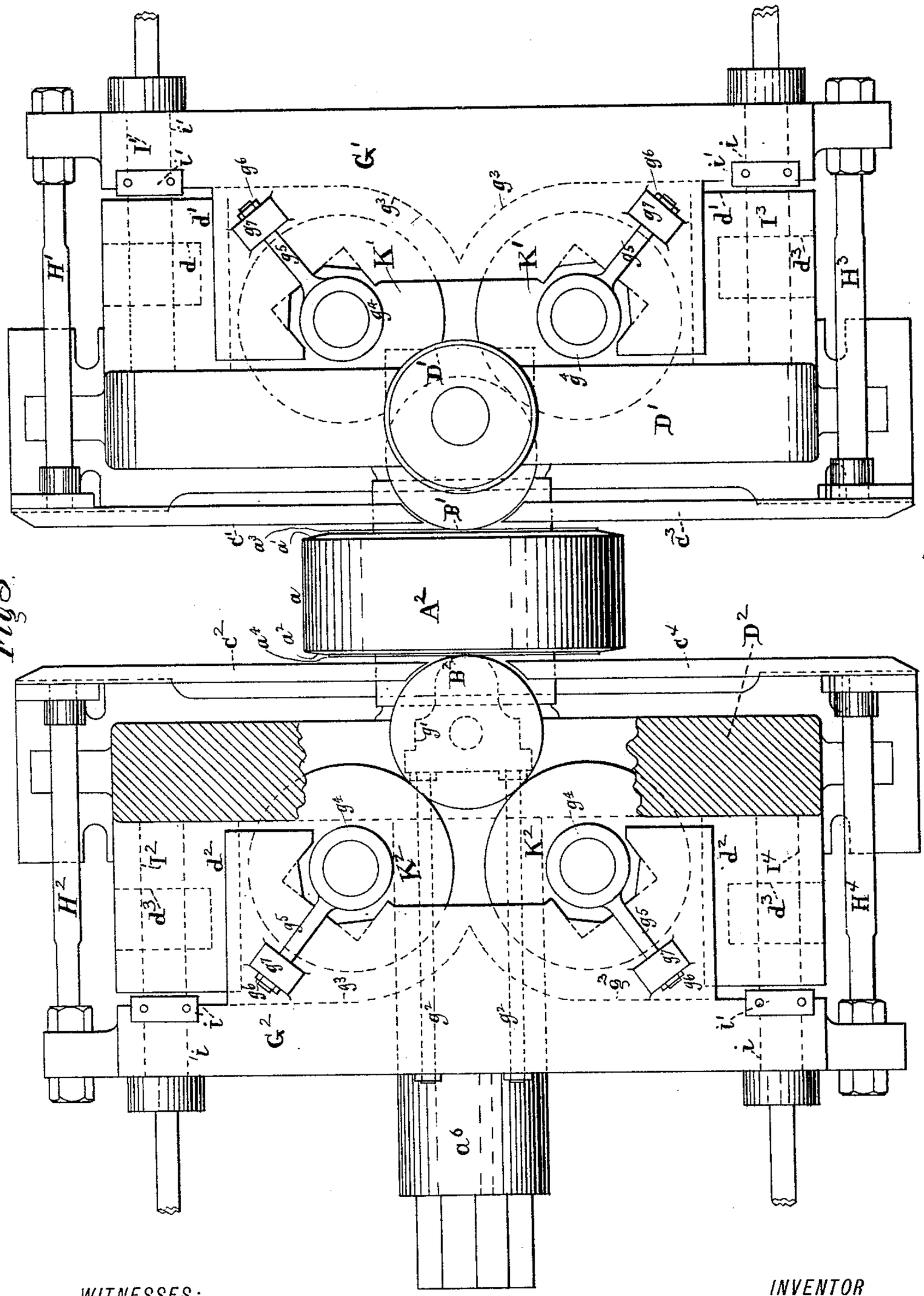
4 Sheets—Sheet 3.

L. D. YORK.

ROLLING APPARATUS.

No. 410,724. Patented Sept. 10, 1889.

Fig 3.



WITNESSES:

Wm. H. Robinson.

C. R. Ferguson

INVENTOR

Levi D. York

BY Gifford & Brownell

ATTORNEYS

(No Model.) 4 Sheets—Sheet 4.

L. D. YORK.

ROLLING APPARATUS.

No. 410,724. Patented Sept. 10, 1889.

Fig 4

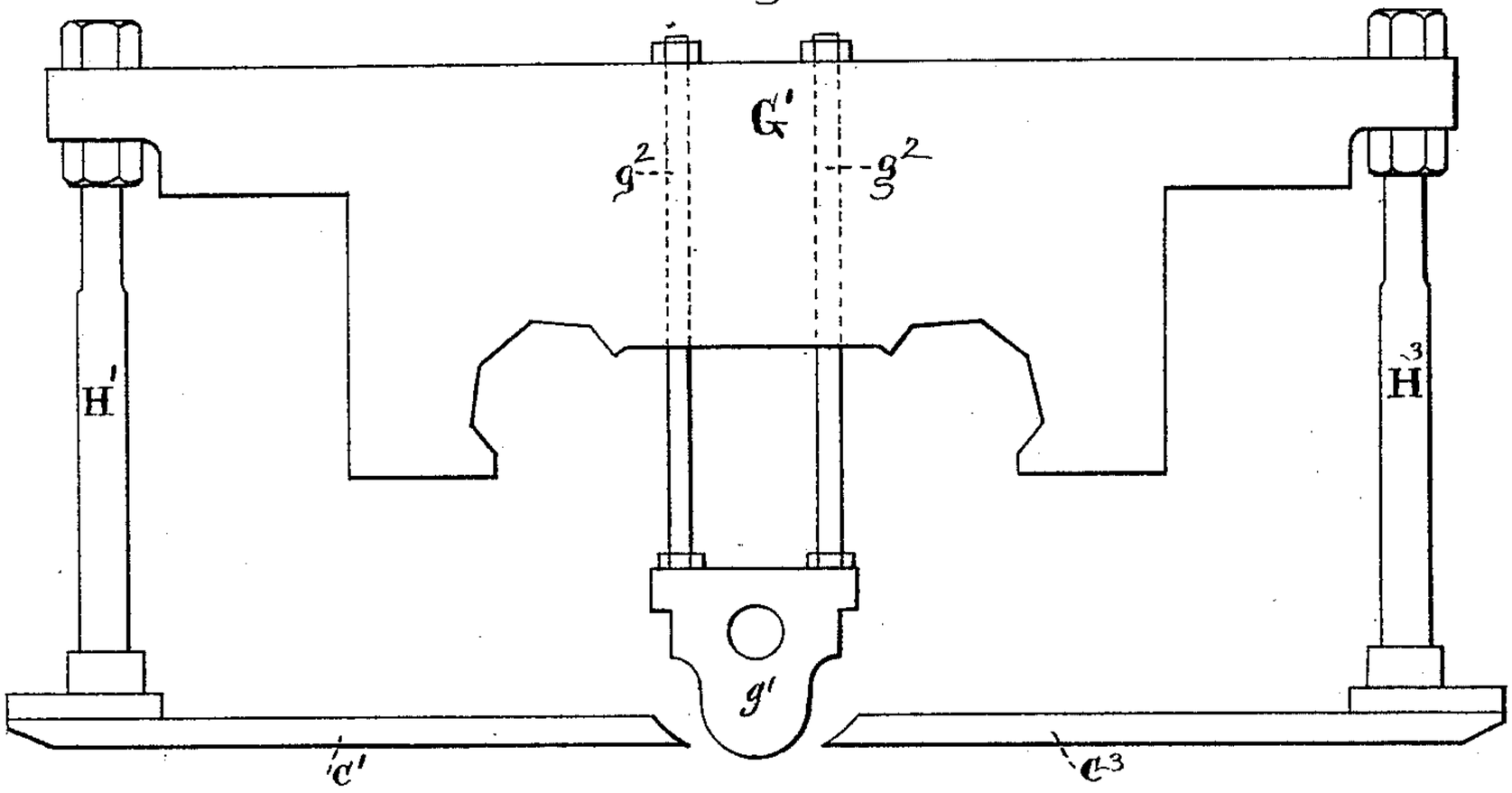


Fig 6

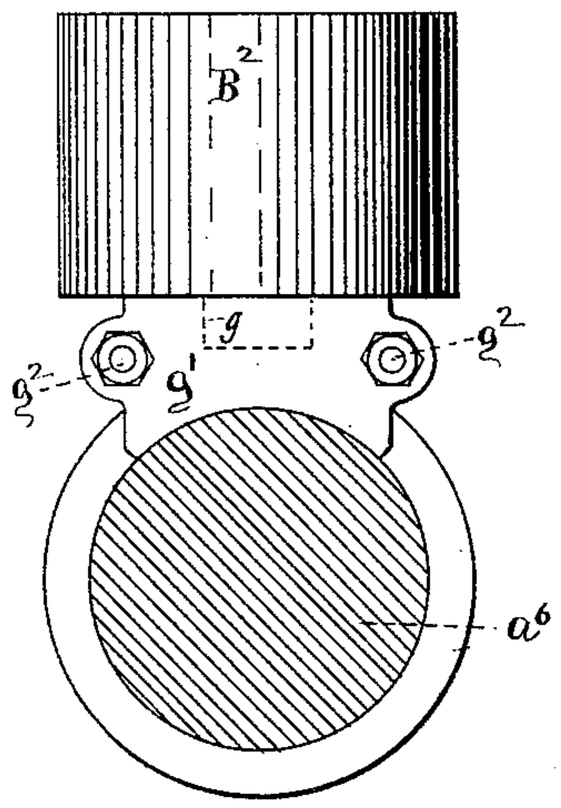
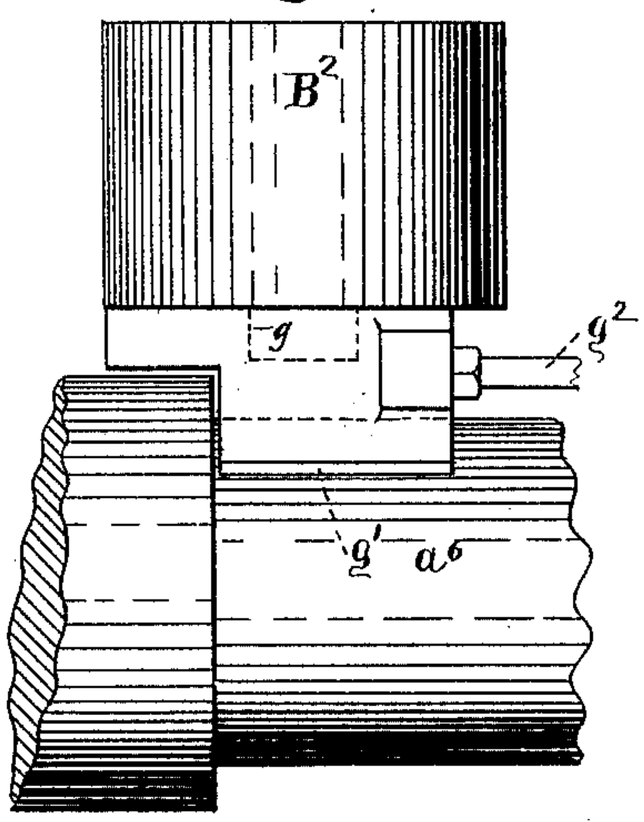


Fig 5



WITNESSES:

Wm. H. Robinson

C. R. Ferguson

INVENTOR

Levi D. York

BY Gifford & Brownell

ATTORNEYS

UNITED STATES PATENT OFFICE.

LEVI D. YORK, OF PORTSMOUTH, OHIO, ASSIGNOR OF ONE-HALF TO JAMES EDWIN YORK, OF ASHLAND, WISCONSIN.

ROLLING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 410,724, dated September 10, 1889.

Application filed March 23, 1889. Serial No. 304,556. (No model.)

To all whom it may concern:

Be it known that I, LEVI D. YORK, of Portsmouth, in the county of Scioto and State of Ohio, have invented a certain new and useful Improvement in Rolling Apparatus, of which the following is a specification.

I will describe an apparatus embodying my improvement, and then point out the novel features in the claim.

In the accompanying drawings, Figure 1 is a front elevation of an apparatus embodying my improvement, certain parts being shown in section. Fig. 2 is an end elevation of the same. Fig. 3 is a partial plan and a partial horizontal section. Fig. 4 is a plan view of a sliding block which serves to effect the adjustment of one of the side rolls. Fig. 5 is a side view of one of the side rolls, a block by which it is adjusted, and a portion of the lower roll. Fig. 6 is a transverse section of a portion of the lower roll, a side view of one of the side rolls, and an end view of the block by which such side roll is adjusted. Fig. 7 is a sectional elevation of certain parts of the gearing. Fig. 8 is a sectional elevation of certain other parts of the gearing. Fig. 9 is a detail.

Similar letters of reference designate corresponding parts in all the figures.

A′ A^2 B′ B^2 designate rolls, which together are adapted to roll a bar of desired shape. The rolls A′ A^2 are arranged one above the other, their axial lines being in a horizontal plane. The rolls B′ B^2 are arranged opposite one another and adjacent to the sides of the rolls A′ A^2, the axes of said rolls B′ B^2 being vertical.

In the present example of my improvement the rolls are adapted to the production of what are commonly known as "I-beams" or "girders," but this form I have adopted as a mere matter of illustration, for the principle of my invention is not merely applicable to the rolling of this particular form of bar. It will be seen that the rolls A′ A^2 have main portions a of cylindric form, angular portions a' a^2 at the sides of the cylindric portions, and smaller portions a^3 a^4 at the sides of the angular portions a' a^2. These smaller portions a^3 a^4 may be substantially cylindrical.

Reference to Fig. 1 will make it apparent that the rolls will produce an I-beam or girder with the web in a horizontal position, and it will be readily seen that the cylindric portions a of the rolls A′ A^2 form the web or body of said beam or girder, that the angular portions a' a^2 of said rolls form the inner or opposite sides of the flanges of the beam or girder, and that the smaller cylindric portions a^3 a^4 form the edges of the flanges. The outer sides of the flanges or heads of the beam or girder are formed by the rolls B′ B^2. There are combined with these rolls guides C′ C^2 C^3 C^4. These guides are represented as extending horizontally, but their faces are vertical. The material may be passed to the rolls from either side, and hence may be guided into the rolls either by the guides C′ C^2 or by the guides C^3 C^4. One pair of guides will always serve to direct the material properly from the rolls after the rolling.

An adjustment between the two rolls A′ A^2 is provided. I have shown this as attained by making the upper roll A′ vertically adjustable. There is also an adjustment between the rolls B′ B^2 and the guides in the different pairs, this being attained in the present instance by making both the rolls B′ B^2 and the opposite guides adjustable toward and from each other. The adjustments which I have provided adapt the apparatus to work of different kinds and sizes.

Having now given a general explanation of the rolls and guides, I will proceed to give a detailed description of the apparatus which I have illustrated.

The lower roll A^2 has its journals a^5 a^6 supported in journal-boxes arranged in two side frames D′ D^2. It will be observed that the journal a^6 extends a considerable distance beyond the journal-box wherein it is supported, and that at the outer extremity it is shaped to interlock with a coupling for connecting it with another shaft arranged in line with it, such shaft being the means of imparting rotary motion to it.

The roll A′ has its journals a^7 a^8 supported upon bars a^9 extending horizontally beneath them. These bars are simply for taking the weight of the roll, and are sustained by ver-

tical rods a^{10}, passing downwardly from them and connected at the lower ends by links a^{11} with levers a^{12}, which are fulcrumed to the base portion of the apparatus and have attached to them weights a^{13}. These weights are somewhat heavier than the roll A′ and its journals and other appurtenances; hence they will always elevate said roll and its appurtenances when the force ordinarily exercised to hold said roll and its appurtenances down shall be relaxed.

Above the journals a^7 a^8 of the roll A′ are half-boxes a^{14}, which serve to resist the upward movement of the roll, and therefore to exert upon the roll the pressure which is requisite for the rolling operations. The side frames D′ D² are of open construction, so as to constitute housings *d*. The edges of these half-boxes a^{14} are fitted to the edges of the housings *d*, and are guided by the latter when moved up and down.

Above the boxes a^{14} are screws E′ E². These screws extend through the upper portions of the side frames D′ D², above the housings therein, and engage with nuts which are fitted into these portions of the side frames. By rotating these screws in one direction they may be made to force the boxes a^{14} downwardly, and by so doing force the roll A′ and its appurtenances downwardly, so as to reduce the space between this roll and the opposite roll A². If the screws are rotated in the reverse direction, they will allow the roll A′ and its appurtenances to rise and so increase the space between it and its fellow A².

The upper ends of the screws E′ E² are shown as having affixed to them bevel gear-wheels e' e^2. These bevel gear-wheels engage with bevel gear-wheels e^3 e^4, affixed to a shaft F, extending transversely to the length of the screws. The shaft F constitutes a driving-shaft for the mechanism employed to effect the adjustment of the roll A′ and also the adjustment of other parts, as will hereinafter be explained. I have shown the shaft F as provided with a wheel F′, that may be operated by hand to rotate the shaft. The shaft may, however, if preferred, be combined with means enabling it to be operated by power.

The shaft F is supported in bearings *f*, which are provided with suitable boxes for receiving the shaft and which are fitted to vertical rods *f′* in such manner that they may slide up and down along said rods. These rods *f′* are supported on horizontal sliding blocks G′ G². I may remark in passing that these horizontal sliding blocks G′ G² serve to support the rolls B′ B². The shaft obviously is raised and lowered when the bearings *a* are elevated and lowered. This raising and lowering of the shaft F is provided to enable it to always maintain its relations with the screws E′ E² regardless of change in position of the latter brought about by rotating them for the purpose of adjusting the upper roll A′.

The shaft F is coupled to the screws E′ E² by coupling-pieces f^2 (here shown as consisting of collars fitting the shaft loosely) and transverse tubular extensions extending over cylindric extensions e^5 at the upper ends of the screws above the gear-wheels e' e^2. The cylindric extensions e^5, where they fit within the coupling-pieces, have circumferential grooves. Screws e^6, passing through the coupling-pieces and extending into the said circumferential grooves, fasten the coupling-pieces and the screws E′ E² together, while still permitting the screws to rotate. It will be observed that the journal a^8 of the roll A′ extends considerably beyond the bar a^9, upon which it rests, and that at the outer extremity it is constructed to interlock with a coupling serving to connect it to a shaft, whereby rotary motion will be imparted to it.

As the shafts which are employed to drive the rolls A′ A² may be of ordinary kind, I have not deemed it necessary to illustrate them, and I shall not further describe them, saving only to add that the shaft which drives the roll A′ may be supported in such a manner that it may assume inclined positions to adapt it to the raising and lowering of said roll.

The side frames D′ D² have extending from their outer sides lateral projections d' d^2, the side frame D′ having two parallel and opposite lateral projections *d′*, one near the front edge and one near the rear edge, and the side frame D² having similar projections d^2. The sliding block D′ has its inner portion, or, in other words, that portion which is nearest the rolls A′ A², fitted between the two lateral projections *d′* of the side frame D′. The adjacent surfaces of the projections *d′* and inner portion of the block G′ are rabbeted and grooved, so as to form shears or ways along which the block G′ may slide toward and from the rolls A′ A². The outer portion of the block G′ extends beyond the ends of the projections *d′*, and at the extremities has affixed to it, beyond the said projections *d′*, rods H′ H³. These rods H′ H³ are secured to the guides C′ C³; hence, whenever motion is imparted to the blocks G′, a corresponding motion will be imparted to the guides C′ C³.

The sliding block G² is constructed like the sliding block G′ and is fitted to the projections d^2 of the side frame D² in a manner similar to that in which the block G′ is fitted to the projections *d′* of the side frame D′. Rods H² H⁴ are at one end secured to the extremities of the outer portion of the block G² beyond the projections d^2 of the side frame D², and at the other end these rods H² H⁴ are secured to the guides C² C⁴, so that when the block G² is moved the guides C² C⁴ will be similarly moved.

The lateral projections d' d^2 of the side frames D′ D² are provided with pockets d^3, into which are fitted nuts for engaging with screws I′ I³ I² I⁴. These screws are provided with plain shanks, which fit in bearings *i* in

the sliding blocks G′ G². The shanks of the screws are provided with circumferential grooves. With these grooves engage the forked ends of plates *i′*, which are secured to the sliding blocks. The screws are thus secured to the sliding blocks, so as to be incapable of longitudinal movement independently of the sliding blocks. Owing to this it will be obvious that when the screws are rotated the nuts will cause them to move longitudinally, and their longitudinal movement will impart a movement to the sliding blocks toward or from the rolls A′ A², according to the direction in which the screws are rotated.

The screws I² I⁴ are provided with bevel gear-wheels *i²*. The gear-wheels engage with bevel gear-wheels *i³*, affixed to a shaft I⁵. In this manner the screws I² I⁴ are secured together. In like manner the screws I′ I³ are provided with bevel gear-wheels engaging with other bevel gear-wheels on a shaft corresponding to the shaft I⁵, and are thus geared to operate in unison. The pair of screws I² I⁴ are driven through a shaft J² from the shaft F. The screws I′ I³ are similarly driven through a shaft J′ from the shaft F. It will be seen, therefore, that the two pairs of screws are driven in unison and correspondingly, and from this it will be obvious that the rolls B′ B² and guides C′ and C³ and C² and C⁴ will be moved correspondingly toward or away from the rolls A′ A².

The side frames D′ D² have formed in their opposite or adjacent sides recesses *d*¹⁰ for the accommodation of the guides when they are adjusted as far as they can be adjusted away from each other.

The shaft F is provided at the ends with bevel gear-wheels *j*, which engage with bevel gear-wheels *j′*, affixed to rotate with the shafts J′ J². The gear-wheels *j′* have long hubs *j*³ and are engaged by feathers or splines with the shafts J′ J²; hence they may slide along the shafts J′ J² when the shaft F is raised and lowered through the action of the screws E′ E², and yet will rotate the shafts J′ J². The gear-wheels *j* have long hubs *j*⁴, formed with or secured to them, and are engaged with the shaft F by feathers, so that this shaft shall be incapable of rotating without imparting rotary movement to them, and withal so that they can slide lengthwise of the said shaft F. The boxes or bearings *f*, which receive the shaft F and are free to slide along the rods *f′*, embrace the hubs *j*⁴ of the bevel-wheels *j;* hence when the sliding blocks G′ G², which carry the rods *f′*, move toward and from the rolls A′ A² the bevel-wheels *j* will be moved correspondingly along the shaft F. The hubs *j*⁴ of the bevel-wheels *j* are also embraced by yokes *j*⁵, and these yokes embrace the hubs *j*³ of the bevel-wheels *j′*. These yokes are so connected with the hubs of the bevel-wheels that there can be no relative movement between the yokes and hubs of the wheels, saving only as regards a rotary movement of the wheels. These yokes cause the bevel-wheels *j′* to slide along the shafts J′ J² when the shaft F is raised and lowered by the action of the screws E′ E².

It will be understood that when the shaft F is rotated it will, by operating the screws E′ E², adjust the upper roll A′ relatively to its fellow A², and also adjust the rolls B′ B² and the opposite pairs of guides C′ C³ and C² C⁴ laterally with relation to the rolls A′ A². By this means the several rolls and the guides may be adjusted into positions adapting them for successive rollings of any given bar or mass of metal for the purpose of reducing it to a bar, beam, or girder of desired configuration.

At the lower end the shafts J′ J² are provided with bevel gear-wheels *j*⁶, which are engaged with them by means of keys and engage with and impart motion to the bevel-wheels *i²* on the screws I′ I². Around the shanks of the screws I′ I² are collars *j*⁷. These are shown as severally made in two sections secured together by bolts. They are severally provided with sockets *j*⁸, receiving the ends of the shafts J′ J². These shafts J′ J² are provided near the lower ends, where they enter the sockets, with circumferential grooves, and the sockets are provided with screws *j*⁹, which enter the circumferential grooves, thus securing the shafts J′ J² within the sockets, and thereby connecting them with the shanks of the screws I′ I².

By means of the connections, which have been just described, for securing the bevel gear-wheels *j*⁶ in operative engagement with the bevel-wheels *i²* it is possible to disconnect the said wheels *j*⁶, elevate them and their shafts J′ J², then make adjustments of the screws, which are driven through the shafts J′ J², and afterward restore the connections, so as to make the said screws again operative through the shafts J′ J². This is advantageous, because where a different shaped or sized bar is to be produced the mechanism will be reorganized or specially adapted to the doing of that work and afterward restored to such operative condition that all the adjustments can be effected by the rotation of the shaft F.

Now a description will be given of the manner in which the rolls B′ B² are supported and how they are adjusted through the adjustment of the sliding blocks G′ G². Each of these rolls B′ B² is shown as having a single journal *g*, and this is located on the bottom and fits in a block *g′*. The blocks *g′* of the rolls B′ B² rest on the journals *a*⁵ *a*⁶ of the roll A². To adapt them the better to do this they are curved on the under side to conform to the circumference of the journals. These blocks are connected by bolts *g²* with the sliding blocks G′ G², the block *g′* of the roll B′ being connected by bolts *g²* with the sliding block G′, and the block *g′* of the roll B² being connected by bolts *g²* with the sliding block G². The rolls B′ B² are not sup-

ported against the metal being rolled by their journals *g*. These journals are employed for securing the adjustment of the rolls. The rolls are sustained during work by rollers K′ K². There are two rollers K′, and they are arranged so as to bear upon the roll B′ at different points. They are arranged relatively to the roll B′ so that the axis of the roll B′ and the axes of the two rollers K′ are in the position of the point of the apices of a triangle. The roll B² is sustained by two rollers K², arranged with relation to it in the same manner as the rollers K′ are arranged relatively to the roll B′. The rollers K′ K² are supported in the sliding blocks G′ G². These blocks, in the sides which are toward the rolls A′ A², have pockets or recesses g^3 formed in them, and the rollers K′ K² extend into these pockets or recesses. The journals of the rollers K′ K² fit in half-boxes in the edges of the blocks G′ G², above and below the pockets or recesses g^3 thereof. I have shown collars g^4 fitted to the ends of the journals of the rollers K′ K² and connected by rods g^5 and nuts g^6 with lugs g^7, formed upon the blocks.

What is here claimed, and desired to be secured by Letters Patent, is—

1. In an apparatus for rolling metal, the combination of top and bottom rolls, side rolls, blocks with which the side rolls are connected, screws for effecting the adjustment of these blocks toward and from each other, screws for effecting the adjustment of the upper roll, a shaft driving the screws for effecting the adjustment of the upper roll, other shafts transmitting motion to the screws for effecting the adjustment of the blocks with which the side rolls are connected, the shaft whereby the screws for effecting the adjustment of the upper roll are driven being supported in vertically-sliding boxes, and the shafts for transmitting motion to the screws whereby the adjustments of the sliding blocks are effected being supported to slide in the direction of the length of the shaft which drives the screws for effecting the adjustment of the upper rolls, substantially as specified.

2. In an apparatus for rolling metal, the combination of top and bottom rolls, side rolls, movable blocks to which the side rolls are connected, side guides carried by said blocks, shafts, bevel-gear, and screw-connections, whereby an adjustment may be effected simultaneously between the several rolls, substantially as specified.

3. In an apparatus for rolling metal, the combination of the rolls A′ A², the screws E′ E², the shaft F, driving said screws, the side rolls B′ B², sliding blocks by which said rolls B′ B² are adjusted, screws for adjusting these blocks, and shafts J′ J², for driving the screws for adjusting the said blocks, the shaft F being supported in vertically-sliding bearings, and the shafts J′ J² being supported so as to move laterally correspondingly with the movement of the said blocks, substantially as specified.

4. In an apparatus for rolling metal, the combination of rolls A′ A², having long journals a^6 a^8, the screws E′ E², the shaft F, driving said screws, the side rolls B′ B², sliding blocks by which said rolls B′ B² are adjusted, screws for adjusting these blocks, and shafts J′ J², for driving the screws for adjusting the said blocks, the shaft T being supported in vertically-sliding bearings, and the shafts J′ J² being supported so as to move laterally correspondingly with the movement of the said blocks, substantially as specified.

5. In an apparatus for rolling metal, the combination of upper and lower rolls, side rolls having curved bearings on the journals of the lower roll, adjustable blocks for effecting the adjustment of the side rolls, and rollers supported by said blocks and sustaining the side rolls, substantially as specified.

6. In an apparatus for rolling metal, the combination of upper and lower rolls, screws for adjusting said rolls, loosely-running side rolls, adjustable blocks for effecting the adjustment of the side rolls, loosely-running rollers supported by said blocks and sustaining the side rolls, and gearing operating to adjust the rolls together, each of the side rolls and the rolls which sustain it being arranged in the apices of a triangle, substantially as specified.

7. In an apparatus for rolling metal, the combination of upper and lower rolls, side rolls, adjustable blocks *g′*, receiving journals with which the side rolls are provided, sliding blocks G′ G², connected with the blocks *g′*, and rollers K′ K², supported in the sliding blocks G′ G², substantially as specified.

8. In an apparatus for rolling metal, the combination of the top and bottom rolls, the adjustable side rolls, sustaining-rollers, sliding blocks supporting the sustaining-rollers, and blocks supporting the side rolls connected to the blocks supporting the sustaining-rollers, so as to be capable of moving independently of the blocks sustaining the side rolls away from the top and bottom rolls, substantially as specified.

9. In an apparatus for rolling metal, the combination of the top and bottom rolls, the adjustable side rolls having journals at their lower ends only, and supporting-blocks beneath the side rolls receiving their journals and sliding on the journals of the bottom roll, substantially as specified.

10. In an apparatus for rolling metal, the combination of positively-rotating top and bottom rolls, freely-turning side rolls, and freely-turning sustaining-rolls for said side rolls, substantially as specified.

LEVI D. YORK.

Witnesses:
JAMES E. YORK,
EDWIN H. BROWN.

Correction in Letters Patent No. 410,724.

It is hereby certified that in Letters Patent No. 410,724, granted September 10, 1889, upon the application of Levi D. York, of Portsmouth, Ohio, for an improvement in "Rolling Apparatus," an error appears in the printed specification requiring the following correction: In line 75, page 4, the reference letter "T" should read *F;* and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed, countersigned, and sealed this 24th day of September, A. D. 1889.

[SEAL.]

CYRUS BUSSEY,
Assistant Secretary of the Interior.

Countersigned:

C. E. MITCHELL,
Commissioner of Patents.