(No Model.) 4 Sheets—Sheet 1.

C. L. FITZHUGH, J. Z. SPEER & S. S. BABBITT.

ROLLING MILL.

No. 496,084. Patented Apr. 25, 1893.

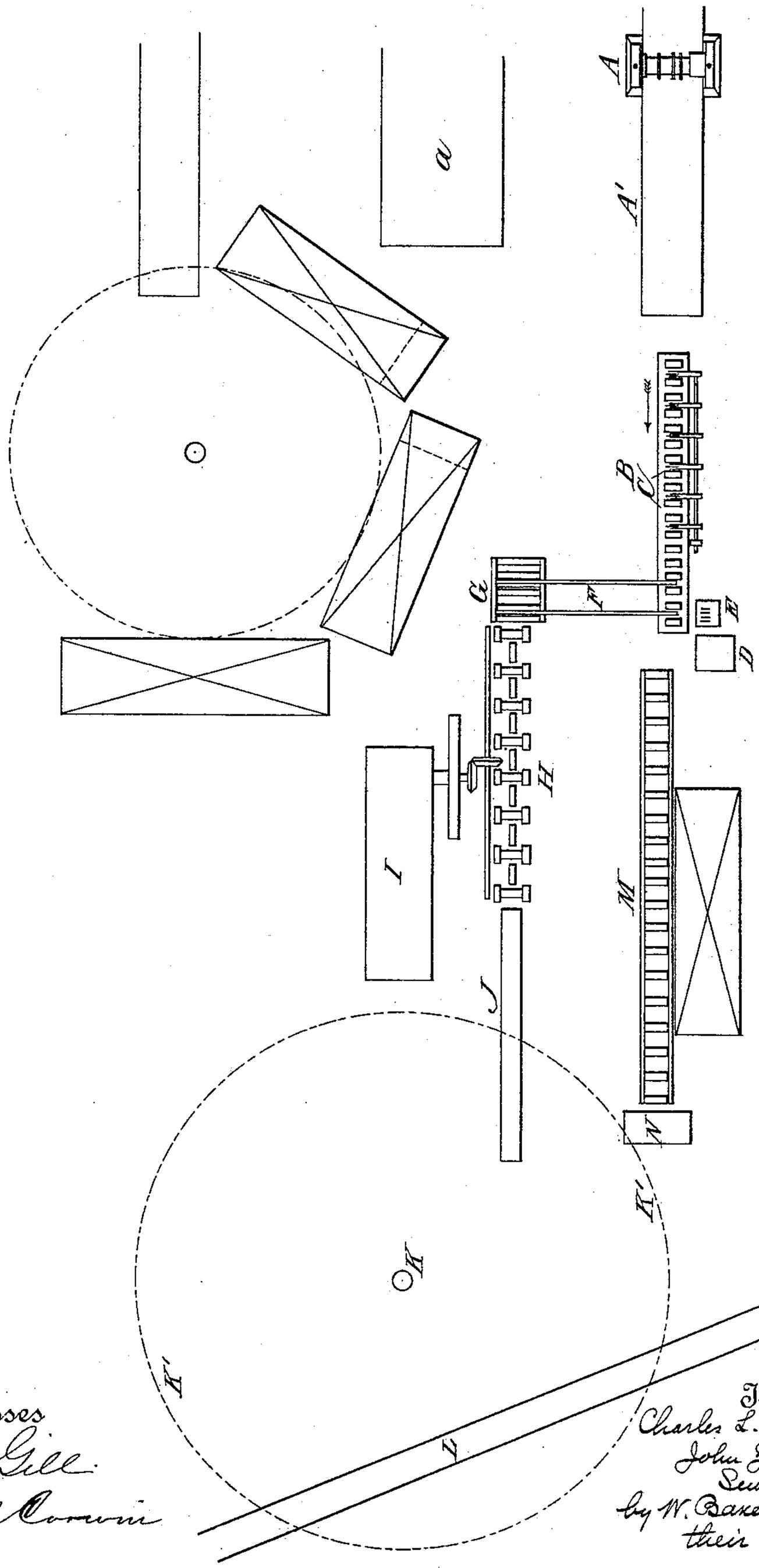

Fig. 1.

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(No Model.) 4 Sheets—Sheet 2.

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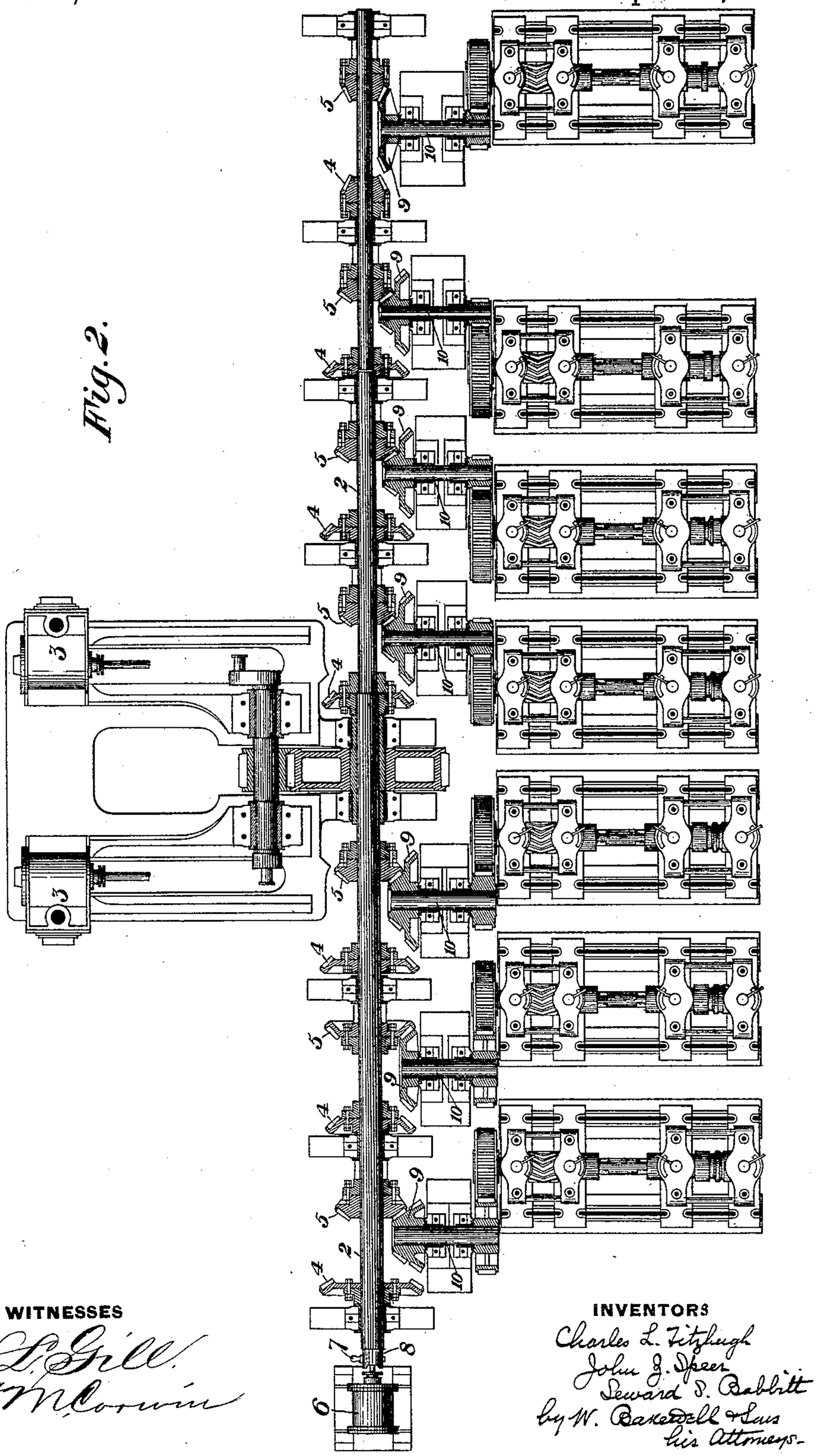
ROLLING MILL.

No. 496,084. Patented Apr. 25, 1893.

Fig. 2.



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(No Model.) 4 Sheets—Sheet 3.

C. L. FITZHUGH, J. Z. SPEER & S. S. BABBITT.

ROLLING MILL.

No. 496,084. Patented Apr. 25, 1893.

Fig. 3.

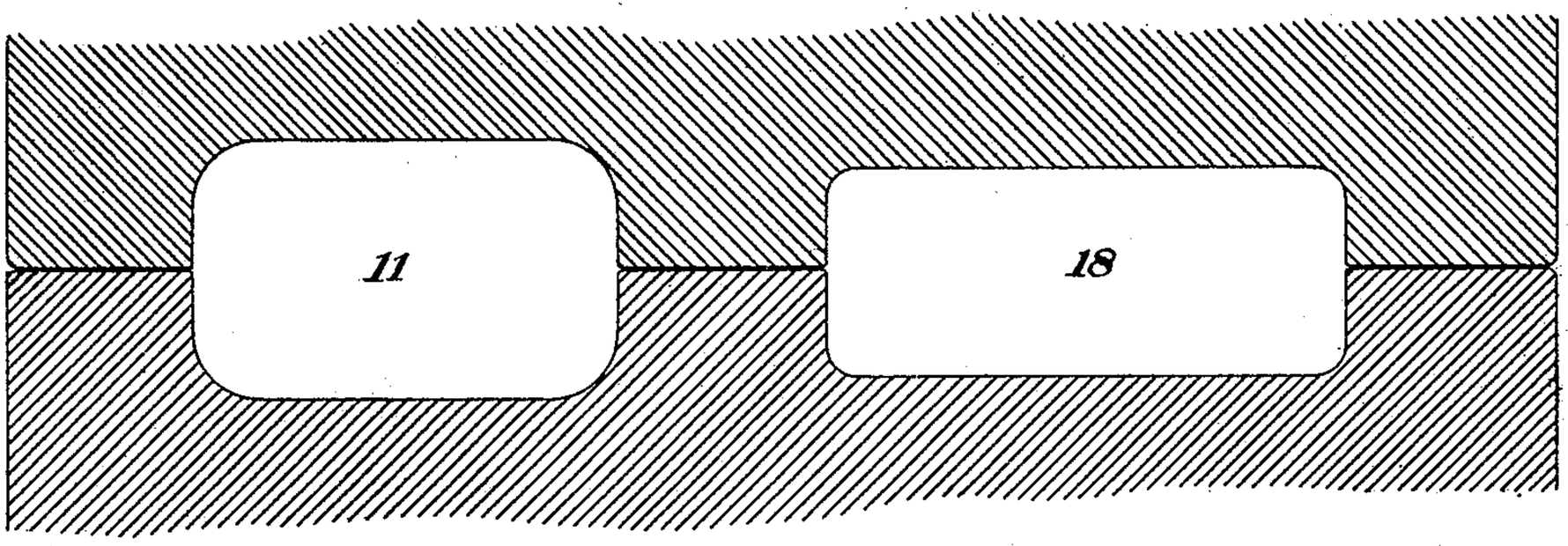


Fig. 4.

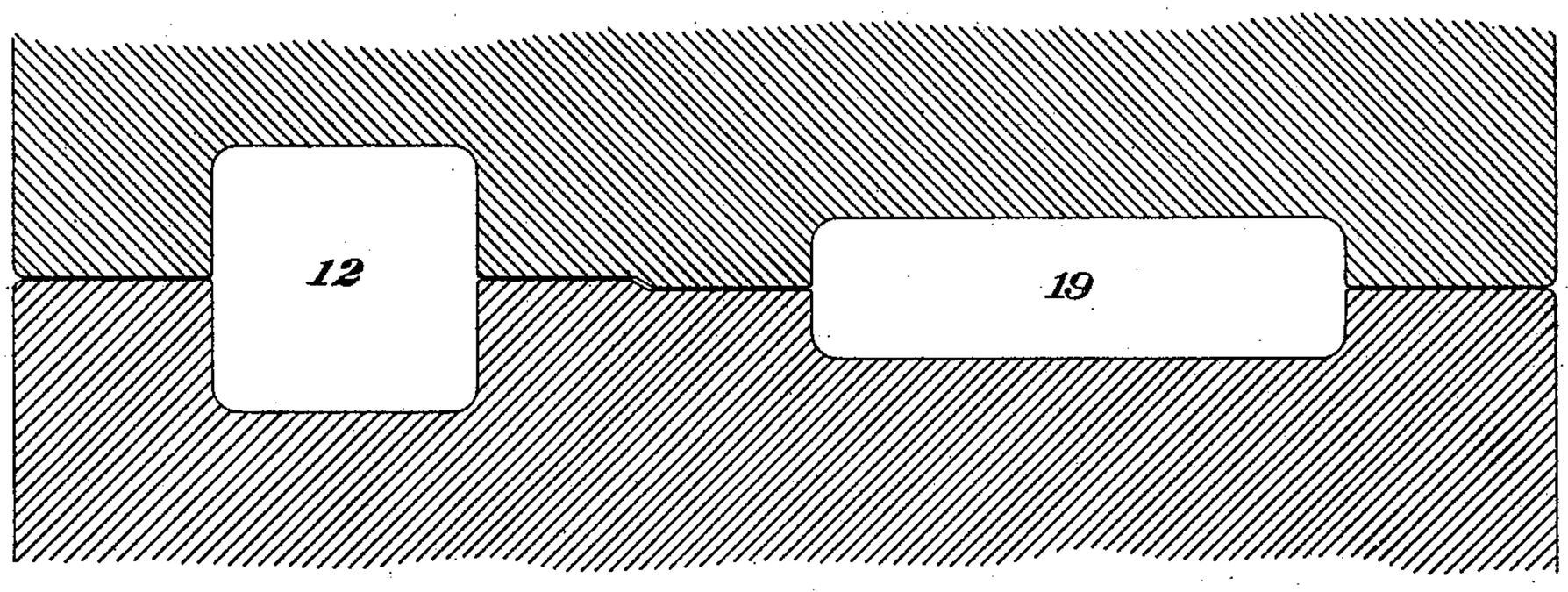
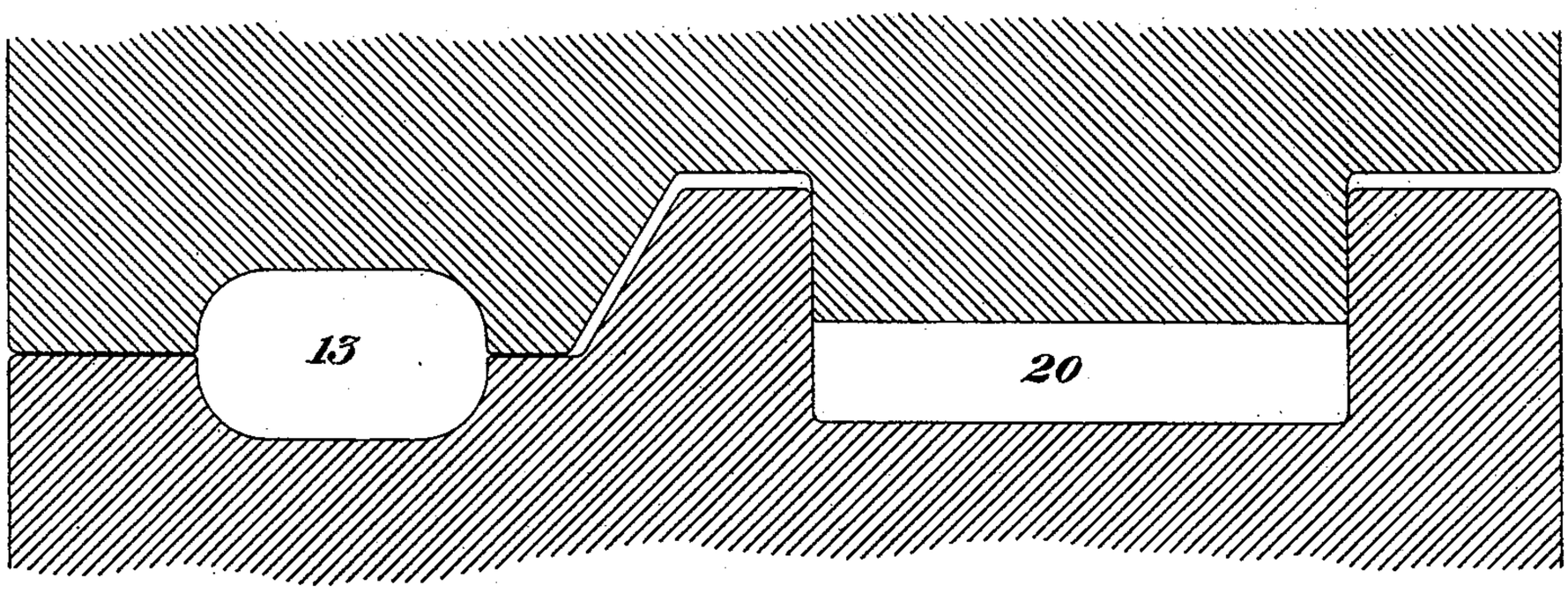


Fig. 5.



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(No Model.) 4 Sheets—Sheet 4.

C. L. FITZHUGH, J. Z. SPEER & S. S. BABBITT.

ROLLING MILL.

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Fig. 6.

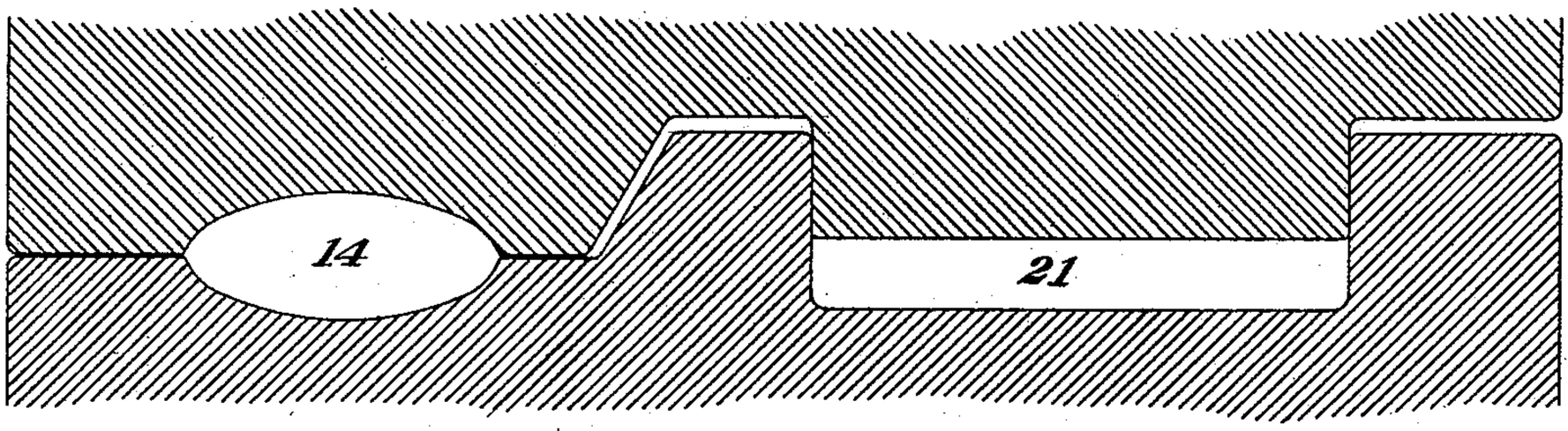


Fig. 7.

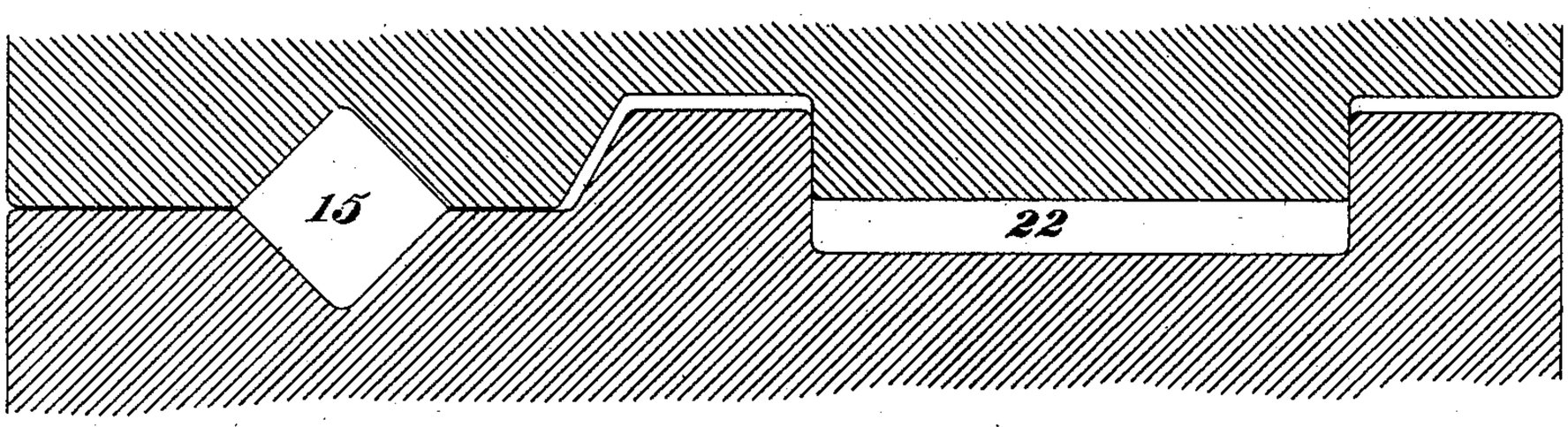


Fig. 8

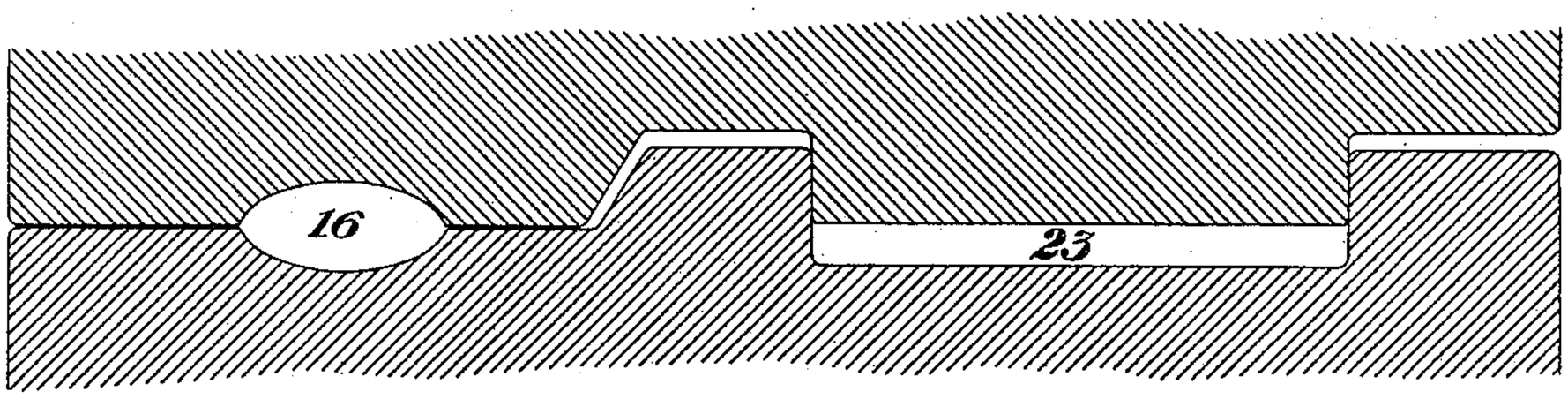
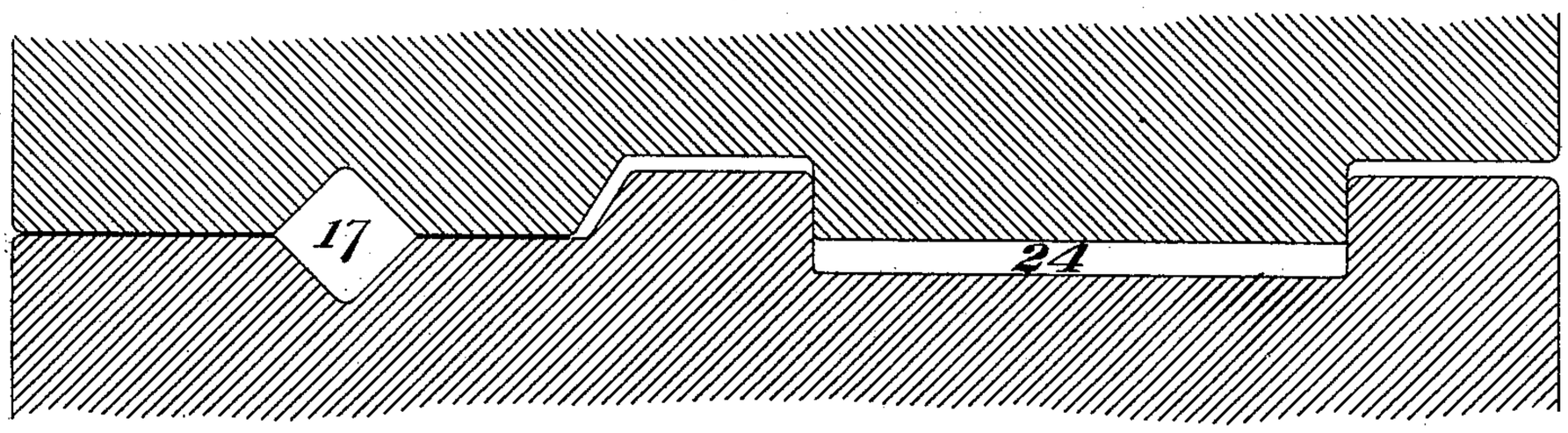


Fig. 9.



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UNITED STATES PATENT OFFICE.

CHARLES L. FITZHUGH, OF ALLEGHENY, AND JOHN Z. SPEER AND SEWARD S. BABBITT, OF PITTSBURG, PENNSYLVANIA.

ROLLING-MILL.

SPECIFICATION forming part of Letters Patent No. 496,084, dated April 25, 1893.

Application filed October 29, 1892. Serial No. 450,328. (No model.)

To all whom it may concern:

Be it known that we, CHARLES L. FITZHUGH, of Allegheny, and JOHN Z. SPEER and SEWARD S. BABBITT, of Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Rolling-Mills, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a plan view of our improved rolling-mill; and Fig. 2 is an enlarged plan view of the continuous mill which we employ therein; while Figs. 3–9, inclusive, illustrate the double system of passes employed in this continuous mill.

Our invention relates to that class of rolling mill machinery wherein ingots are reduced to billets or shapes, and its object is to provide a plant which shall take up as little room as possible and produce billets or shapes with equal facility without any changing of the rolls employed, as well as to effect the reduction of the metal with rapidity and economy.

To that end, it consists in combining with a reversing blooming mill a continuous mill having two or more independent sets of reducing passes of different character. It also consists in a continuous mill having the passes above mentioned, as well as in the construction and arrangement of the mill as hereinafter more fully described and set forth in the claims.

In Fig. 1 of the drawings, A is the blooming mill, the rolls of which are suitably constructed to reduce an ingot to a bloom of the proper size; *a* is the engine or engines by which the blooming-mill is driven. C, C, is a series of hot saws arranged in connection with a conveying table B, and adjusted so as to be adapted to cut the bloom into lengths desired for its further use. Shears or other cutting mechanism may be substituted for the saws. A′ represents conveying mechanism, preferably feed-roller tables by which the bloom is conveyed from the blooming-mill to the saw or cutting table B; D is the engine by which the saws and the table B are actuated; E is the pulpit or station of the man who controls the operation of these parts; H is a series of rolls arranged in line in the manner of a continuous mill and adapted to reduce into the form of billets, slabs, plates or shapes the metal pieces passed through them; G, is a table in front of the continuous mill and adapted to deliver the metal thereto; F represents conveying mechanism, which may consist of drag-chains, adapted to transfer the metal from the table B to the table G; I is the driving engine of the continuous mill; J is a water trough situated at the delivery end of the continuous mill, into which the finished product falls to be cooled for immediate shipment, or shearing; and K represents the mast of a crane, by means of which the billets may be lifted from the trough J and carried to cars on a suitable track L. The dotted circular line K′ represents the sweep of the jib of the crane. M represents a conveying table which extends from the end of the table B to the shears N. We use this table for conveying such of the material as is not cut and is not desired to be rolled in the continuous mill to the shears N, where it is cut to the required length for further use or treatment.

In Fig. 2, which illustrates the continuous mill H, 2 is a shaft running the entire length of the series of rolls and driven from the engines 3, 3, as shown. This shaft is provided with a series of bevel-wheels 4, facing in one direction, and a similar series of bevel-wheels 5 facing in the opposite direction. At one end of the shaft 2 is a cylinder 6, whose piston-rod is removably secured to the shaft 2 by a key 7 passing through a collar 8 upon the end of the shaft and through a slot in the piston-rod. By means of this cylinder, the shaft 2 may be moved endwise in its bearings, so that either set of bevel-wheels 4 or 5 shall engage the set of bevel-wheels 9 upon the short shafts 10, from which motion is communicated to the various sets of rolls by the usual toothed wheels and wabblers as shown. A number of bevel-wheels 9 have two sets of teeth as shown, on account of the wide variation between the adjacent bevel-wheels 4 and 5 which alternately engage therewith. The endwise movable shaft with two sets of gears is employed in order that the correct proportionate speeds may be imparted to the successive rolls corresponding to the reductions of the metal, the amount of reduction and con-

sequent elongation varying according to the sizes and shapes rolled. Thus, the one set 4 is so proportioned as to give to the successive rolls the correct increase in speed corresponding to the reductions in rolling one class of shapes, while the set 5 is varied in accordance with the successive reductions in another class of shapes, the one or the other set being thrown into gear as desired, the engines being reversed when the gears are changed, in order to rotate the rolls in the same direction.

The successive passes are clearly shown in Sheets 3 and 4, wherein 11, 12, 13, 14, 15, 16, and 17, represent the successive passes and reductions employed in rolling one kind of shapes, while 18, 19, 20, 21, 22, 23, and 24, represent the corresponding passes and reductions in the same rolls for rolling another class of shapes. Other combinations of shapes besides those represented in the drawings can be rolled in the same way.

The operation of our improved mill is as follows:—An ingot, heated in a suitable furnace, is conveyed to the blooming-mill A, and is passed through the same a proper number of times to reduce it to a bloom of the required size. It is then delivered upon the table B, where it may be cut into pieces of the required length or taken as a whole for use in the continuous mill H. The metal is then moved over the conveying mechanism F and carried thereby to the table G of the continuous mill. The pieces are delivered by the table G to the train of rolls of the continuous mill, and after passing through the same are, after being sheared, received by a cradle (not shown), which is carried by the crane K′ and is located in the trough J, which trough can be charged with water for the purpose of cooling the product. After a suitable number of pieces have been rolled in this manner and have been delivered to the cradle, they are carried by the crane to the cars on the track L. The material remaining on the table B and not required for use in the continuous mill may be carried by the table M to the shears N, where it is sheared to proper length and may be conveyed by a suitable crane to the cars.

In the continuous mill, the shaft 2 is shifted to bring the desired gears into action and the key 7 is then removed, allowing a free rotation of the shaft by means of the engines 3, 3, the mill turning out any class of shapes desired.

The advantages of our construction are obvious. The ingot is reduced to the desired size without any reheating being necessary on account of the proximity of the continuous mill to the blooming mill and the quick transfer of the metal therebetween. The construction of the continuous mill, permitting the use of two or more lines of passes, rolling different shapes, and mechanism connected therewith whereby the speed of the rolls may be varied proportionately to roll metal in these different lines of passes without changing rolls is the cause of a great saving in time and cost. The plant is very compact and performs the functions of separate mills.

Many variations in the construction and arrangement of our invention may be made without departure therefrom, since

What we claim is—

1. In rolling-mill apparatus, a continuous mill whose rolls are provided with two or more sets of passes, and means for varying the speed of the rolls relatively to each other according to the set of passes employed; substantially as and for the purposes described.

2. In rolling-mill apparatus, the combination with a blooming-mill, of a continuous-mill adjacent thereto, said continuous mill having two or more independent sets of passes, and means for varying the speed of the rolls relatively to each other according to the set of passes employed; substantially as and for the purposes described.

3. In rolling-mill apparatus, the combination with a blooming-mill, of a continuous mill adjacent thereto, and cutting and conveying mechanism between the two mills, said continuous mill having two or more independent sets of passes, and means for varying the speed of the rolls relatively to each other according to the set of passes employed; substantially as and for the purposes described.

4. In rolling-mill apparatus, a continuous mill having more than one set of passes, sets of gears corresponding in number to the sets of passes, and means for engaging either set of gears with the actuating connections of the rolls; substantially as and for the purposes described.

5. A continuous mill, having more than one set of passes, an actuating shaft extending the entire length of the mill, two or more sets of gears upon the shaft, and means for moving the shaft endwise, whereby either set of gears may be engaged with the roll-driving connections; substantially as and for the purposes described.

6. The combination with a continuous mill, of two or more sets of gears of different relative speeds, and means for engaging either set of gears with the rolls, thereby changing the relative speeds of the rolls; substantially as described.

7. A continuous mill having in combination with a line of roll housings and shafting extending along said line, two or more sets of gears on the same shafting, and of different speeds; substantially as and for the purposes described.

In testimony whereof we have hereunto set our hands this 24th day of October A. D. 1892.

CHAS. L. FITZHUGH.
JOHN Z. SPEER.
SEWARD S. BABBITT.

Witnesses:
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