No. 824,518. PATENTED JUNE 26, 1906.

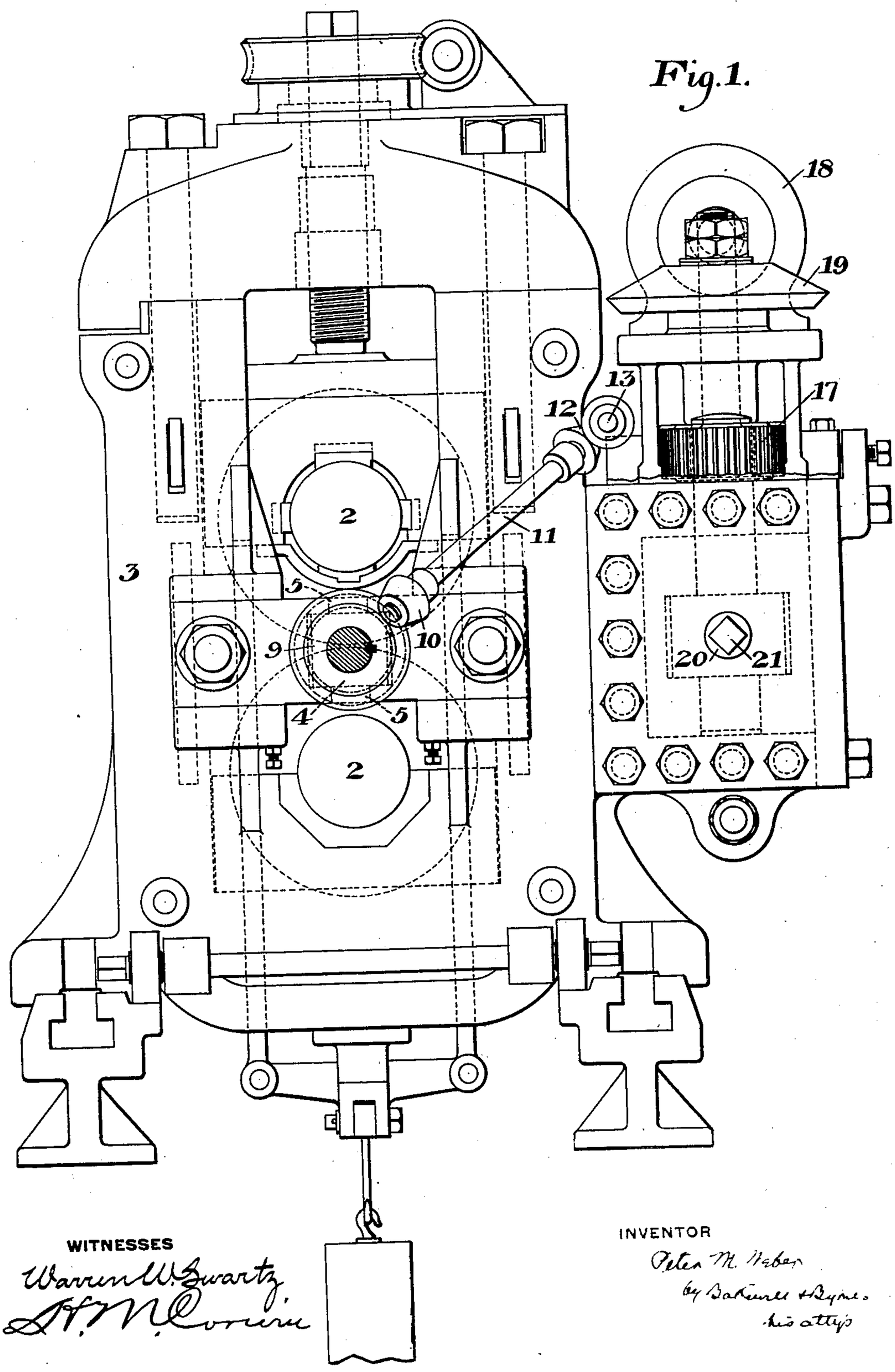
P. M. WEBER.

UNIVERSAL MILL.

APPLICATION FILED MAR. 5, 1902.

5 SHEETS—SHEET 1.

Fig. 1.



WITNESSES

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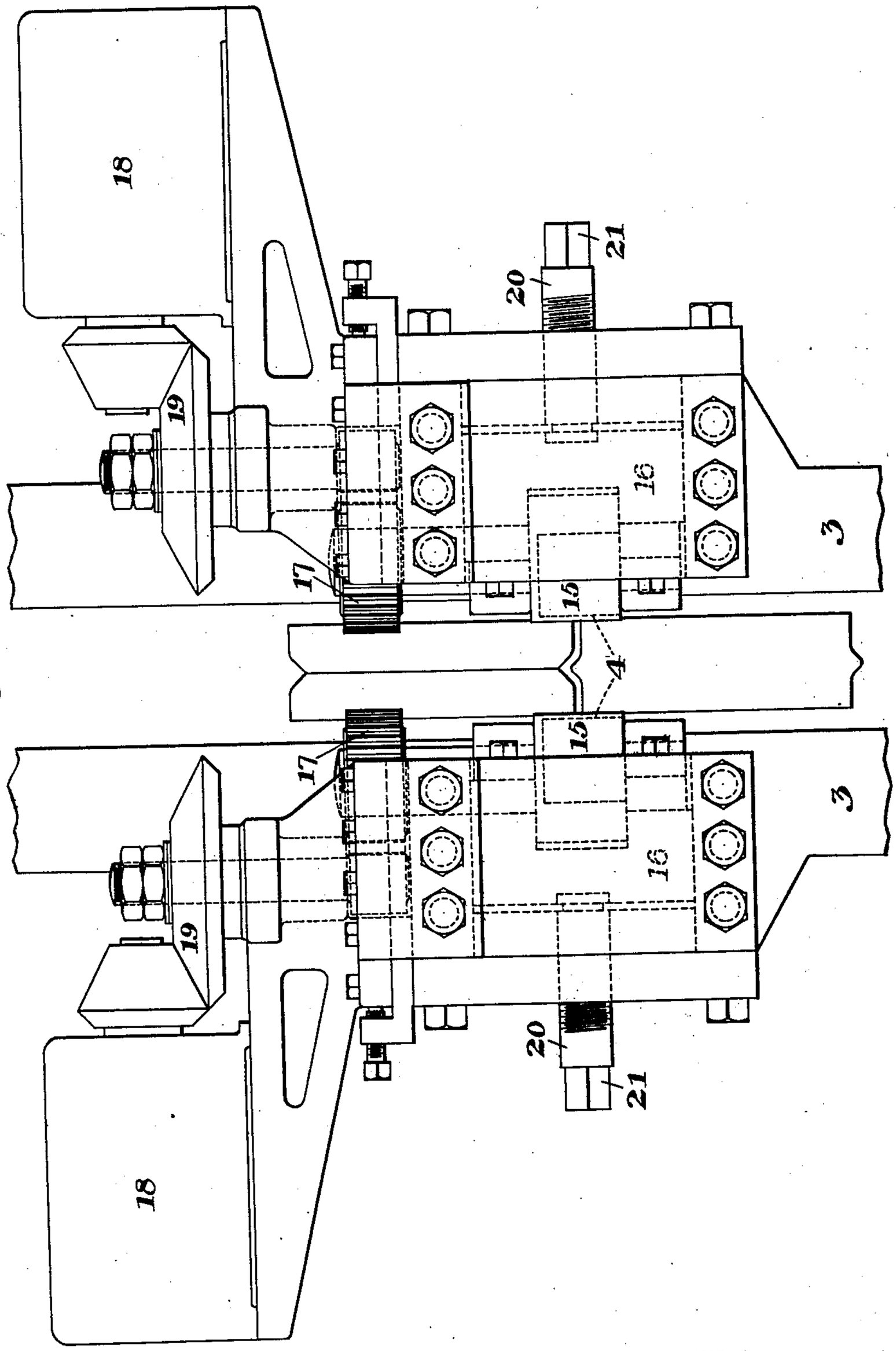
5 SHEETS—SHEET 2.

Fig. 2.



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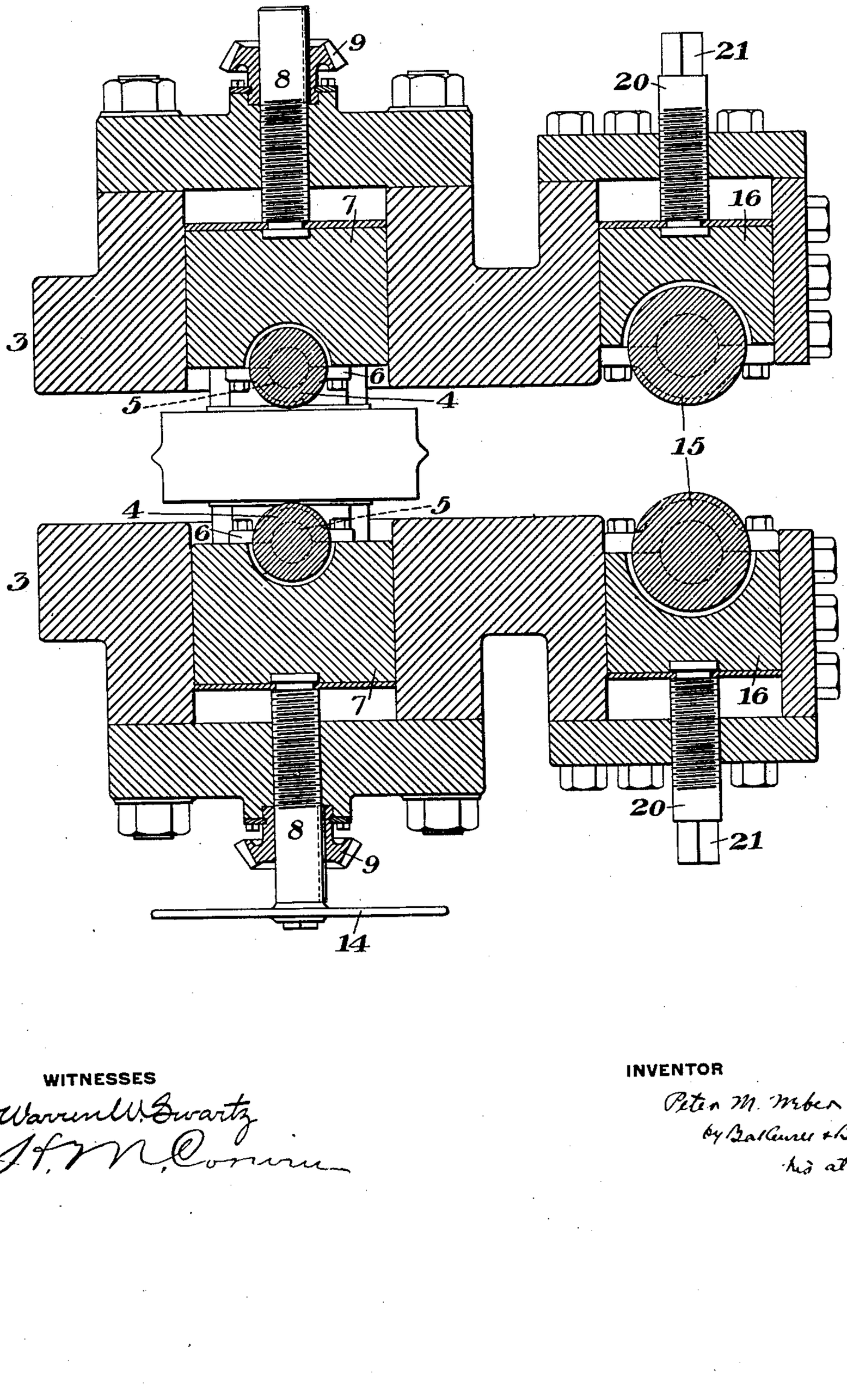
5 SHEETS—SHEET 3.

Fig. 3.



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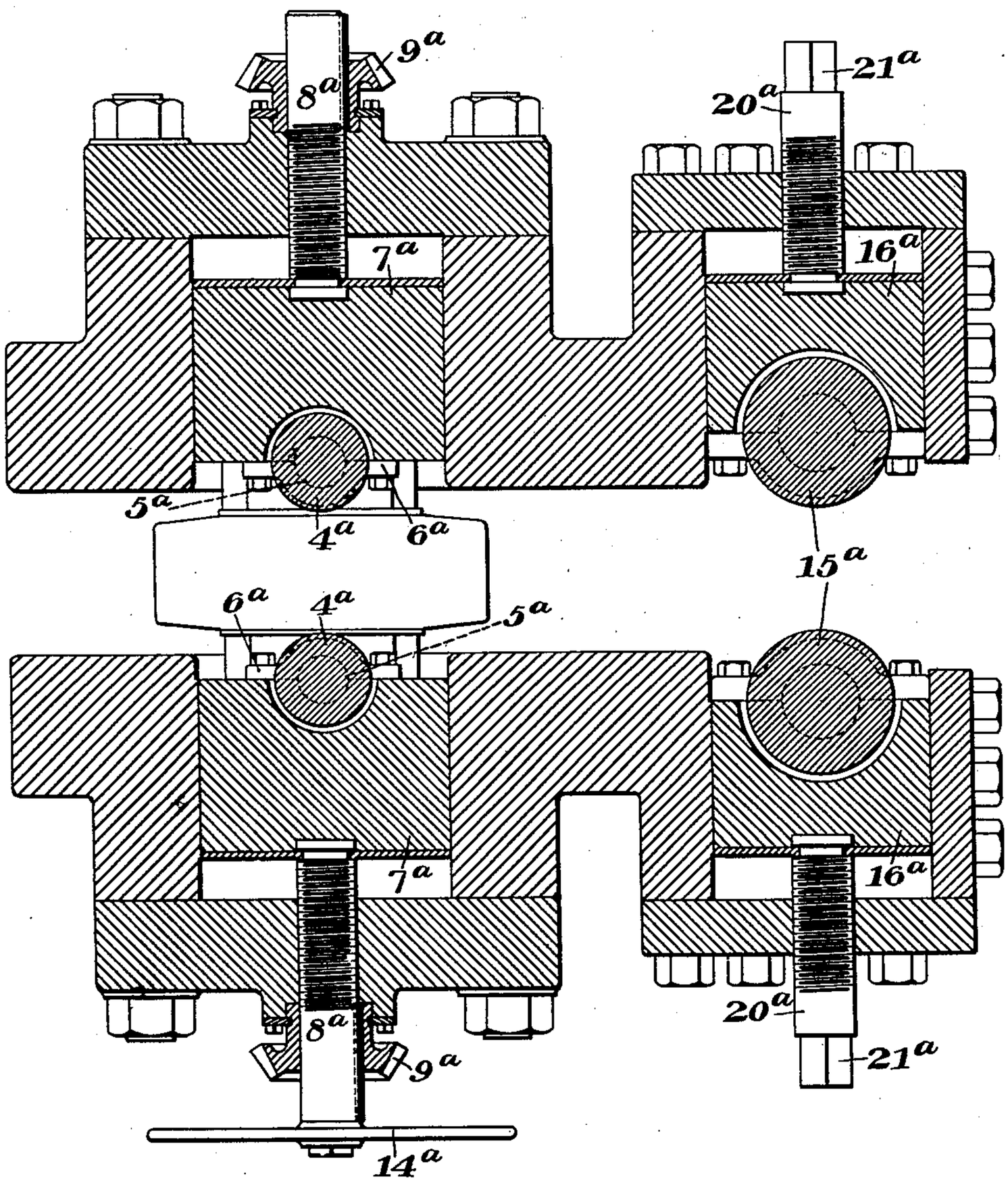
5 SHEETS—SHEET 4.

Fig. 4.



WITNESSES

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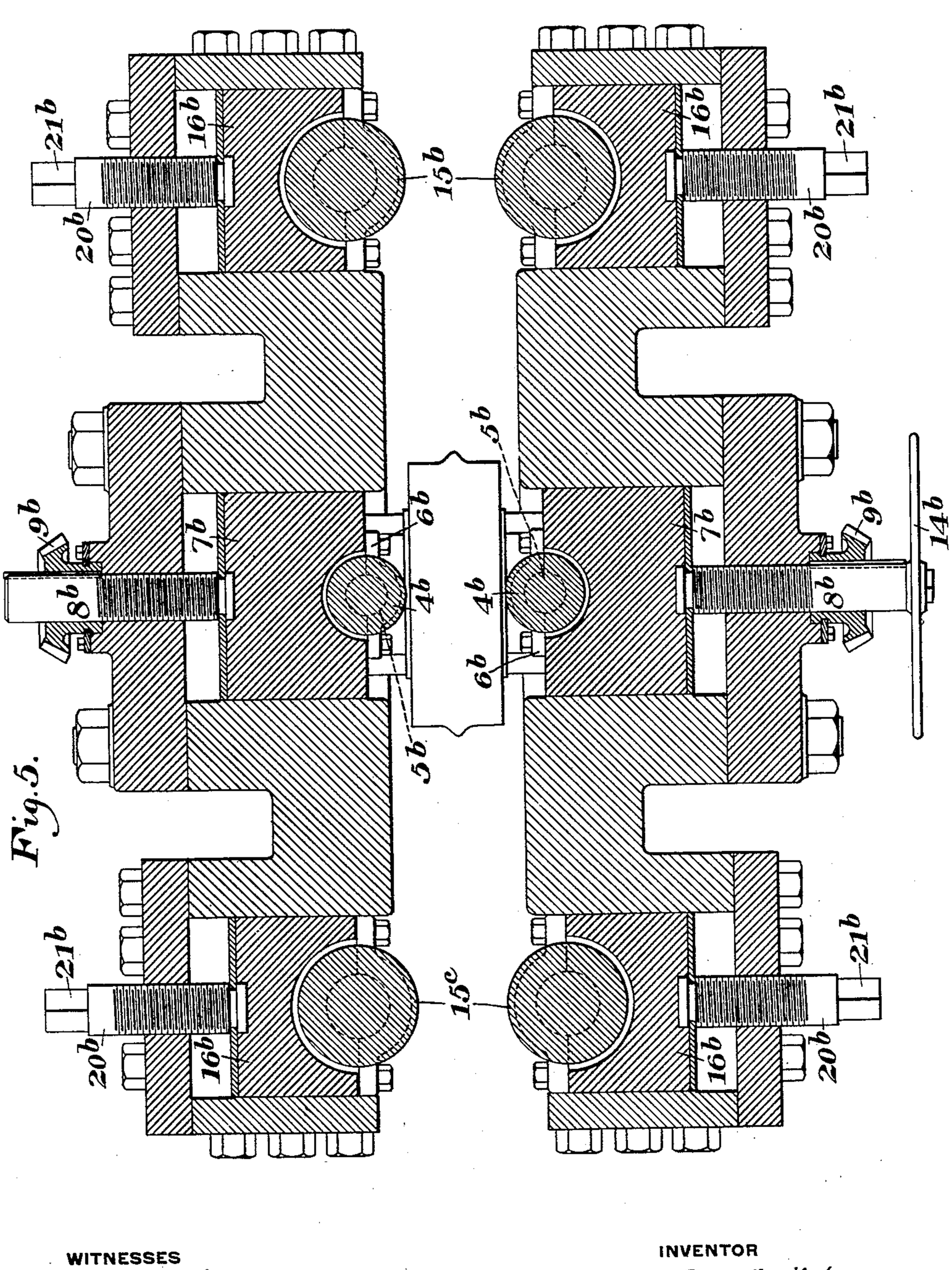
5 SHEETS—SHEET 5.

Fig. 5.



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UNITED STATES PATENT OFFICE.

PETER M. WEBER, OF HOMESTEAD, PENNSYLVANIA.

UNIVERSAL MILL.

No. 824,518. Specification of Letters Patent. Patented June 26, 1906.

Application filed March 5, 1902. Serial No. 96,801.

To all whom it may concern:

Be it known that I, PETER M. WEBER, of Homestead, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Universal Mill, 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 side elevation of a universal mill constructed in accordance with my invention. Fig. 2 is a partial front view of the same. Fig. 3 is a sectional top plan view of the same between the horizontal rolls, showing the mill arranged for rolling angles. Fig. 4 is a view similar to Fig. 3, showing a mill arranged for rolling channels. Fig. 5 is a view similar to Fig. 3, showing a modified form of the invention.

My invention relates to that class of universal mills wherein frictionally-driven vertical rolls are employed whose axes lie in a vertical plane passing through the axes of the horizontal rolls; and the object of the invention is to improve the operation of such mills, to increase the speed of reduction, and to arrange them for rolling angles, bars, or similar material.

The invention consists in combining a pair of positively-driven vertical rolls with a mill having positively-driven horizontal rolls, and frictionally-driven vertical rolls at the centers of the horizontal rolls.

It also consists in combining with a universal mill having centrally-located frictionally-driven vertical rolls two sets of positively-driven rolls, one on each side of the mill.

In the drawings, referring to the form of Figs. 1 and 2, 2 2 represent horizontal rolls, mounted in side housings 3 and shaped for rolling angles, as indicated in Fig. 3. The side edges of the angle are acted upon by vertical frictionally-driven rolls 4 4, having short necks 5, mounted in bearings 6, removably secured in horizontal slides 7. The axes of these vertical rolls lie in a vertical plane containing the axes of the horizontal rolls. The slides for the vertical rolls 4 may be adjusted toward and from each other by means of screw-threaded shafts 8, having spline connections with bevel-wheels 9. The bevel-wheels 9 intermesh with corresponding bevel-pinions 10 upon inclined shafts 11, having similar bevel-gear connections 12 with a shaft 13, common to both, extending across the front of the mill. A hand-wheel 14 may be provided on one of the shafts 8, and by turning this wheel the vertical rolls are simultaneously adjusted toward or from each other, as desired. If it is desired to roll an angle having one leg or flange longer than the other, these gearing connections may be disconnected and one of the vertical rolls adjusted to a greater distance from the center of the pass than the other. It will be noted that I show the small vertical rolls as acting upon the edges of the angle-flanges.

Another most important feature of my invention lies in the proportion of the diameter of the vertical frictionally-driven roll to that of the horizontal positively-driven roll. I have found by actual experiment that in order to make the mill operative the diameter of the vertical roll must not be greater than one-half, and preferably one-third, the diameter of the horizontal positively-driven roll with which it coacts. The reason for this is that the metal being rolled must be first engaged by the horizontal rolls and sufficient grip thereon afforded to draw the metal through the vertical rolls which are not positively driven, and if the diameter of the vertical roll is greater than one-half the diameter of the horizontal roll the piece will stick and the horizontal rolls will not be able to draw it through the mill, especially where the additional positively-driven vertical rolls are not used.

To assist in the operation of the mill and increase the reduction, I provide a pair of vertical rolls 15, mounted in adjustable horizontal slides 16. Each roll 15 is positively driven by spur-gearing 17 on shafts connecting with electric motors 18 through bevel-gearing 19. The slides 16 may be adjusted by screw-threaded shafts 20, having squared ends 21, adapted to receive a wrench, and the electric motors are adjusted to correspond thereto by set-screws and bolts. The housings for these vertically-driven rolls may also support the motors 18. This independent driving of the vertical rolls of a universal mill I consider new.

In operating the mill the rolls 15 are preferably adjusted so that they are slightly closer together than the frictionally-driven rolls 4. As the piece first enters the mill its sides are reduced by the positively-driven vertical rolls, and as the metal is reduced in the four succeeding rolls it spreads laterally and its edges are held in shape by the vertical

rolls 4. As soon as the piece is seized by the horizontal rolls power may be and preferably is cut off from the motors 18, the rolls 15 then rotating by friction.

In Fig. 4 I show a mill similar to that of Figs. 1 and 2, except that it is arranged for rolling channels or beams, and in this case the vertical frictionally-driven rolls engage the outer faces of the flanges. I have marked the parts in this figure with the same numerals used in Fig. 2, adding the letter *a*. In this form the driven vertical rolls will be used as guide-rolls, they having little or no reducing action.

In Fig. 5 I show a mill similar to that of Figs. 1 and 2 with the addition of two positively-driven vertical rolls on the opposite side of the main set. The parts corresponding to Fig. 1 are designated by the same numerals with the addition of the letter *b*. The rolls 15^c are similar to the rolls 15^b and are positively driven in the same manner or by any desirable connections.

The advantages of my invention result especially from the use of the positively-driven vertical rolls in combination with the horizontal rolls and centrally-located vertical frictionally-driven rolls, since the action of the mill is improved and the product made more uniform and reduction more rapidly obtained. As applied to the rolling of angles, bars, or similar material, the use of a frictionally-driven vertical roll working upon the edge of a leg or flange is of special advantage. The peculiar relation of the diameters of the vertical horizontal rolls is important, especially where the vertical positively-driven rolls are not used, and are better even where the latter rolls are employed. The use of the short necks on the vertical frictionally-driven rolls I have found to give better results than where backing is applied to the body of such rolls.

By the words "frictionally driven" in the claims I intend to cover rolls which are driven by frictional contact with the metal being rolled as distinguished from rolls which are actuated by driving connections.

Many variations may be made in the form and arrangements of the rolls, the shape of the pass, the means for driving, &c., without departing from my invention.

I claim—

1. A universal mill having horizontal rolls, vertical frictionally-driven rolls located centrally thereof, positively-driven vertical rolls arranged in line with the pass, and mechanism for driving the horizontal rolls and the positively-driven vertical rolls; substantially as described.

2. A universal mill having horizontal rolls, vertical frictionally-driven rolls located centrally thereof, an outer pair of vertical rolls slightly nearer together than the frictionally-driven rolls, and connections for driving the horizontal rolls and the outer vertical rolls; substantially as described.

3. A rolling-mill having horizontal positively-driven rolls and vertical frictionally-driven rolls, the axes of all the rolls lying in the same vertical plane, and two pairs of vertical positively-driven rolls, one pair on each side of and in line with the pass of the four rolls; substantially as described.

4. A rolling-mill having horizontal positively-driven rolls, a pair of vertical frictionally-driven rolls, the axes of said rolls lying in the same vertical plane, a pair of vertical positively-driven rolls in line with the pass of the four rolls, and mechanism for adjusting all the vertical rolls; substantially as described.

5. A universal mill, having horizontal positively-driven rolls, a vertical frictionally-driven roll having its axis in the plane passing vertically through the axes of the horizontal rolls, a pair of positively-driven vertical rolls, and connections for driving said positively-driven vertical rolls independent of the horizontal rolls; substantially as described.

In testimony whereof I have hereunto set my hand.

PETER M. WEBER.

Witnesses:
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C. P. Byrnes.