No. 870,285. PATENTED NOV. 5, 1907.

A. K. HAMILTON & A. T. KELLER.

HYDRAULIC COUNTERBALANCE FOR ROLLING MILLS.

APPLICATION FILED NOV. 24, 1905.

4 SHEETS—SHEET 1.

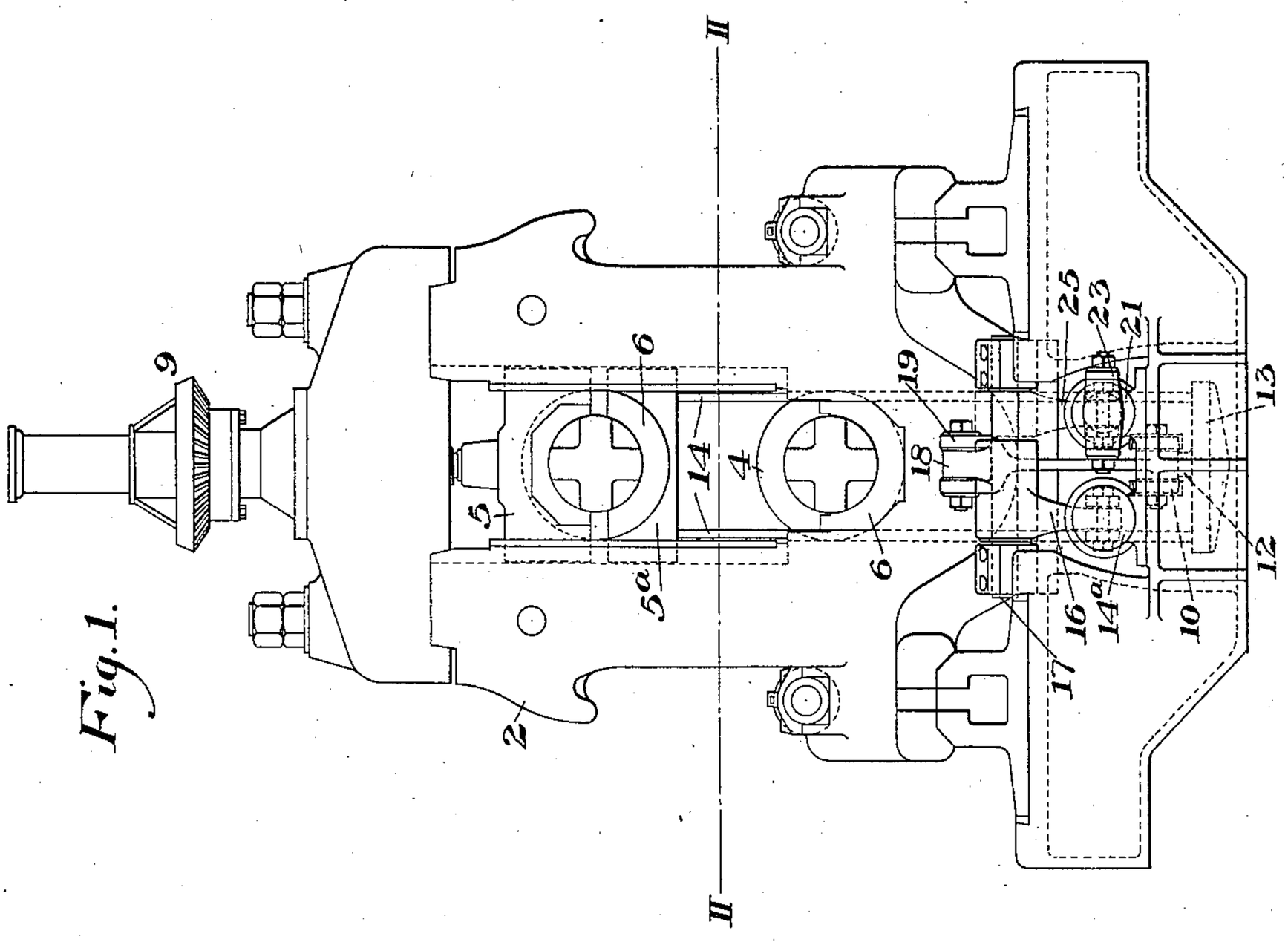

Fig. 1.

WITNESSES

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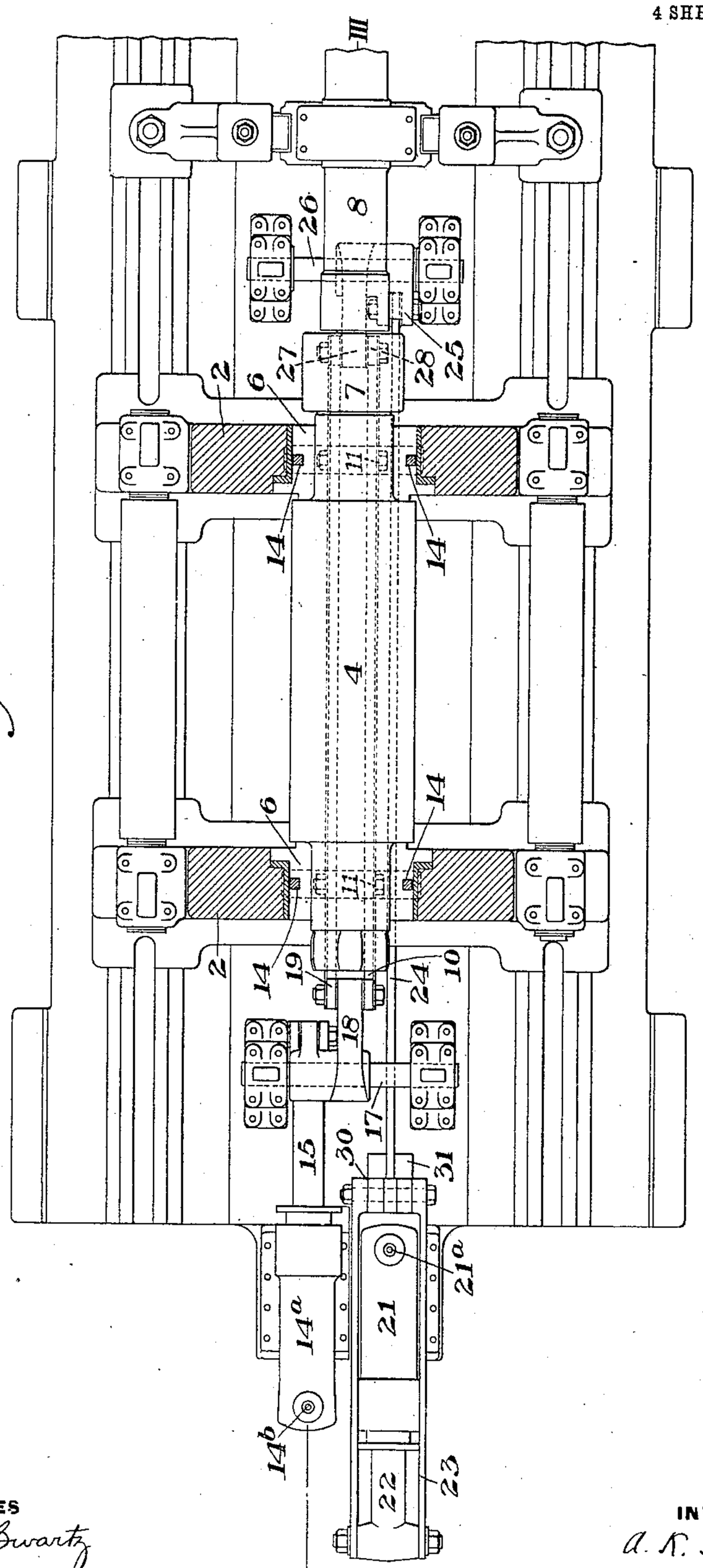

Fig. 2.

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4 SHEETS—SHEET 3

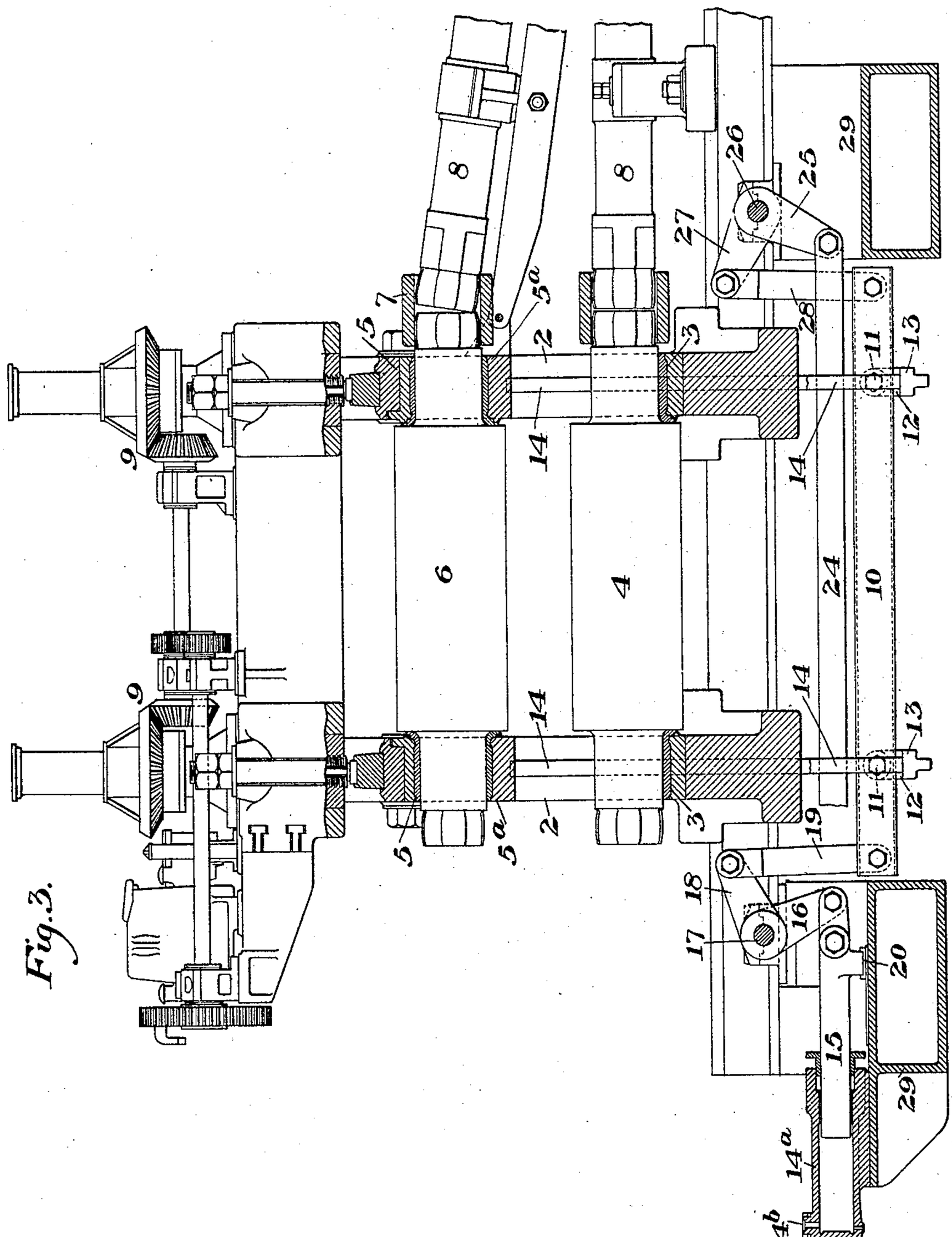

Fig. 3.

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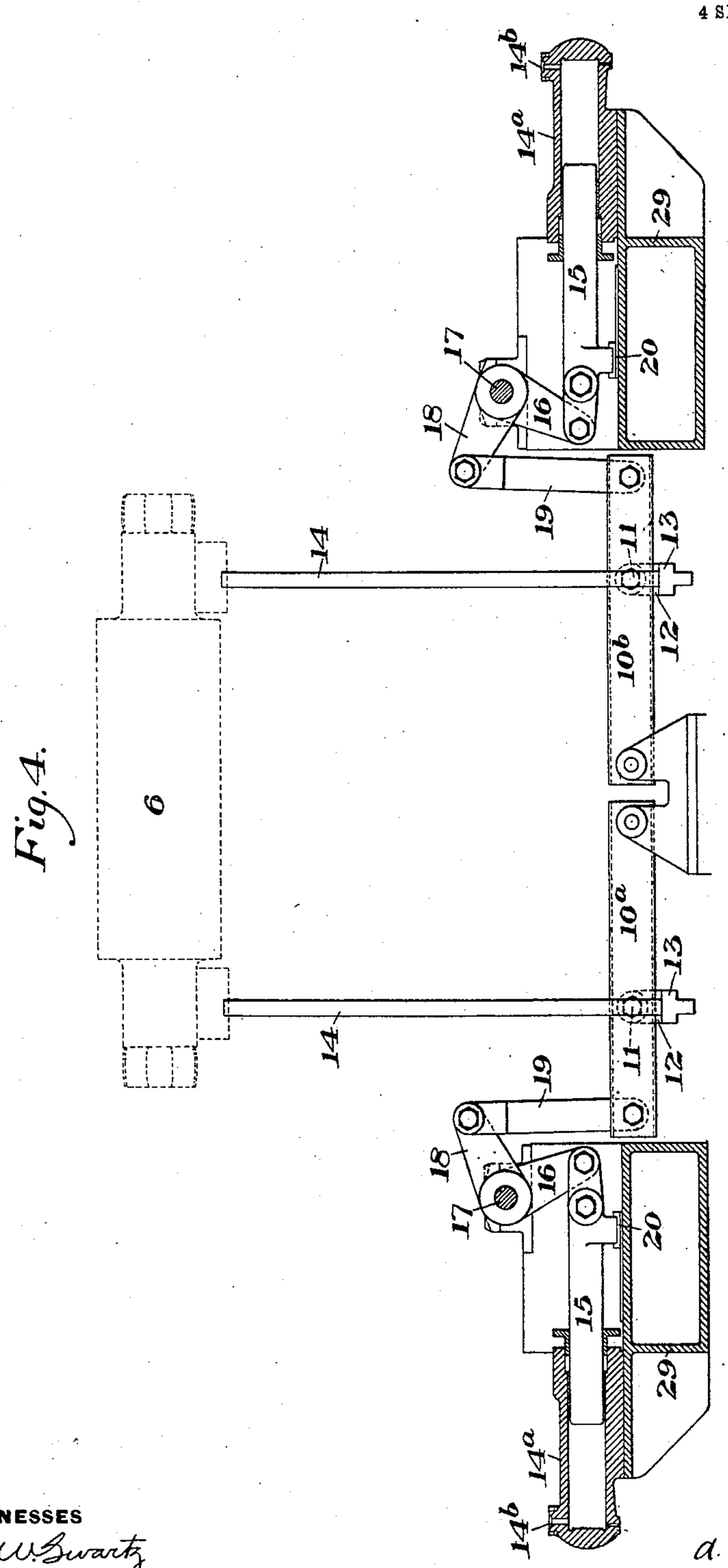
4 SHEETS—SHEET 4.

Fig. 4.



WITNESSES

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UNITED STATES PATENT OFFICE.

ALEXANDER K. HAMILTON, OF NEW BRIGHTON, NEW YORK, AND ALBERT T. KELLER, OF PITTSBURG, PENNSYLVANIA; SAID KELLER ASSIGNOR OF ONE-HALF OF HIS RIGHT TO MESTA MACHINE COMPANY, OF PITTSBURG, PENNSYLVANIA, A CORPORATION OF PENNSYLVANIA.

HYDRAULIC COUNTERBALANCE FOR ROLLING-MILLS.

No. 870,285. Specification of Letters Patent. Patented Nov. 5, 1907.

Application filed November 24, 1905. Serial No. 288,888.

To all whom it may concern:

Be it known that we, ALEXANDER K. HAMILTON, of New Brighton, borough of Richmond, New York, and ALBERT T. KELLER, of Pittsburg, Allegheny county, Pennsylvania, have invented a new and useful Hydraulic Counterbalance for 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 an end elevation of a rolling mill embodying our invention; Fig. 2 is a horizontal section on the line II—II of Fig. 1; Fig. 3 is a vertical section on the irregular line III—III of Fig. 2; and Fig. 4 is a view showing a modification of the counterbalancing arrangement.

Our invention relates to the class of hydraulic counterbalances for rolling mills, the object being to provide simple and efficient counterbalancing means for the movable roll which are so located as not to interfere with the movable rolls or with the free access to the scale pits, and in which the hydraulic actuating cylinders are so situated, where they will not be affected by hot scale falling from the rolls.

Other objects and advantages of our invention will hereinafter appear.

In the accompanying drawings, 2, 2 designates the roll housings in which are mounted the bearings 3, 3 for the lower roll 4 and the movable bearings 5, 5^a for the upper roll 6.

7 indicates the driving couplings for the rolls, and 8 the driving spindles.

9 designates any usual or suitable gearing for securing the vertical adjustment of the upper rolls 6.

10 is a horizontally arranged lifting beam below the roll housing and loosely connected at 11 to upwardly-extending lugs 12 of cross heads 13 to which are connected the vertical lifting rods 14 which engage the lower bearings 5^a of the upper roll 6.

14^a is a hydraulic cylinder whose plunger 15 is connected to one arm 16 of a bell crank lever keyed to a shaft 17, and the other arm 18 of which is connected by a link 19 with one end portion of the lifting beam 10.

20 indicates a suitable supporting guide for the plunger 15.

21 designates a second hydraulic cylinder whose plunger 22, carried by a yoke 23, is connected by a bar or link 24 with one arm 25 of a bell crank lever keyed to a shaft 26 and whose other arm 27 is connected by link 28 with the other end of the lifting beam 10, the shaft 26 being located at the opposite end of the mill from the shaft 17. The cylinders 14^a and 21 are supported on one of the ties 29, and these ties also carry the bearings for the shafts 17 and 26. The cross-head 30 of the frame 23 can be provided with a supporting shoe or guide 31 similar to the shoe or guide 20 for the plunger 15.

The cylinder 14^a is supplied with an actuating fluid at 14^b from any suitable source, and the cylinder 21 is similarly supplied at 21^a, the supply connections being located at opposite ends of the respective cylinders. The cylinder 21 is larger than the cylinder 15 for the reason that said cylinder through the connections above described has the additional work to perform of carrying the weight of the upper roll couplings 7 and the partial weight of the upper spindles 8.

In operation, the actuating fluid being admitted to the cylinders 14^a and 21, the plungers 15 and 22 are moved in opposite directions, thereby actuating the two bell crank levers and their respective shafts 17 and 26, and thereby, through the links 19 and 28, raising the lifting beam 10, the cross-heads 12 and the lifting rods 14 and causing the bearings for the roll 6 to follow the slacking of the adjusting screws. The lifting rods 14, as will be seen, support the roll 6, the load being transmitted through the connections described to the cylinders 14^a and 21, and the fluid in such cylinders being displaced by the reverse movement of the plungers as the roll 6 is moved downwardly by the adjusting screws. In this manner the said roll is at all times perfectly counterbalanced.

Instead of employing a continuous lifting beam as above described, I may employ two beams 10^a, 10^b as shown in Fig. 4, said beams being pivoted at their inner end portions, and each of them supporting one of the movable roll bearings. In this arrangement one of the cylinders is connected to the outer end portion of each beam, and the two cylinders are also shown as being arranged at opposite ends of the mill.

The cylinders being located outside of the housings, do not in any way obstruct access to the scale pit, and are themselves away from the falling scale from the rolls.

We do not, however, wish to limit ourselves to the particular arrangement of the cylinders which we have shown and described, since such arrangement together with the connections for actuating the lifting beam may be varied without departing from our invention.

What we claim is:—

1. In a rolling mill, a vertically movable roll, a lifting member supporting the bearing for the roll, a lifting beam for actuating the lifting member, said beam being located below the roll housings and extending in a direction substantially parallel to the roll axes, motive devices located outside of the roll housings in the direction of the length of the beam, and an actuating connection between the motive devices and the beam for raising it and thereby the roll bearing and roll; substantially as described.

2. In a rolling mill, a vertically movable roll, a lifting member supporting the roll bearing, a lifting beam for ac-

tuating the lifting member, said beam being located below the roll housings and extending in a direction parallel to the roll axes, hydraulic cylinders outside of the roll housing and at one end of the beam, and an actuating connection between the piston of the cylinders and the beam; substantially as described.

3. In a rolling mill, a vertically movable roll, a lifting member supporting the roll bearing, a lifting beam for actuating the lifting member, said beam being located below the roll housings and extending in a direction parallel to the roll axes, hydraulic cylinders outside of the roll housing and at one end of the beam, and actuating connections from the piston of one cylinder to one end portion of the beam, and actuating connections from the piston of the other cylinder to the opposite end portion of said beam; substantially as described.

4. In a rolling mill, the combination with lifting rods for the movable roll bearings and cross-heads carrying the said rods, of a beam below the roll housings to which the cross-heads are connected, bell cranks connected to the end portions of the beam, and hydraulic cylinders connected to the bell cranks; substantially as described.

5. In a rolling mill, the combination with movable roll bearings, of a vertically movable beam below the roll housings, means carried by the beam for supporting the roll bearings, bell-crank levers at opposite ends of the mill and connected to the beam, and a hydraulic cylinder connected to each bell crank lever; substantially as described.

In testimony whereof, we have hereunto set our hand.

ALEXANDER K. HAMILTON.
ALBERT T. KELLER.

Witnesses:
JOHN A. SCHROEDER,
GEO. L. REIS.