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J. KENNEDY & H. AIKEN.

MILL FOR ROLLING FLANGED BEAMS.

No. 410,106. Patented Aug. 27 1889.

Fig. 1.

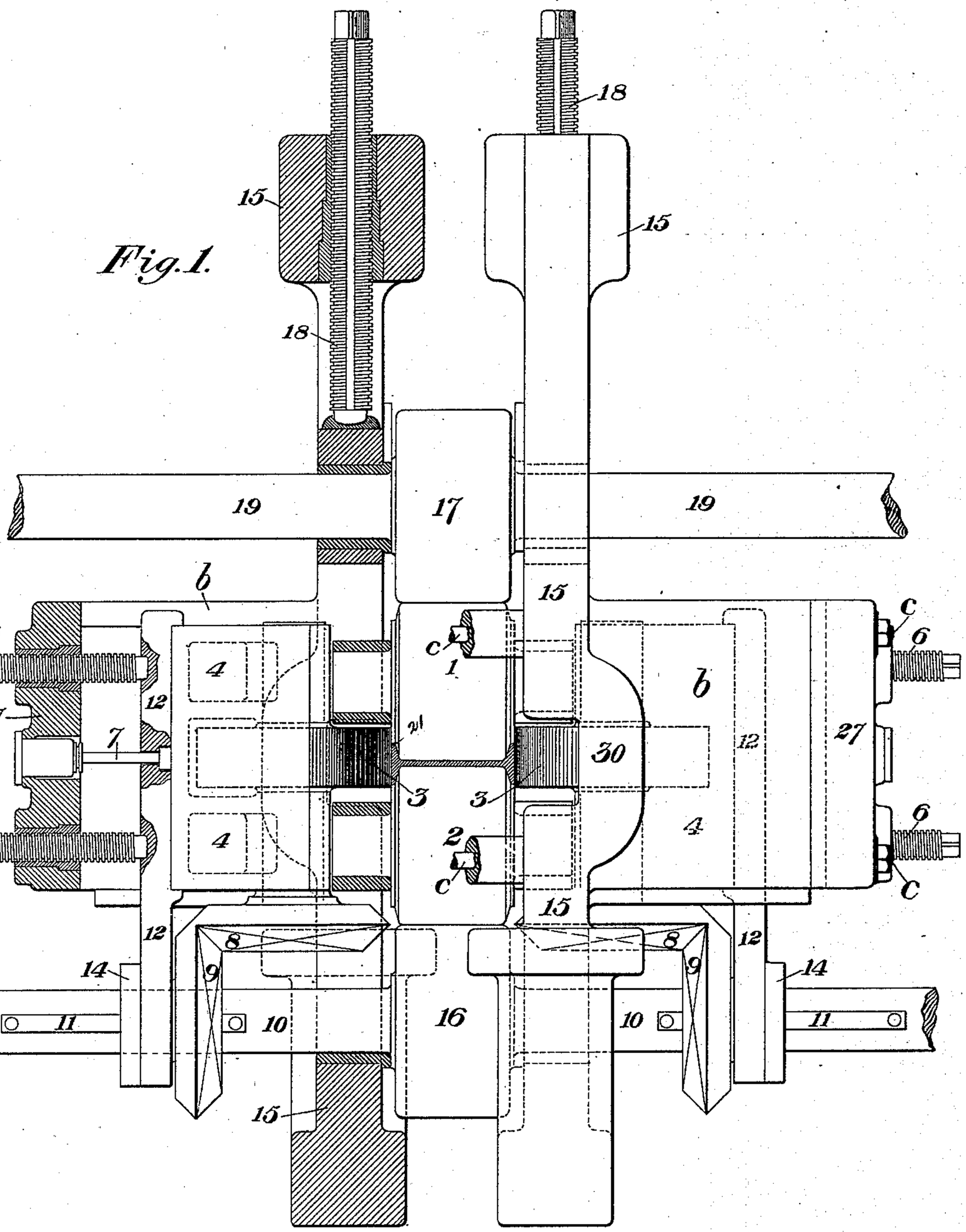

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Fig. 2.

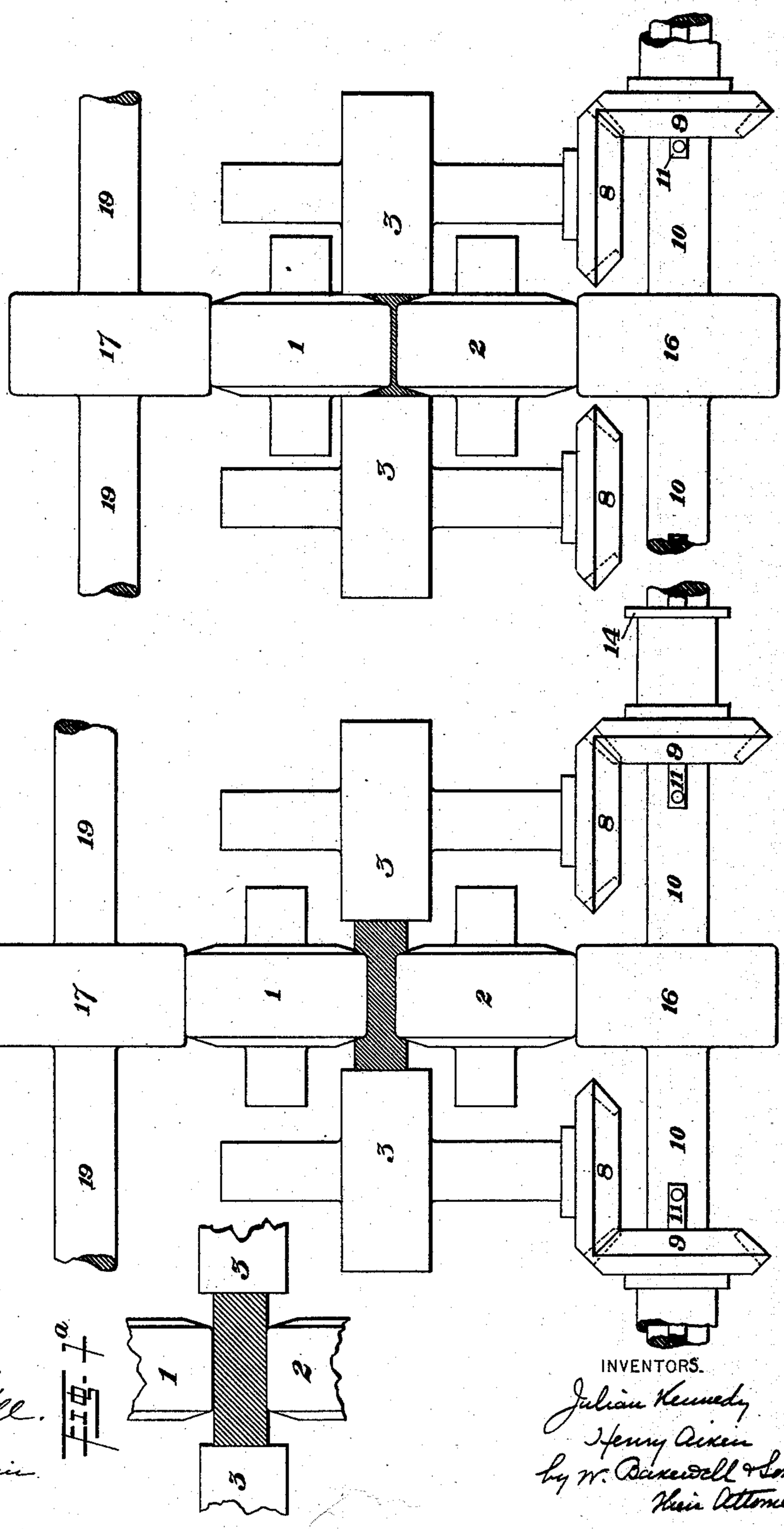

Fig. 1a.

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FIG. 5.

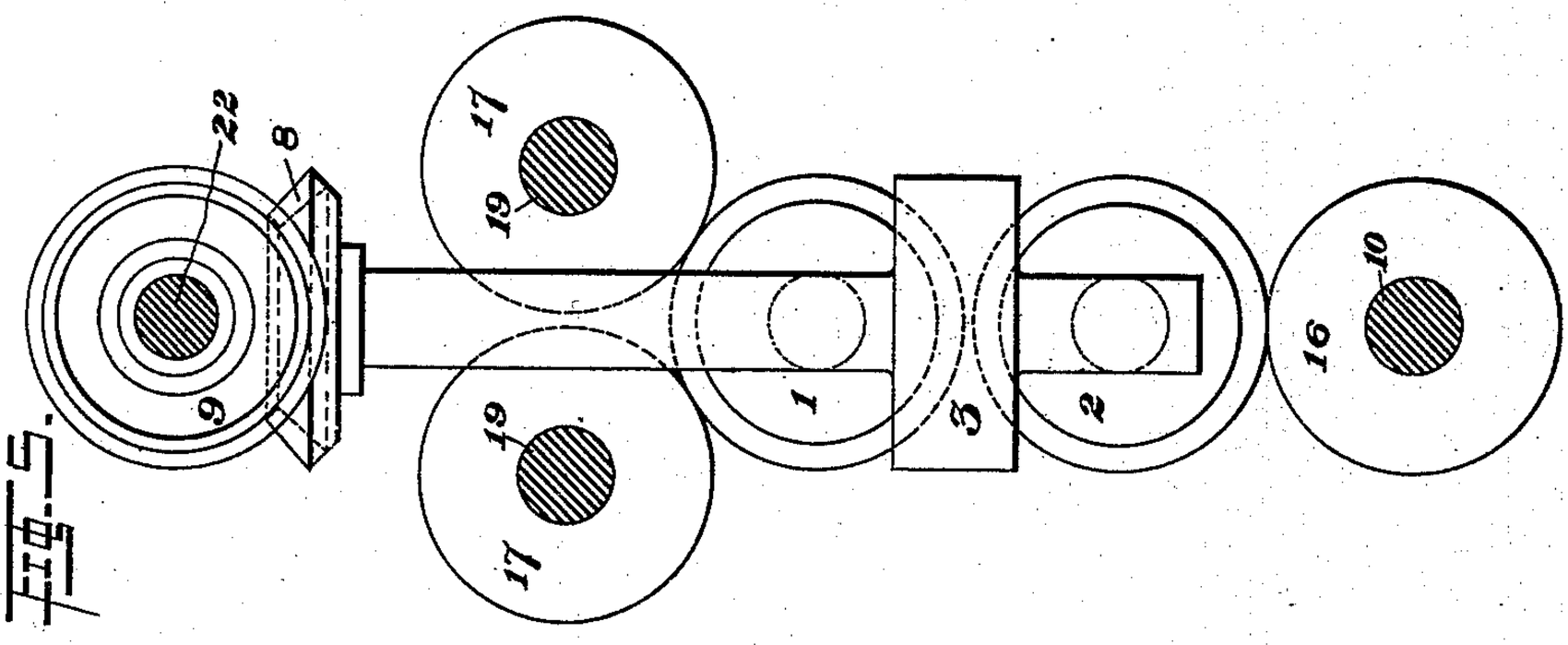

FIG. 4.

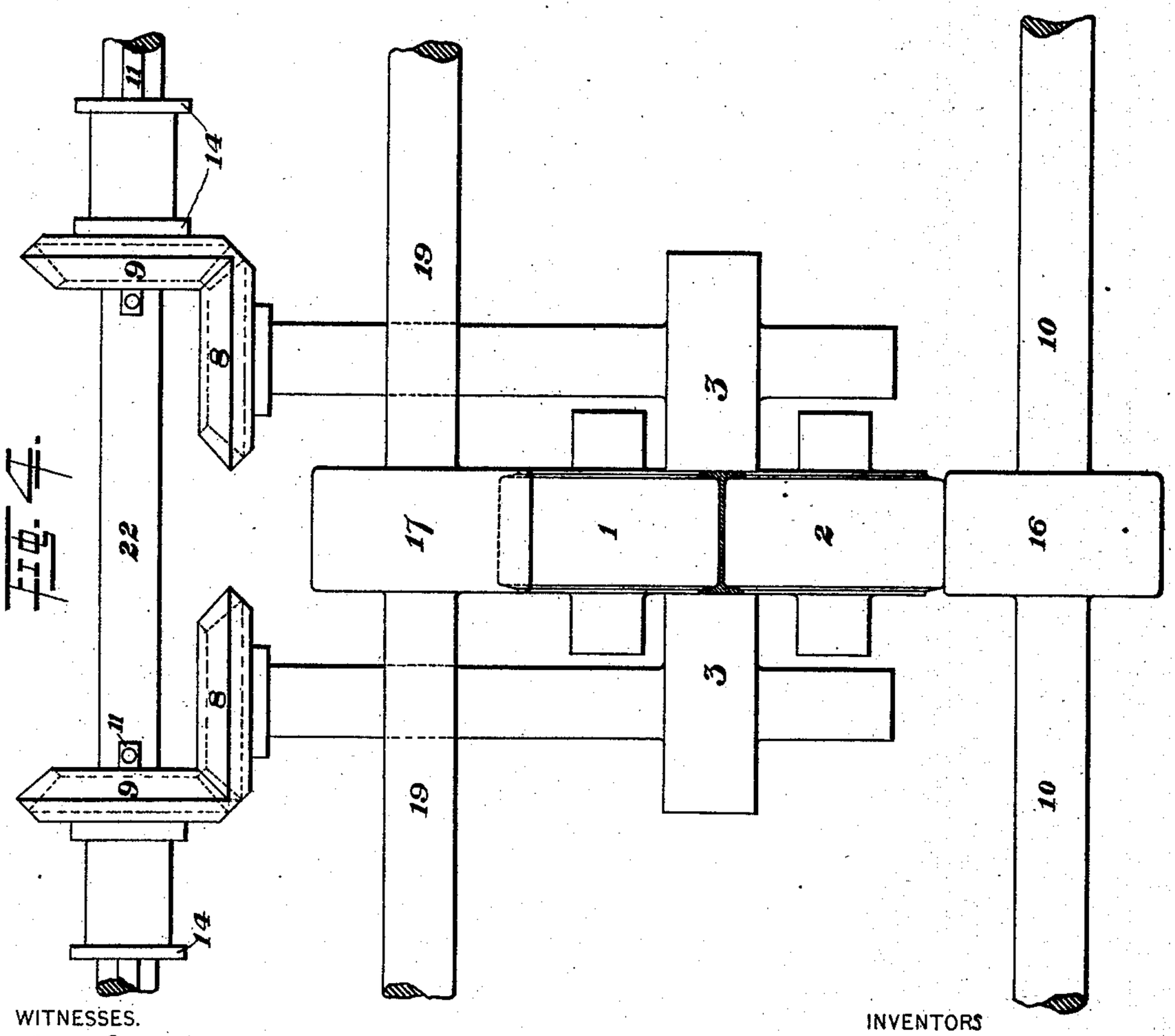

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Fig. 6.

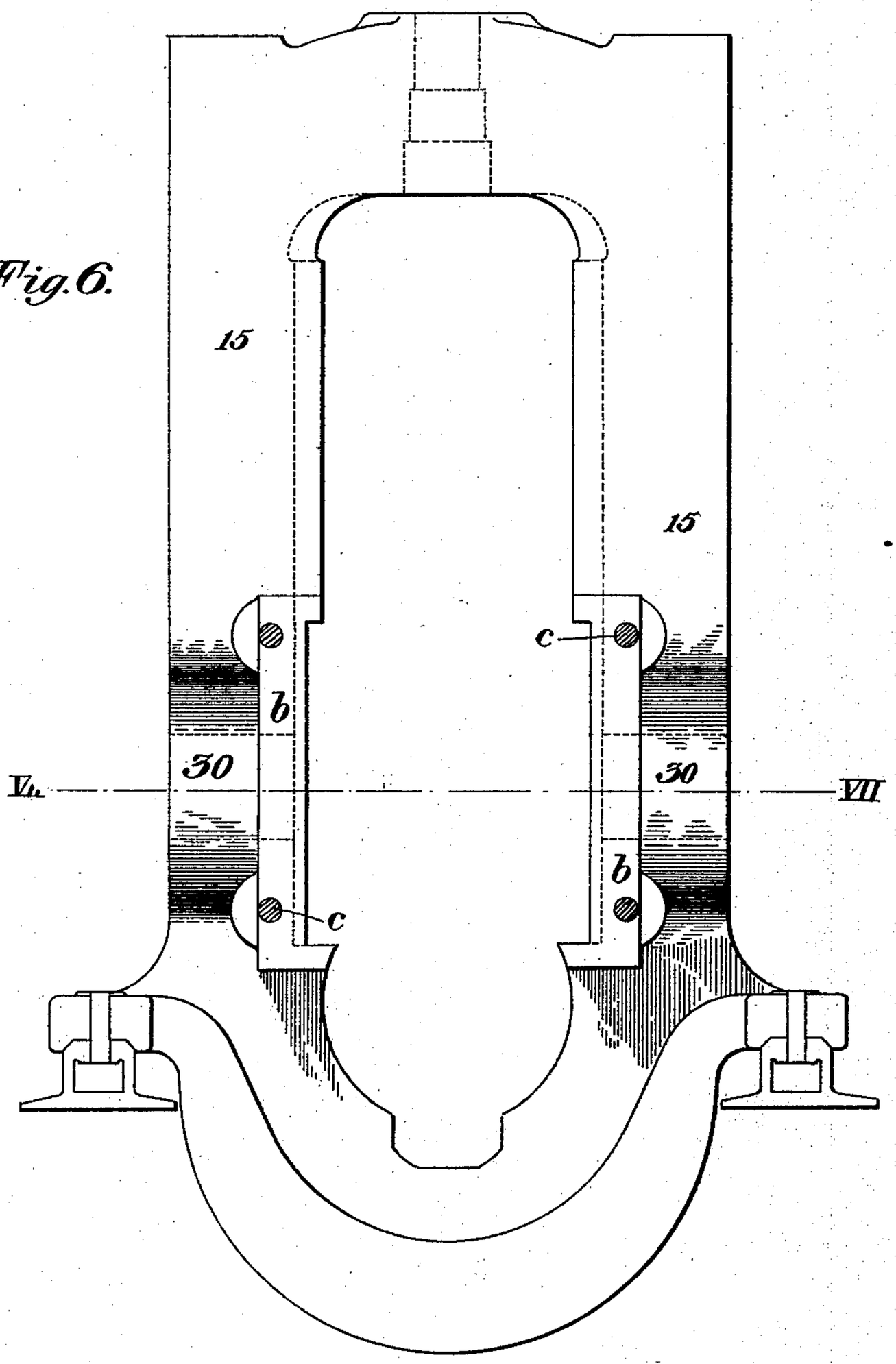
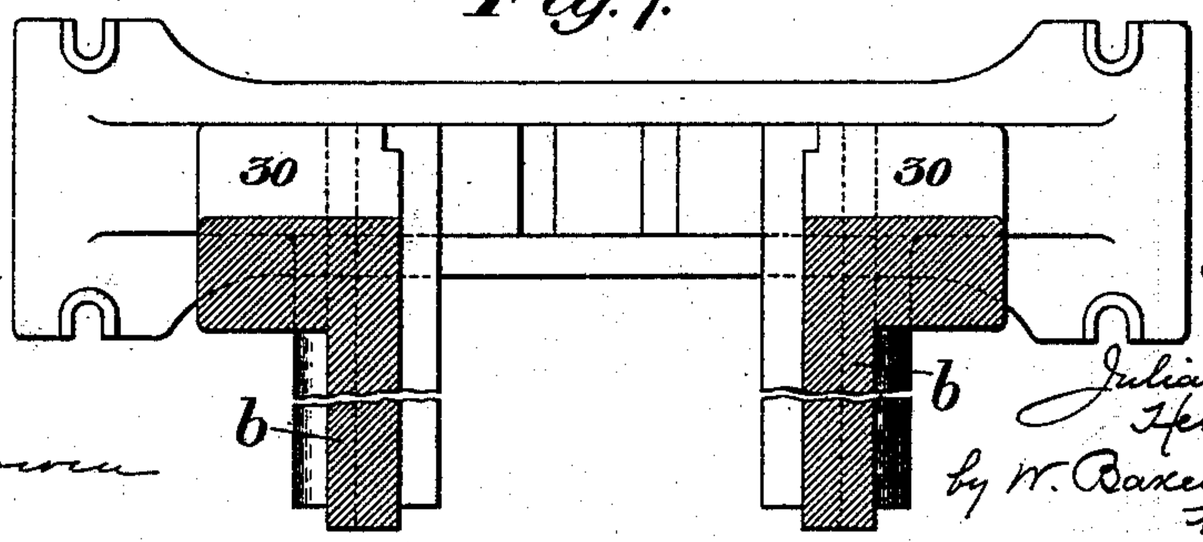


Fig. 7.



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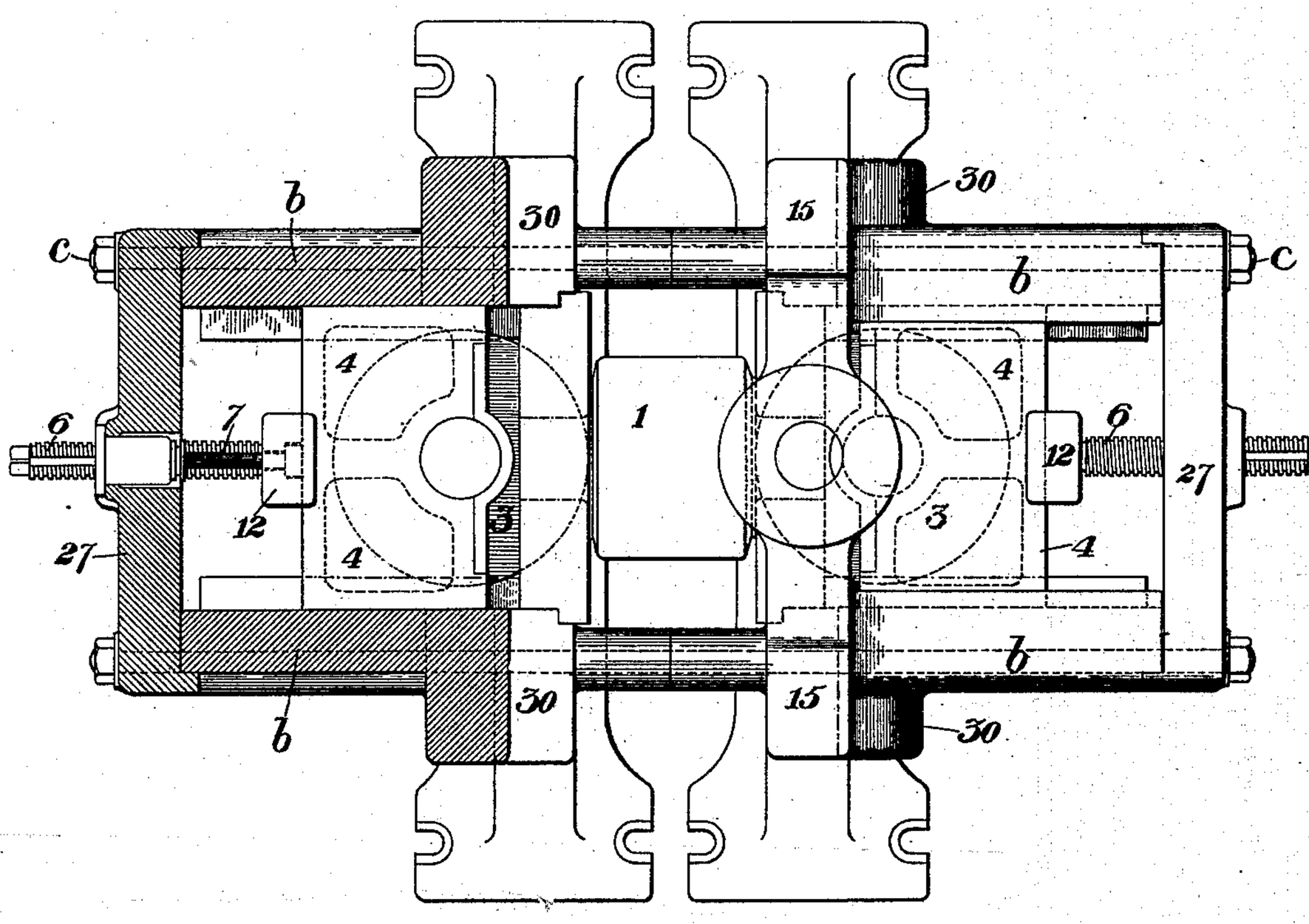
MILL FOR ROLLING FLANGED BEAMS.

No. 410,106. Patented Aug. 27 1889.

Fig. 8.



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UNITED STATES PATENT OFFICE.

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MILL FOR ROLLING FLANGED BEAMS.

SPECIFICATION forming part of Letters Patent No. 410,106, dated August 27, 1889.

Application filed November 19, 1888. Serial No. 291,210. (No model.)

To all whom it may concern:

Be it known that we, JULIAN KENNEDY, of Latrobe, in the county of Westmoreland and State of Pennsylvania, and HENRY AIKEN, of Homestead, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Mills for Rolling Flanged Beams; and we do hereby declare the following to be a full, clear, and exact description thereof, reference being had to the accompanying drawings, in which—

Figure 1 is a front view, partly in section, of the rolls and their housings. Fig. 1ª is a view of the rolls of Fig. 2, showing the ingot therein before it has been reduced by the rolls. Fig. 2 is a front view of the rolls and their driving-gear without the housings and roll-carriers. This view shows the rolls operating on a billet of metal in the first stages of its reduction. Fig. 3 is a similar view showing the metal in the final stages of its reduction. Fig. 4 is a front elevation of rolls, showing a modified form of our invention; and Fig. 5 is an end elevation of Fig. 4. Fig. 6 is an end view of one of the housings of the rolls. Fig. 7 is a horizontal cross-section thereof on the line VII VII of Fig. 6. Fig. 8 is a plan view, partly in horizontal section, of the housings and rolls, the upper horizontal driving-roll being omitted for clearness of illustration.

Our invention in universal mills for rolling **I**-beams and other forms of structural metal beams relates particularly to the construction, arrangement, and adjustment of the horizontal rolls. We will describe it particularly as applied to the manufacture of **I**-beams; but we do not limit ourselves thereto, as it is also applicable to and designed for use in rolling channel-bars and other forms of flanged beams or articles having longitudinal flanges by changing the working-faces of the rolls to conform to the shape desired.

Referring now to Figs. 1, 2, and 3 of the drawings, the mill has two horizontal short-necked formative rolls 1 2 and two vertical rolls 3 3, driven by a suitable engine, (not shown,) which, to enable the metal to be passed back and forth through the mill, should be a reversing-engine. The necks of the vertical rolls 3 are journaled in strong side frames or carriers 4, the inner parts of which are preferably made of vertically-divided portions secured together by bolts so as to form tubular bearings for the necks of the rolls. These carriers are suitably flanged to afford the desired strength, and are recessed, as shown in Fig. 1, to permit free rotation of the rolls. The carriers are set in and are supported by laterally-projecting wings *b* of the housings, which are constructed as shown in Figs. 6 and 7. At the rears of the carriers 4 are adjusting-screws 6, by which the carriers are movable toward the horizontal rolls through windows made for that purpose in the housings of the latter. (See Figs. 6 and 7.) The carriers are also provided with piston-rods 7 of hydraulic cylinders, by which they may be retracted; or, if desired, a screw may be substituted for the hydraulic engine. The screw 6 and the piston 7 work through suitable plates 27 at the ends of the laterally-projecting portions *b* of the housings, and bear against the outer sides of the straps or yokes 12, hereinafter to be described, and the end plates at the opposite sides of the housings are connected by bolts or tie-rods *c*, Fig. 8, which serve to add strength to the machine. The necks of the vertical rolls 3 project below the carriers 4 and are provided with beveled pinions 8, which are in gear with pinions 9 on a horizontal shaft 10. The pinions 9 are mounted on the shaft 10 by a feather and spline 11, and are connected with the carriers 4 by straps or yokes 12, which at their lower ends are forked and loosely encircle cylindrical necks on the pinions 9. The pinions are confined to the lower ends of the straps 12 by collars 14 on the necks of the pinions at the ends of the yokes. When thus arranged, the rotation of the shaft 10 drives the rolls 3 through the pinions 8 and 9, and these parts are kept in gear in every adjustment of the carriers 4, because the yokes 12 move the pinions in the adjustment of the carriers and preserve a constant relation between them.

15 is the housing of the horizontal rolls. The bearings of the lower horizontal roll 2 are not fixed in the housings, but are set in place therein, so that the face of the roll shall rest upon and be supported by a hori-

zontal roll 16, which is fixed on the shaft 10 and is journaled in fixed or non-adjustable bearings at the base of the housing. The upper horizontal roll is set in the housing 15, so that its bearings shall be movable vertically therein, and above it in the housing is journaled a horizontal driving-roll 17, the bearings of which are arranged to be vertically adjustable by means of adjusting-screws 18. The roll 17 is driven by a shaft 19, and the roll 1 is held in contact with it by means of a suitable counter-balance connected with the bearings of the roll, which we have not shown, because it may be of any of the well-known forms. The rolls 1 and 2 are thus held in contact with the driving-rolls 17 and 16, in one case by the action of the counter-balance, which raises the roll 1 as the driving-roll above it is raised, and in the other case by mere gravity of the roll 2, and they are therefore driven by frictional contact, and as the metal is passed between the rolls 1 and 2 the stress of the work is taken up by the outer driving and supporting rolls. The necks of the horizontal rolls are made quite short, so that they shall not interfere with the operation and adjustment of the vertical rolls, and by thus driving the horizontal rolls not directly from the shaft, but by means of the outer supporting and driving rolls, we are enabled, without using horizontal rolls of undue size, to locate the driving-shafts away from the vertical rolls, so that there shall be no interference between them. By this arrangement we are able to set the horizontal and vertical rolls so that the axes of all of them shall be in the same vertical plane, securing in this way the advantages of the construction which was described and claimed in our prior patent, No. 344,383, on which the present mill is an improvement. We thus secure a strong and compact construction of rolls which are very effective for the work for which we intend them.

The rolls 1 and 2 are designed to be easily removable from the housings and replaced by other rolls for rolling different sizes of beams, the vertical rolls serving for any size without change. In order to facilitate this substitution, we provide the housings 15 with a window or enlargement 30 at the side. The rolls may be removed through this window without removing the driving-rolls or dismantling the housings by simply raising the upper rolls 1 and 17, drawing back the vertical rolls, and then lifting the roll 2 up to the level of the window and drawing it out. The roll 1 may then be dropped to the level of the window and withdrawn. For this purpose the window may be made at any convenient level; but by making it just opposite to the pass of the side rolls we afford a free opening for the passage of the ingot in the earlier stages of its reduction when the side rolls are most separated without setting the housings unduly far apart. If desired, there may be a driving-roll used in connection with only one of the formative rolls 1 or 2, the other roll 1 or 2 being in such case driven positively. This, however, would not be so good a construction, because it would necessitate making one of the necks of each side roll very short. We desire, however, to cover it by this patent.

The mill is designed for rolling I-beams, and consequently the edges of the rolls are so formed as to give the proper shape to the edges of the flanges. They may also be provided with offsets 21 to square up the edges.

The operation of the mill will be evident to those familiar with the art from the preceding description of its construction. The bloom or ingot having been properly heated is passed between the rolls 1 2 in the usual way (see Fig. 2) until it has been partially elongated and reduced, and then the side rolls 3 3 are adjusted inwardly by the screws 6 with a gradual movement. The horizontal rolls are likewise brought together by means of the adjusting-screws, and by successive passes of the metal back and forth between the rolls and successive adjustments of the latter the beam, with its flanges, is brought to the desired form. When the operation is complete, the rolls occupy the relative positions shown in Figs. 1 and 3. The number of passes will vary according to the size of the bloom, the condition of the metal, and the character of the beam to be made, and, if desired, the beam, after finally emerging from this mill, may be further treated in separate finishing-rolls, as will be readily understood.

In Figs. 1, 2, and 3 we show the vertical rolls geared with and driven by the same shaft which drives the lower horizontal rolls. They may, however, be driven by a separate shaft, and we illustrate an arrangement adapted to this end in Figs. 4 and 5. In this case, in order to afford room for the shafts of the vertical rolls, we employ two horizontal driving-rolls 17, which are journaled side by side and are both in contact with the surface of the roll 1. The shafts of the vertical rolls 3 extend up between the necks of the rolls 17 and are connected with a driving-shaft 22 by means of pinions 8 and 9, which are arranged in like manner with the correspondingly-numbered parts in Fig. 1, the pinions 9 being yoked to the frames or carriers of the vertical rolls. The driving-shaft 22 may, if desired, be placed below the roll 16, and the vertical rolls connected with it in like manner by a simple reversal of the parts, as will be readily understood.

The construction of the housings and of the other parts of the rolls of Figs. 4 and 5 is similar to the parts shown in the first three figures of the drawings, and therefore need not be shown or described.

We claim as our invention—

1. In a universal mill, the combination, with side rolls, of horizontal rolls, one at least of which is frictionally driven, and an outer

roll which drives and supports said horizontal roll, substantially as and for the purposes described.

2. In a universal mill, the combination, with side rolls, of horizontal rolls and outer rolls, which drive and support the horizontal rolls, substantially as and for the purposes described.

3. In a universal mill, the combination, with side rolls, of horizontal rolls and driving-rolls arranged on the outside of the horizontal rolls, the axes of the horizontal rolls and their driving-rolls being in substantially the same plane, substantially as and for the purposes described.

4. In a universal mill, the combination of the side rolls, horizontal rolls, outer rolls, which drive and support the horizontal rolls, the driving-shaft of the outer roll, and gearing connecting the side rolls therewith, substantially as and for the purposes described.

5. In a universal mill, the combination of horizontal rolls, one at least of which is frictionally driven, an outer roll which drives and supports said horizontal roll, side rolls and their carriers, positive driving-gear for the side rolls, and independent adjusting mechanism bearing on the carriers of the side rolls, by which they are laterally adjustable, substantially as and for the purposes described.

6. In a universal mill, the combination of the short-necked horizontal rolls, the outer rolls, which drive and support the same, and positively-driven side rolls, the axes of all said rolls being in substantially the same plane, substantially as and for the purposes described.

In testimony whereof we have hereunto set our hands this 24th day of October, A. D. 1888.

JULIAN KENNEDY.
HENRY AIKEN.

Witnesses:
W. B. CORWIN,
H. L. GILL.