(No Model.) 3 Sheets—Sheet 1.

W. SELLERS & W. LEWIS.

BENDING ROLLS.

No. 543,815. Patented July 30, 1895.

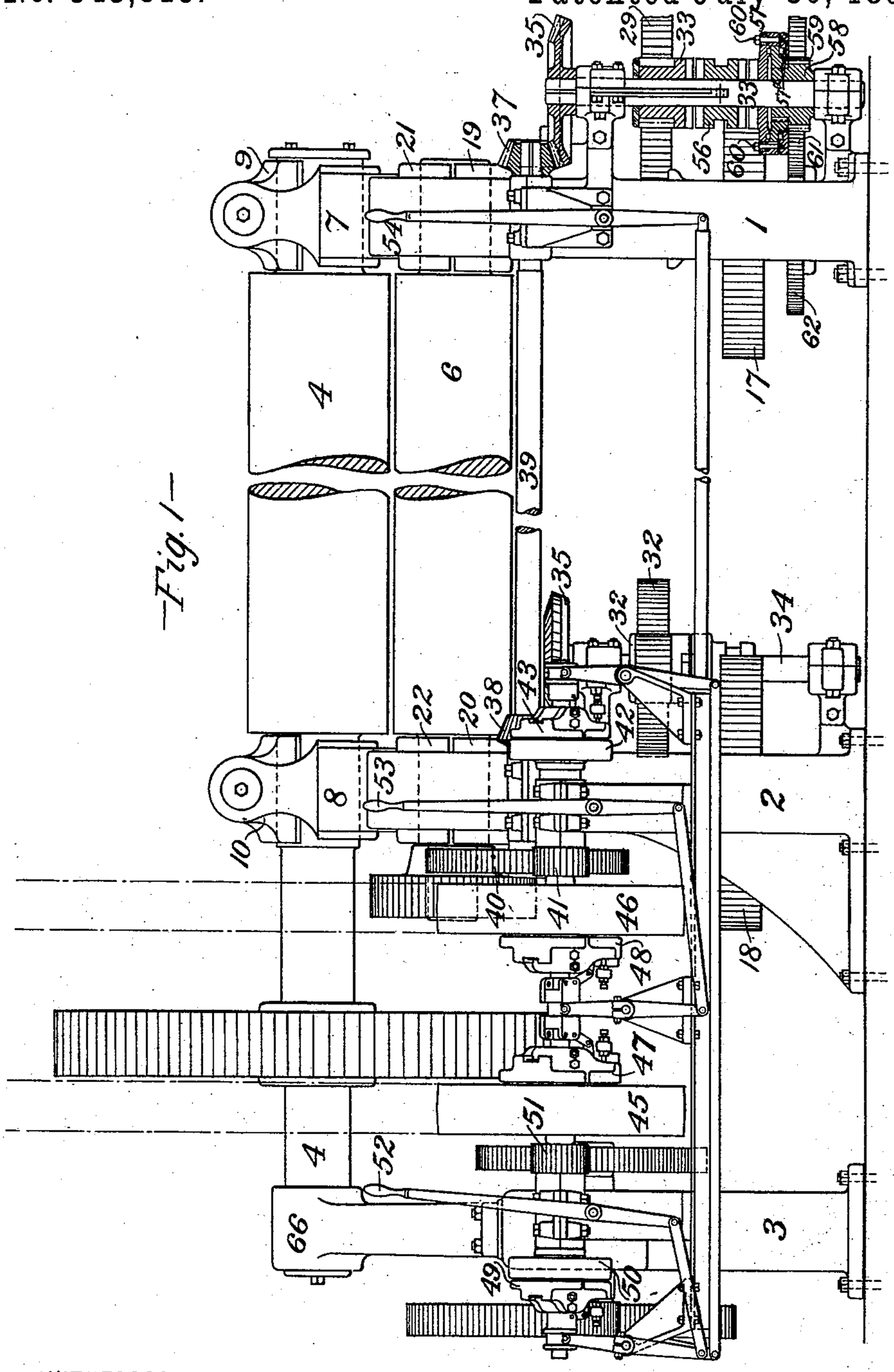

Fig. 1.

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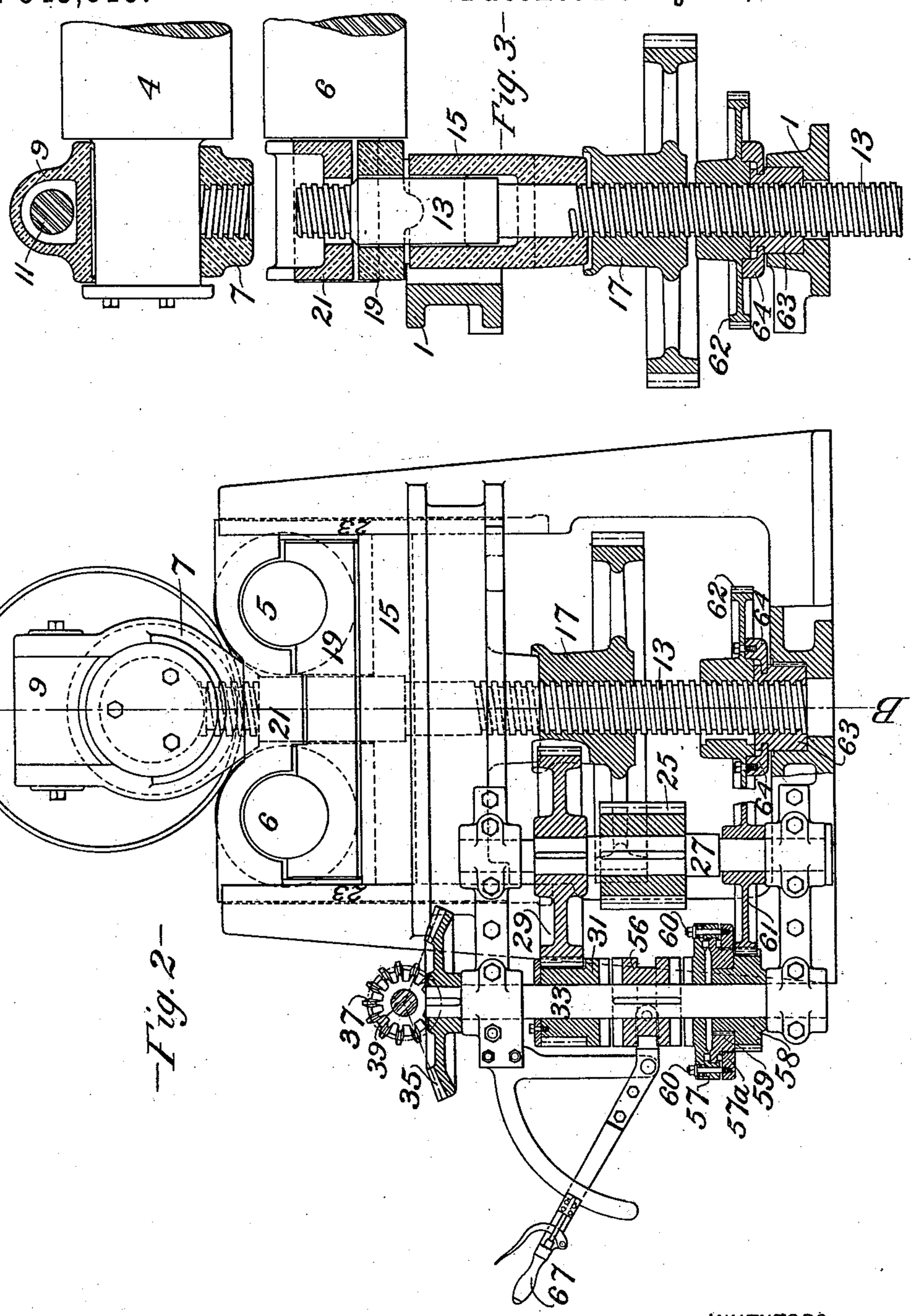

—Fig. 2.—

—Fig. 3.—

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Fig. 4.

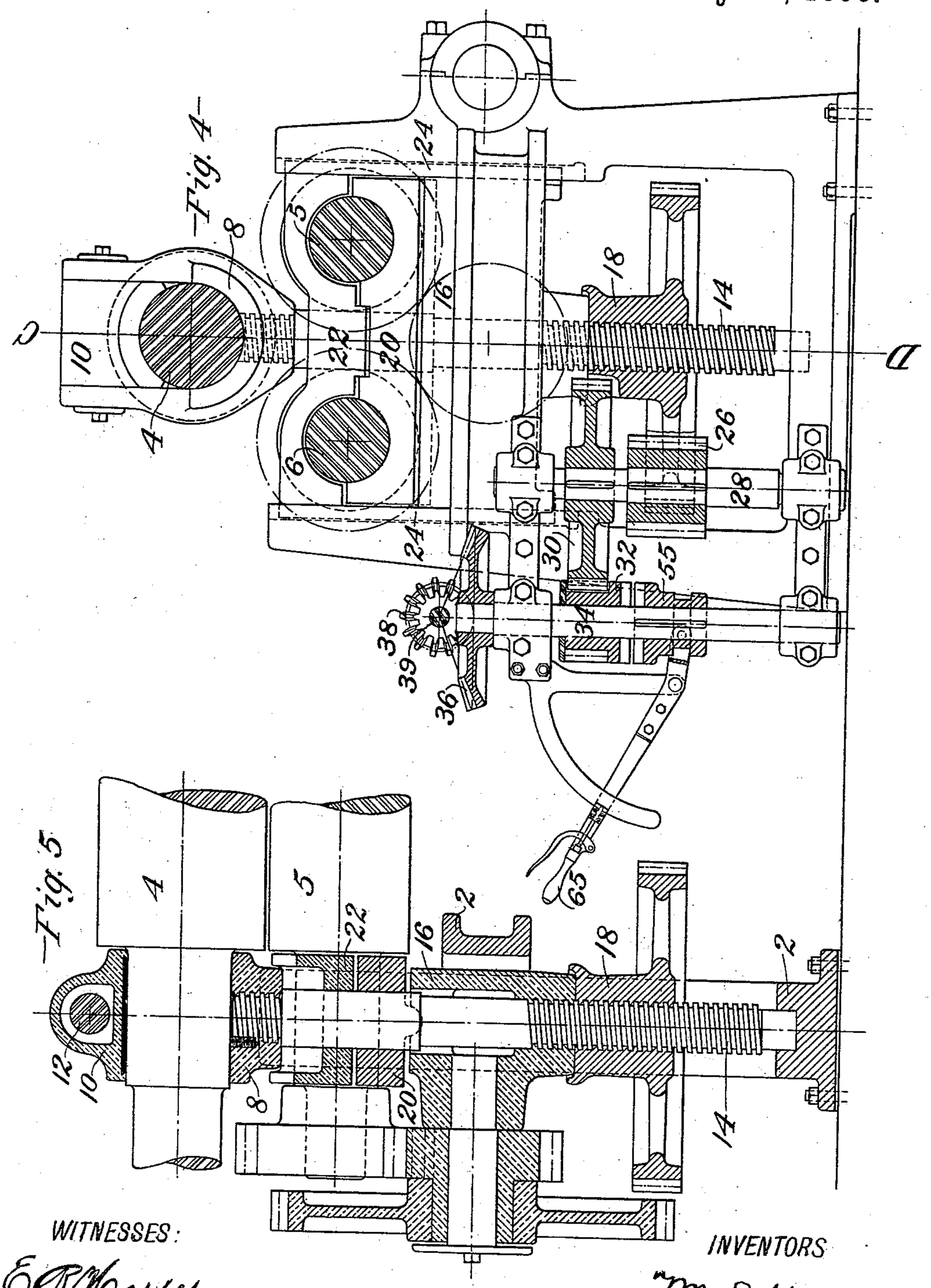

Fig. 5.

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UNITED STATES PATENT OFFICE.

WILLIAM SELLERS AND WILFRED LEWIS, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNORS TO THE WILLIAM SELLERS & COMPANY, INCORPORATED, OF SAME PLACE.

BENDING-ROLL.

SPECIFICATION forming part of Letters Patent No. 543,815, dated July 30, 1895.

Application filed April 26, 1895. Serial No. 547,271. (No model.)

To all whom it may concern:

Be it known that we, WILLIAM SELLERS and WILFRED LEWIS, of the city and county of Philadelphia and State of Pennsylvania, have invented a new and useful Improvement in Bending-Rolls, of which improvement the following is a specification.

Our invention relates to that class of bending-rolls which give the material subjected to their operations a permanent set and provide conditions which permit the removal from the rolls of a plate which has been bent to form a complete cylinder.

Hitherto various devices have been employed upon such rolls, among which is a removable bearing pivoted to the housing or to the adjusting-screw and operated by hand.

In small machines this is a feasible method, but in large machines counterweights are required to balance the removable parts, which makes the mechanism clumsy and inconvenient and causes delay in its operation. By another method a tumbler-bearing made in halves and pivoted to opposite sides of the housing is used, but here, also, counterweights are required, and the same objection holds. This bearing, however, is in the plane of the bearings for the lower rolls, and thus avoids the twist put upon the end housing by eccentric loading.

In bending-machines calculated to resist a pressure of several hundred tons the smallest pins and bolts become too large and heavy for easy manipulation by hand, and hitherto no other method has been devised.

To avoid these defects it is an object of our invention to connect the upper and lower roll bearings in the most direct and positive manner.

It is a further object of our invention to connect or disconnect the bearings for the free ends of the rolls easily and rapidly.

It is a further object of our invention to limit the power used to connect or to disconnect these bearings to an amount easily sustainable by the mechanism used.

To these ends our invention consists in an adjusting-screw, through which the strain of bending is transmitted to and adjusted between bending-rolls, and by its revolution the connection of the bending-rolls may be severed and restored at will.

It further consists in a reversible driving-shaft with a double-faced clutch, which drives on one side the adjusting-nut and on the other side the adjusting-screw through a friction-clutch, which limits the power transmitted.

Figure 1 is a side elevation of our improved bending-machine, showing in section at one end the clutches for adjusting the lower rolls and the bevel-gears which drive them. Fig. 2 is an end elevation, on an enlarged scale, of the right-hand housing and machinery, showing in section the gearing for attaching and detaching a fixed upper-roll yoke to and from the adjusting-screw, also a plate bent to a full circle between the rolls. Fig. 3 is a section on the line A B, Fig. 2, showing the adjustable rolls lowered and the adjusting-screw withdrawn from the fixed upper-roll yoke for the removal of a plate when bent to a full circle. Fig. 4 is an end elevation, on an enlarged scale, of the middle housing shown in Fig. 1, the clutches for adjusting the lower rolls and gearing being shown in section. Fig. 5 is a section on the line C D, Fig. 4, showing the adjusting-screw and driving-gear for the lower rolls.

1, Fig. 1, is the right-hand housing, and 2 the middle housing.

3 is the left-hand housing to carry the driving machinery and the outer end of the upper roll 4, which is thereby fixed as to its vertical position.

5 and 6 are the lower rolls.

7 and 8 are yokes in which the upper-roll bearings 9 and 10 are carried by the pins 11 and 12, and to which the adjusting-screws 13 and 14 are respectively attached on the under side.

15 and 16, Figs. 2, 3, 4, and 5, are cross-heads guided respectively in the housings 1 and 2 and supported on the adjusting-screws 13 and 14 by the adjusting-nuts 17 and 18. These cross-heads carry the lower-roll bearings 19 and 20 in semicylindrical cross-grooves, Figs. 3 and 5, which allow the bearings to follow any inclination that may occur in the roll-journals.

21 and 22 are cross-bars attached to the cross-heads 15 and 16 by keys 23 23 and 24 24 at each end, and they serve to cover the roll-journals and guide the screws 13 and 14.

The adjusting-nuts 17 and 18 are driven respectively by the pinions 25 and 26 on the shafts 27 and 28, which in turn are driven by the wheels 29 and 30 and pinions 31 and 32 on the shafts 33 and 34. The shafts 31 and 32 are driven respectively by the bevel-wheels 35 and 36 and pinions 37 and 38 on the horizontal shaft 39, which in turn is driven by the wheel 40 and pinion 41 on a sleeve uniting it with the friction-ring 42, which may be connected when desired by the clutch 43 with the power-shaft, on which the driving-pulleys 45 and 46 are mounted to run in opposite directions and drive through the operating-clutches 47 and 48. By means of the clutch 49 on the same shaft and the friction-ring 50 connected by a sleeve with the pinion 51 a train of gearing in connection with the rolls 4, 5, and 6 is driven. The hand-lever 52 controls the clutches 43 and 49, and the hand-levers 53 and 54 control the operating-clutches 47 and 48 through the links, as shown in Fig. 1.

Referring to Fig. 4, the clutch-pinion 32 may be coupled to the shaft 34 by the clutch 55 feathered on the shaft, and by means of the clutch 43 and operating-clutches 47 and 48 the nut 18 may be rotated to adjust one end of the lower rolls. Similarly, Fig. 2, the clutch-pinion 31 may be coupled to the shaft 33 by the clutch 56 to adjust the other end of the lower rolls, and with both clutches 55 and 56 engaged both ends of the rolls may be moved together. The clutch 56, Fig. 2, engages also by an opposite movement with the friction-rings 57 and 57ª, by which the pinion 58 is driven through the keyed collar 59, which is clamped between the friction-rings 57 and 57ª by the spring-mounted bolts 60 60. This pinion 58 drives through the idle-wheel 61 to the wheel 62, feathered on the screw 13, and held to the nut 63 by the half-collars 64 64. The nut 63 is keyed to the housing 1, and when the screw 13 is turned to uncouple the yoke 7 it revolves within the nut 17 and remains supported by the nut 63, through which it descends as it revolves to unscrew the upper end from the yoke 7, and to provide room for the removal of a plate bent to a cylinder. Aside from the provision for the removal of a bent plate the nut 63 is an essential element in uncoupling the yoke 7, for without provision for lowering the screw the yoke and the bending-roll which it supports would be forced upward. In returning to its original position, if the upper roll is short and rigid and the adjusting-screw and the end of it which couples with the yoke 7 are of the same pitch the yoke-screw must enter the yoke as it left it, as the threads cannot fail to match; but if the upper roll is long, and therefore somewhat flexible, the yoke-screw may be of somewhat finer pitch than the adjusting-screw, so as to lower that end of the upper roll as it is withdrawn from the yoke. In either case, that of a long or a short upper roll, the yoke-screw and the adjusting-screw may be of the same pitch; but when the upper roll is flexible it is desirable to have the yoke-screw of finer pitch than the adjusting-screw, so as to avoid unnecessary friction on the end of the yoke-screw after it has withdrawn from the thread in the yoke.

67 and 65, Figs. 2 and 4, are latch-levers for setting the clutches 56 and 55, respectively, and in the positions shown both clutches are disengaged.

66, Fig. 1, is a stand bolted to the housing 3 to carry the projecting end of the top roll 4, and when the screw 13, Fig. 2, is uncoupled the top roll is carried by this stand and the yoke 8 supported by the screw 14, Fig. 5, which is keyed to the yoke and rests upon the housing 2. When the screw 13 is coupled and the lower rolls are in position for bending a plate, the weight of the rolls and their bearings is all carried on the screws 13 and 14, and in the act of bending these screws serve also to transmit the pressure between the rolls without throwing any stress upon the housings 1 and 2. These housings act only as guides and bearing-supports and are therefore light in comparison with housings which transmit the bending strain. When the lower rolls are lowered to remove a plate bent to a full circle, their movement is limited by stops on the housings 1 and 2, and their weight is transferred from the screws to these housings, thus allowing the end screw 13 to turn more freely.

Assuming the rolls to be as shown in Fig. 1, ready to receive a plate for bending, the operation of the machine may now be described in proper sequence. Engage clutch 56 with 31, Fig. 2, and clutch 55 with 32, Fig. 4, then engage friction-clutches 49 and 50, Fig. 1, by means of the hand-lever 52, and start the rolls to enter the plate by means of the operating-lever 53 or 54. If the rolls are not set to bend the plate to the desired radius, friction-clutches 42 and 43 may be engaged, and friction-clutches 49 and 50 disengaged by the lever 52. Then by means of the operating-lever 53 or 54 the proper adjustment can be effected, and by re-engaging the rolling machinery the plate may be bent to a full circle, if required. To remove a plate thus bent, the lower rolls are lowered until arrested by stops in the housings 1 and 2. Clutch 55, Fig. 4, is then withdrawn from 32, and clutch 56, Fig. 2, is thrown out of 31 and engaged with 57. Now, by operating lever 54 the screw 13 is withdrawn from the yoke 7 as far as is necessary to clear the plate, which may then be removed. Reversing the movement, the screw again enters the yoke 7 and is driven up against its shoulder. To avoid undue stress when the shoulder is reached, the frictional device 57 and 59 is introduced to limit the force trans-

mitted. This device is simply a clamp in which the pressure is limited by the compression of the springs 60 60. By careful handling the screw might be coupled and uncoupled without the intervention of this frictional device, but there is danger of excessive torsion from the inertia of the driving-pulleys when the screw reaches its shoulder, and the device described avoids that danger. These rolls are shown and described as driven by reversing friction-clutches, but it is evident that a reversing steam-engine or an electric motor may be substituted for the clutches without any radical change in design. The top roll is also shown as held in position by fixed bearings at one end and driven by a gear-wheel between them, while the lower rolls are adjustable, and this arrangement is preferred for reasons which do not affect the nature of our present improvement; but, obviously, the bottom rolls may be fixed and the top roll may be adjustable, whether driven or not, when provision is made to sustain it at one end while open at the other. To permit this adjustment of the top roll the outer bearing 66 may be slotted on the under side to permit the journal of the top roll to descend therein. When the top roll is raised against the upper end of this slot, the other end of the roll may be unsupported. The screw 13 may then be withdrawn, as hereinbefore described, to permit the removal of a plate bent to a full circle.

Having now described our invention, what we claim as new, and desire to secure by Letters Patent, is—

1. In a plate bending machine, bending rolls, with a revoluble screw and two nuts at one end of the rolls, whereby the connection between the rolls at that end may be severed and restored at will.

2. In a plate bending machine, bending rolls, with a revoluble screw and two nuts at one end of the rolls, whereby the connection between the rolls at that end may be severed and restored at will, in combination with a revoluble nut on the screw, whereby the distance between the bending rolls may be adjusted.

3. In a plate bending machine, bending rolls, with a revoluble screw and two nuts at one end of the rolls, whereby the connection between the rolls at that end may be severed and restored at will, in combination with a frictional device for limiting the torsion of the screw.

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