No. 646,269. Patented Mar. 27, 1900.

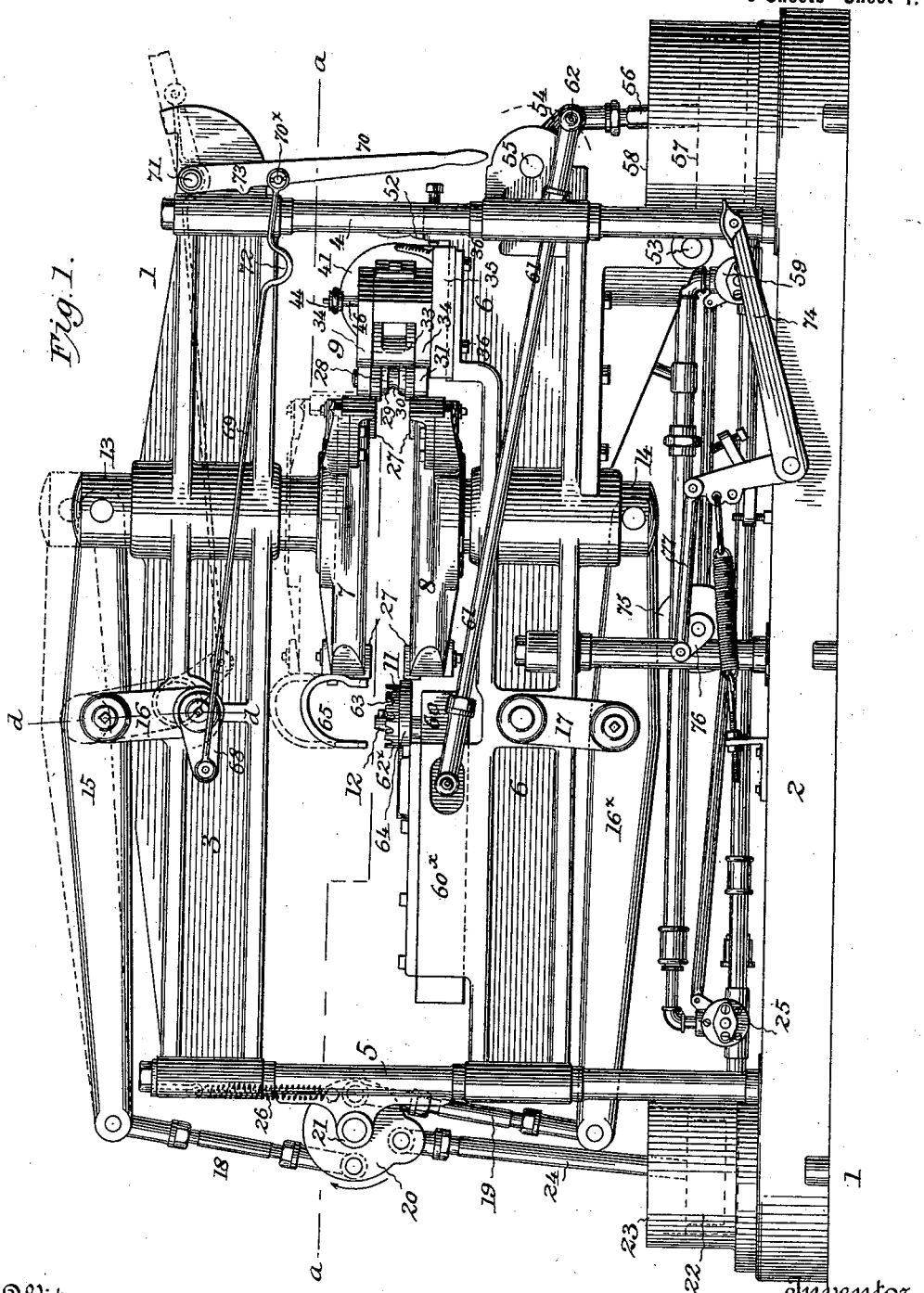
E. EINFELDT.

MACHINE FOR MAKING METAL WHEELS.

(No Model.) (Application filed Nov. 10, 1899.)

9 Sheets—Sheet 1.

Fig. 1.



Witnesses.
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(No Model.) (Application filed Nov. 10, 1899.) 9 Sheets—Sheet 2.

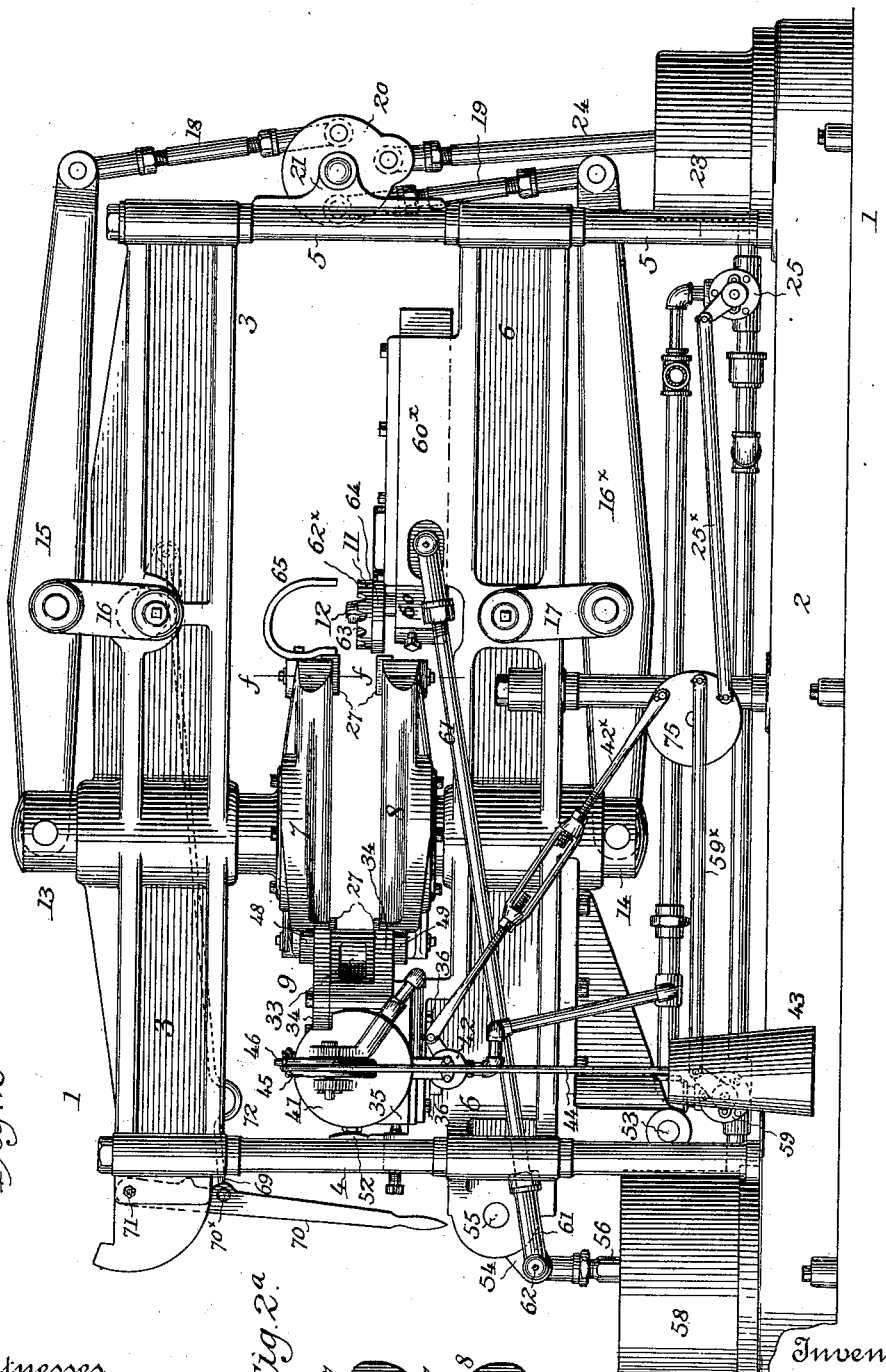

Fig. 2.

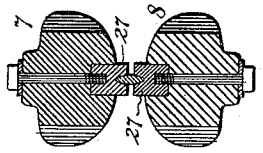

Fig. 2a.

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MACHINE FOR MAKING METAL WHEELS.

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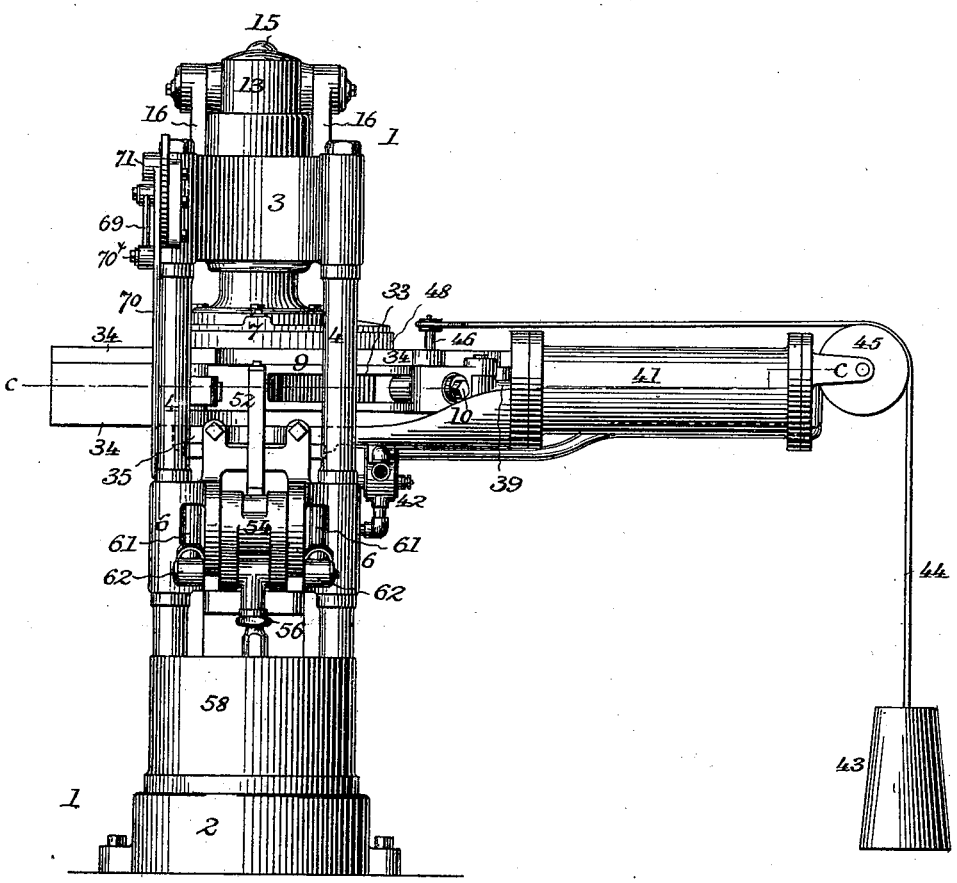
9 Sheets—Sheet 3.

Fig. 3.



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9 Sheets—Sheet 4.

Fig. 4.

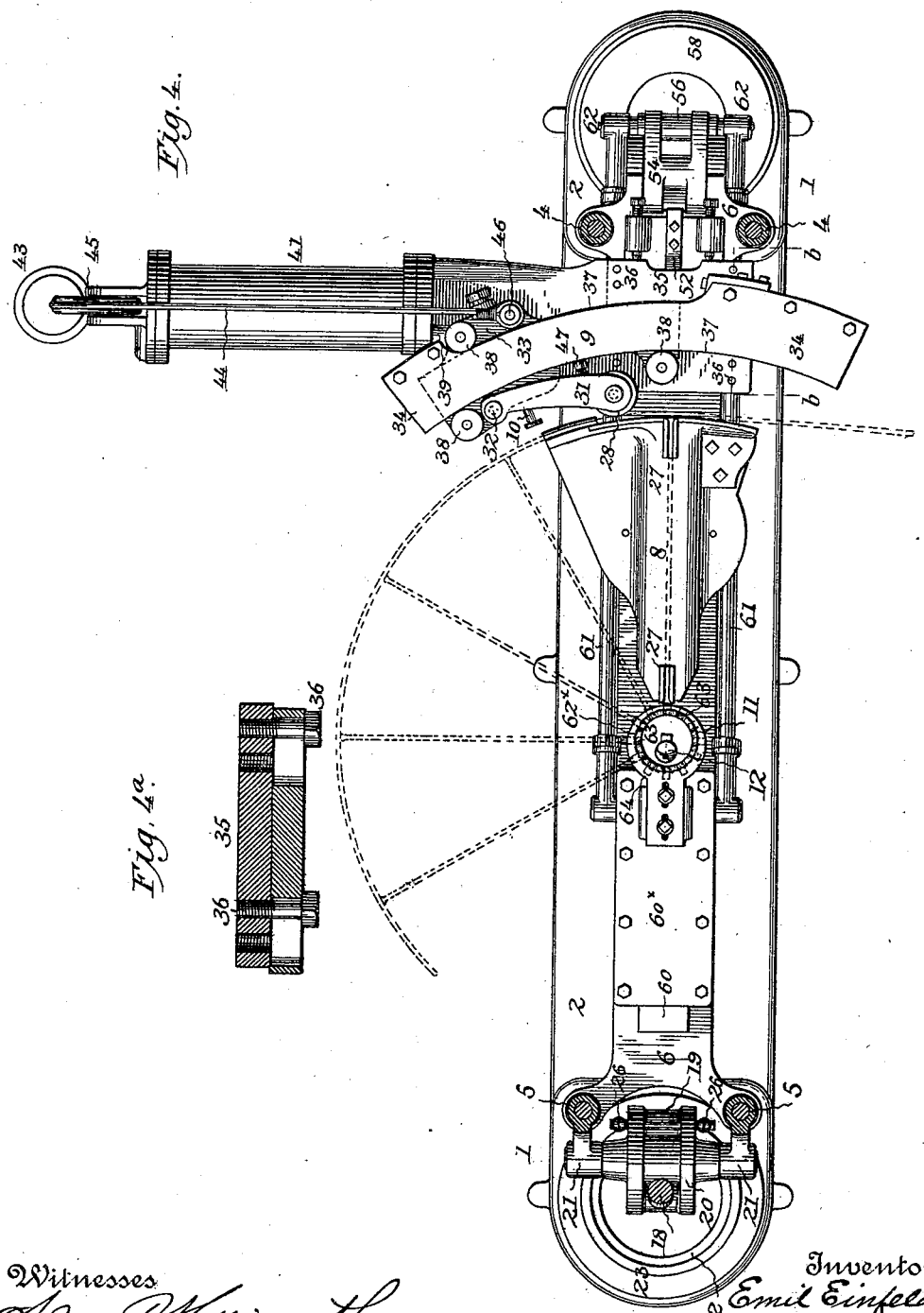

Fig. 4a.

Witnesses

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MACHINE FOR MAKING METAL WHEELS.

(No Model.) (Application filed Nov. 10, 1899.)

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Fig. 5.

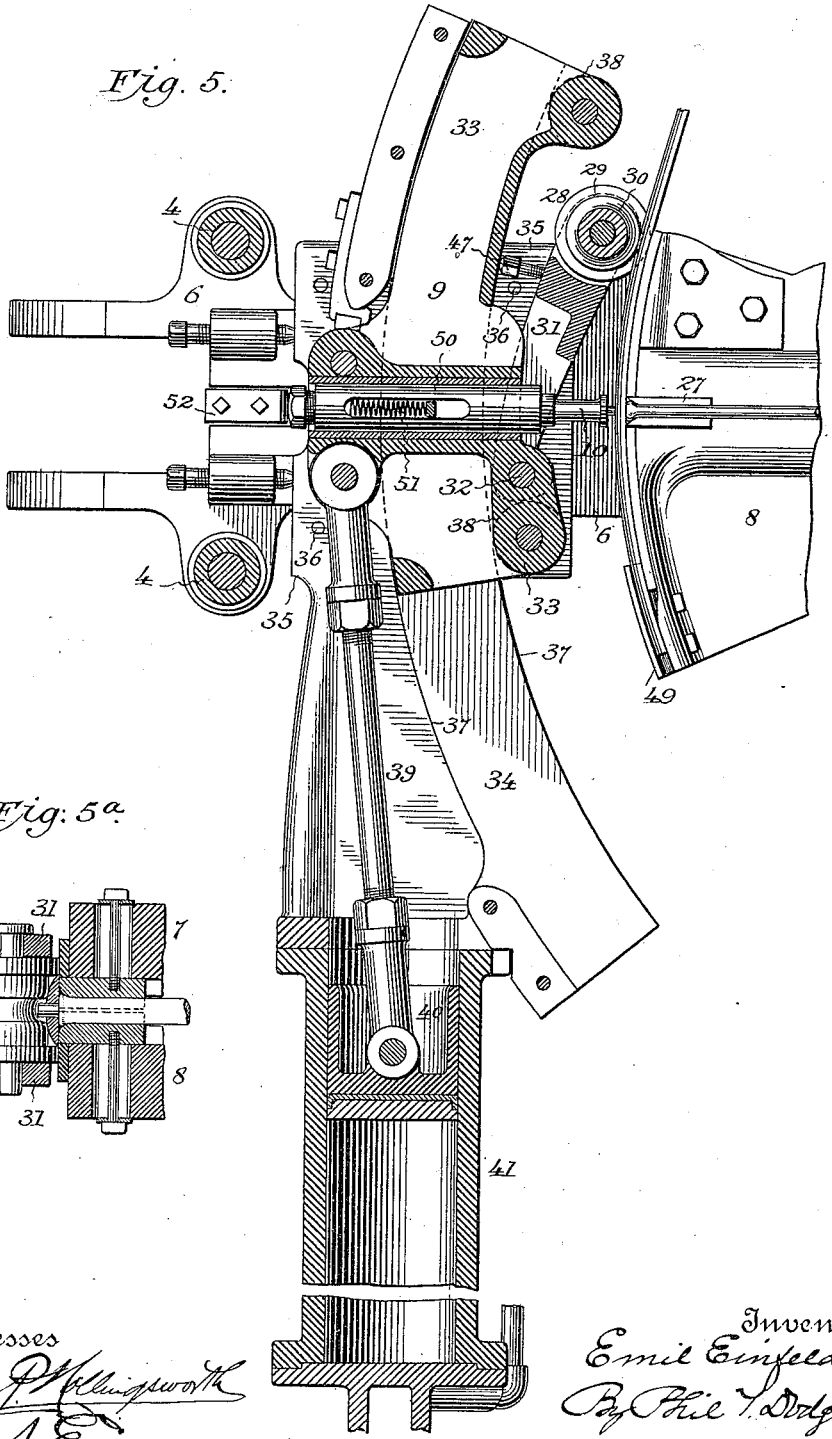

Fig. 5a.

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(No Model.) (Application filed Nov. 10, 1899.)

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Fig. 6

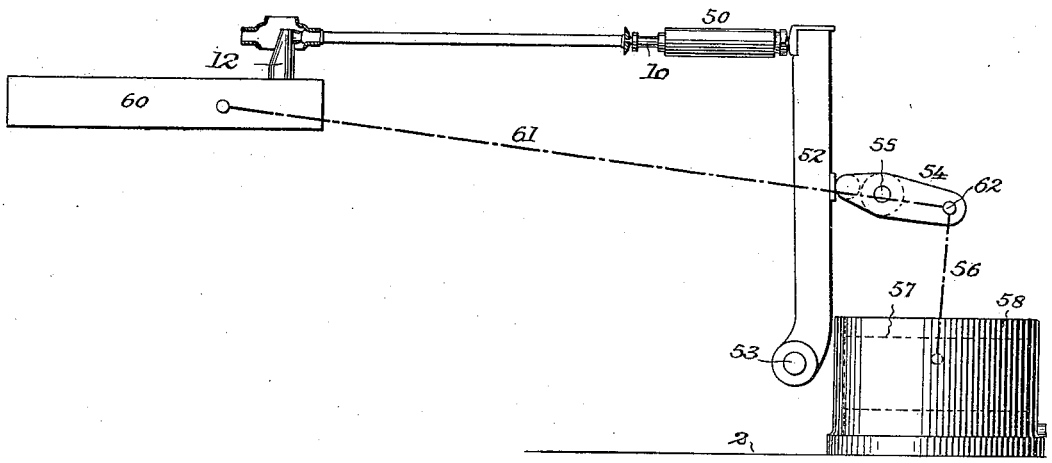


Fig. 7.

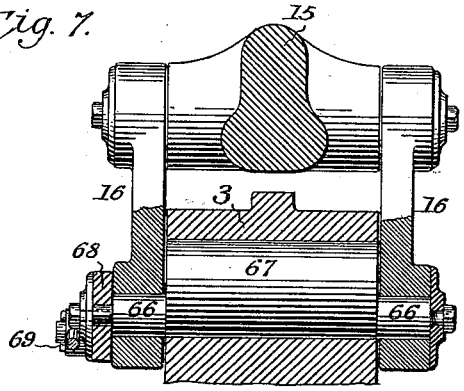


Fig. 8.

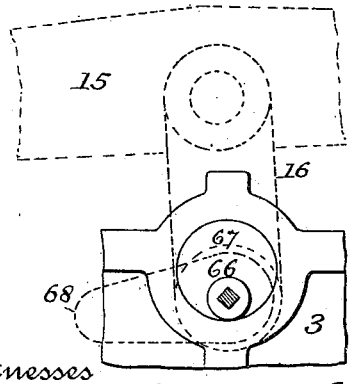
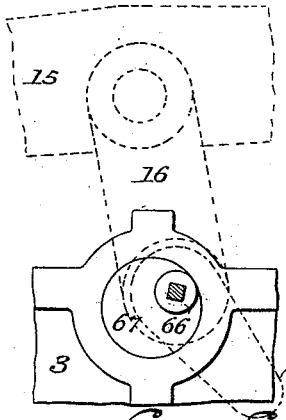


Fig. 9.



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(No Model.) (Application filed Nov. 10, 1899.) 9 Sheets—Sheet 7.

Fig. 10.

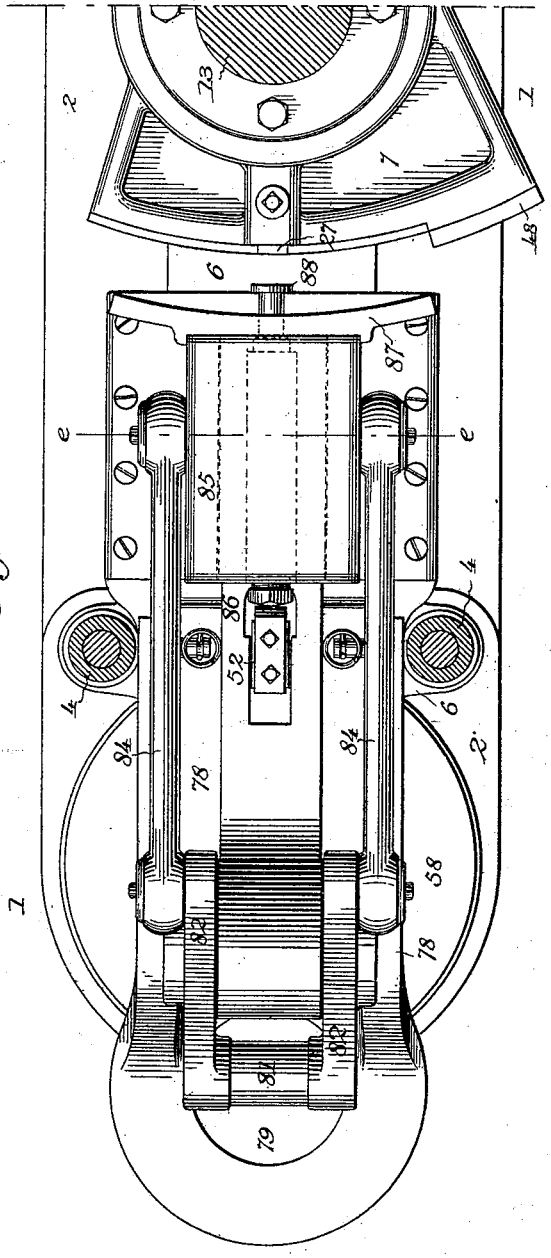
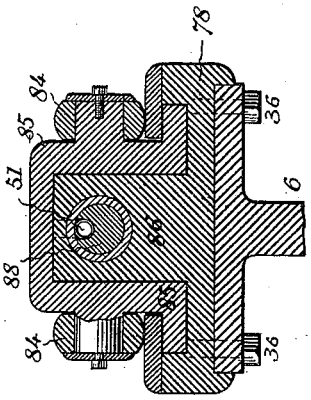


Fig. 11.



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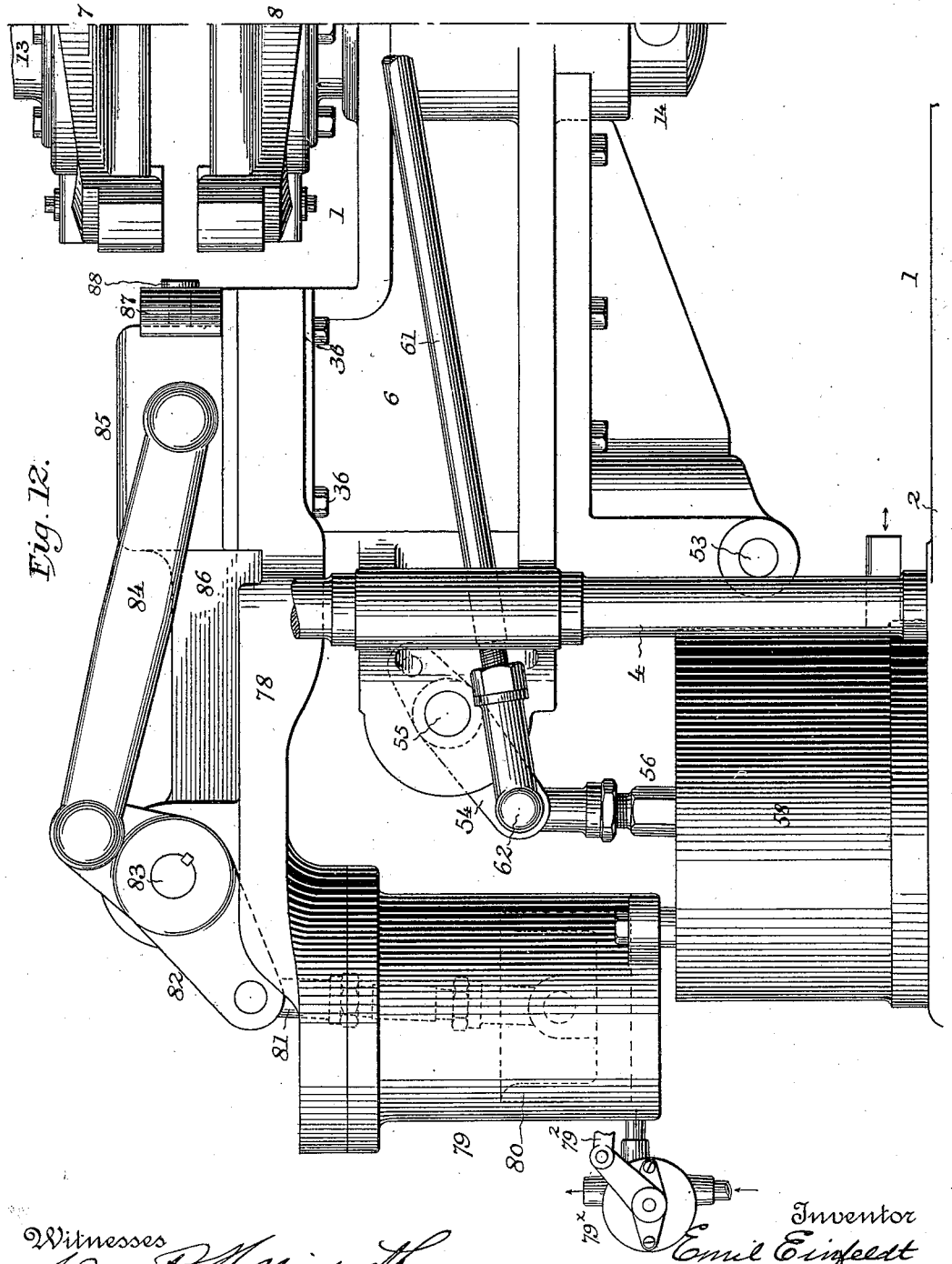
(No Model.) 9 Sheets—Sheet 8.

Fig. 12.



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(No Model.) (Application filed Nov. 10, 1899.)

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Fig. 13

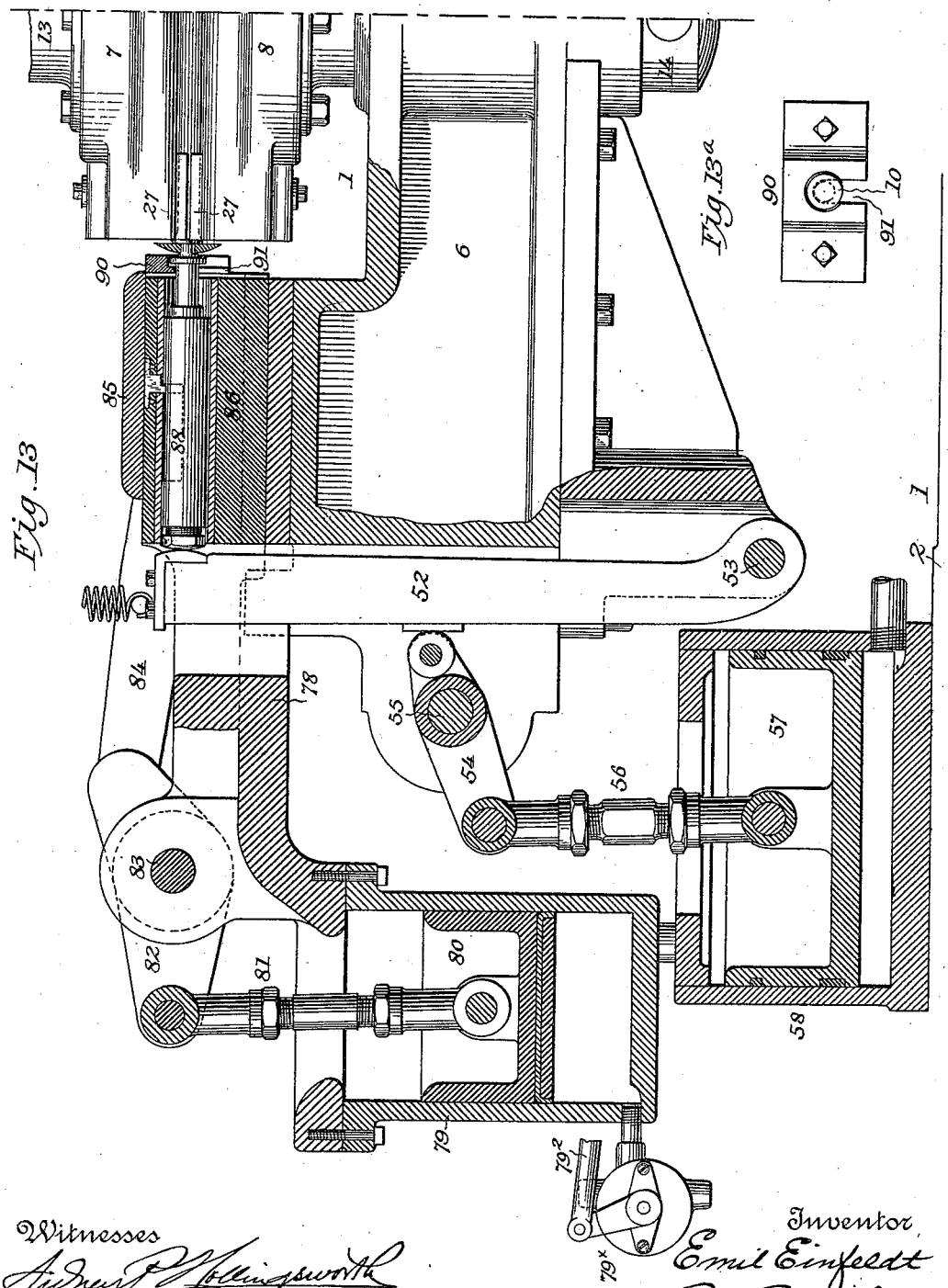

Fig. 13a

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UNITED STATES PATENT OFFICE.

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MACHINE FOR MAKING METAL WHEELS.

SPECIFICATION forming part of Letters Patent No. 646,269, dated March 27, 1900.

Application filed November 10, 1899. Serial No. 736,479. (No model.)

To all whom it may concern:

Be it known that I, EMIL EINFELDT, of Davenport, county of Scott, and State of Iowa, have invented a new and useful Improvement in Machines for Making Metal Wheels, of which the following is a specification.

This invention has reference to the production of metal wheels; and it consists, broadly, of mechanism adapted to progressively bend a strip into circular form to form the rim and fasten the spokes in place as the bending operation progresses. This mechanism embodies a clamping device for holding the spoke, a bending mechanism adapted by successive actions to bend the strip progressively into the form of the rim, and a heading device alternating in its action with that of the bending mechanism and adapted to successively fasten the spokes to the strip.

The invention consists also in combining with the mechanism above described a device adapted to act on the spoke at its inner end and secure the same to the hub simultaneously with the fastening of the outer end of the spoke to the rim.

The invention also consists in the details of construction and combination of parts hereinafter described and claimed.

In the accompanying drawings, Figure 1 is a side elevation of my improved machine in its preferred form. Fig. 2 is a similar view as seen from the opposite side. Fig. 2ª is a cross-section through the clamping-jaws in closed position on the line *f f* of the preceding figure. Fig. 3 is a front elevation of the machine. Fig. 4 is a horizontal longitudinal sectional elevation on the line *a a* of Fig. 1. Fig. 4ª is a transverse vertical section on the line *b b* of the preceding figure. Fig. 5 is a horizontal transverse sectional elevation, on an enlarged scale, of the bending mechanism on the line *c c* of Fig. 3. Fig. 5ª is a sectional elevation through the ends of the spoke-clamping jaws and bending-roller, showing how the latter bends the strip against the jaws. Fig. 6 is a diagrammatic view illustrating the simultaneous action of the two heading devices on the opposite ends of the spoke. Fig. 7 is a vertical transverse sectional elevation, on an enlarged scale, on the line *d d* of Fig. 1, showing how the upper jaw of the spoke-clamp may be raised above its normal operative position to admit of the insertion of the hub in its holder. Figs. 8 and 9 are elevations of the same, showing the parts in different positions. Fig. 10 is a plan view, partly in section, of the bending mechanism in modified form. Fig. 11 is a transverse section on the line *e e* of the preceding figure. Fig. 12 is a side elevation of the modified form of the bending mechanism. Fig. 13 is a longitudinal sectional elevation of the mechanism represented in Fig. 12 with the bending-die removed and in its place a straight die adapted in its action to clamp the rim and in conjunction with the heading-tool to form a shoulder at the inner side of the rim and also to form a head on the outer end of the spoke. Fig. 13ª is a front elevation of the straight die.

Referring to the drawings, particularly to Figs. 1 to 9, inclusive, 1 represents a frame, which may be of a form and material adapted to give support to the operative parts of the mechanism. In the present instance it comprises a base 2, an upper cross-bar 3, sustained at the upper ends of front and rear standards 4 and 5, rising from the base, and a central supporting-bed 6, sustained by the standards between the base and cross-bar. Mounted in this frame is a spoke-clamping device comprising upper and lower jaws 7 and 8, adapted to close on the spoke and hold it firmly in a horizontal position, a bending mechanism 9, adapted to act on the strip of which the rim is to be formed and bend the same progressively, a heading-tool 10, Fig. 5, adapted to act on the outer end of the spoke to fasten it to the rim, a hub-holder 11 to give support to the hub, and a heading-tool 12, arranged to act on the inner end of the spoke within the hub and fasten the same to the hub. The upper and lower jaws of the clamp are fastened to the inner adjacent ends, respectively, of two vertical stems 13 and 14, extended through and guided in vertical openings in the upper cross-bar and central supporting-bed, respectively. The stem of the upper jaw is jointed to the forward end of a horizontal operating-lever 15, extending along the top of the cross-bar and pivoted midway between its ends between the upper ends of two links 16, which are in turn piv-

oted at their lower ends to the cross-bar in such manner that they may be lifted bodily to raise the lever and elevate the upper jaw of the clamp above its operative position, as will be more fully described hereinafter. The stem of the lower jaw of the clamp is jointed at its lower end to the forward end of an operating-lever $16^{\times}$, extending at the under side of the central bed and pivoted midway between its ends between the lower ends of two links 17, whose upper ends are pivoted to the sides of the central bed. At their rear ends the two operating-levers are connected, respectively, by links 18 and 19 with an oscillating member in the form of a disk 20, mounted in bearings 21 on the rear standards. The connection of the links with the disk is on opposite sides thereof, so that when the disk is rocked in the direction of the arrow, Fig. 1, the links will be moved endwise in opposite directions, and, separating the ends of the operating-levers, the jaws of the clamps will be brought together. The oscillating disk is rocked by the ascent of a piston 22 in a cylinder 23 on the rear end of the base, which piston is connected with a piston-rod 24, having its upper end jointed to the oscillating disk 20 below its axis. On the admission of fluid under pressure to this cylinder through a valve 25 the piston will rise, and, turning the disk, the levers will be operated, as described, and the jaws of the clamp will be brought together. When the supply of pressure is cut off from the cylinder, the piston is lowered to its former position and the disk returned to its former position by a spring 26, having its upper end connected with the frame and its lower end with the oscillating disk. At their two ends the jaws have on their adjacent faces beveled ribs 27, Fig. 2^{a}, extending parallel and forming V-shaped grooves, between which the spoke is held near its opposite ends when the jaw is closed. At their forward ends, adjacent to the bending mechanism 9, the jaws of the clamp are widened and curved in the arc of a circle of the diameter of the wheel to be formed, and these curved ends when the two jaws are closed to clamp the spoke act as an abutment or anvil, against which the bending mechanism operates on the strip to give it the proper curvature.

The bending mechanism in the present instance is in the form of a roller 28, Figs. 1, 4, and 5, mounted on a vertical axis and adapted to travel in a horizontal transverse path along the curved ends of the jaws. Its peripheral face is grooved, as at 29, to receive the edges of the strip and prevent the same from sagging, and at the center it is reduced in diameter, as at 30, to permit it to pass over the end of the spoke projecting through the strip, as shown in Fig. 5^{a}. This roller is carried on the end of an arm 31, pivoted at its other end on a vertical axis 32 on a carriage 33, sliding between upper and lower guide-plates 34 on a bracket 35, detachably connected with the central supporting-bed by bolts 36, Fig. 1. The edges of the guide-plates are curved, as at 37, and the carriage in its movements is caused to travel in a path corresponding to this curve by means of friction-rollers 38, mounted on the carriage and bearing on the curved edges of the plates. The carriage is connected by a rod 39 with a piston 40 in a horizontal cylinder 41, projecting laterally from the bracket, and as the piston is advanced by the admission of fluid to the cylinder through its valve 42 the carriage will be moved to the position represented in Fig. 5 and the bending-roller will bend the strip against the curved ends of the jaws. When pressure is cut off from the cylinder, the piston is retracted, the cylinder exhausted, and the carriage moved back to its original position by a weight 43, attached to a rope 44, passing over a guide-pulley 45 on the cylinder and connected at its end with a pin 46, extending upward from the carriage. The bending-roller is held to its work by a set-screw 47, tapped in the arm 31 and bearing against the carriage, as shown in Fig. 5.

In the operation of the mechanism thus far described a spoke, with its inner end inserted in the hub, is set in place in the grooves on the lower jaw of the clamp and the hub seated in the hub-holder. A straight strip to form the rim, provided previously with holes for the outer ends of the spokes, is held at one end, when the jaws are closed between lips 48 and 49, projecting from the curved ends of the jaws at one side, and the free portion of the strip is sprung across the curved ends of the jaws, with the outer end of the spoke extending through a hole in the strip. On the advance of the bending-roller it acts on the strip, pressing the same firmly against the jaws and bends the same, and after advancing holds the strip, as shown in Fig. 5. While the roller is thus holding the strip, the heading-tool 10 is brought into action for fastening the spoke in place, and after the completion of the fastening operation the bending-roller is retracted to its original position. The jaws are now opened, the hub shifted and another spoke set in place, and the previous operations repeated.

The heading-tool 10 alluded to consists of a cylindrical bolt 50, mounted in a horizontal position in a guiding-opening in the carriage to reciprocate longitudinally to a limited extent. It is acted on by a spring 51, which tends to hold the bolt retracted. The bolt is in such a position that when the carriage is advanced, with the bending-roller holding the strip, the bolt will be opposite the outer end of the spoke projecting through the strip, in which position of the parts the opposite end of the bolt will be in line with the upper end of a vertical vibrating arm 52, Figs. 3, 4, 5, and 6, pivoted at its lower end, as at 53, to a depending extension of the central bed. This arm is advanced to cause the heading-tool to act on the end of the spoke by means of a

rocking head 54, pivoted between its ends on a horizontal axis 55 on the central supporting-bed, with one end bearing at the back of the vertical arm and its other end jointed to the upper end of a piston-rod 56, connected with a piston 57 in a cylinder 58 on the forward end of the base of the frame. When fluid under pressure is admitted to this cylinder through its valve 59, the piston in rising will rock the head and depress its free end, and this engaging the vertical arm will swing it forward, and its upper end will engage the sliding bolt and, advancing the same, the outer end of the spoke will be upset and a head formed thereon. When the pressure is cut off from the cylinder, the weight of piston 57 and its connected parts will cause it to descend and exhaust the cylinder, the free end of the rocking block disengaging the vibrating arm and the latter being thrown outward by the outward movement of the bolt under the influence of its retracting-spring.

In order that when the outer end of the spoke is headed to fasten it to the rim its inner end will be simultaneously fastened to the hub, I provide for the operation of the inner heading-tool 12 by the same action which operates the other tool. The tool 12 is carried on the forward end of a horizontal header-bar 60, sliding longitudinally in a guide-casing $60^{\times}$ on the central bed. This bar has pivoted to its opposite sides the rear ends of two rods 61, whose opposite ends are jointed, as at 62, to the rocking head 54 where it joins the piston. As a result of this construction when the piston rises the end of the lever will move outward in the arc of a circle, as shown by dotted lines, Fig. 1, and the rods 61 will be pulled forward, thereby drawing the header-bar forward and causing the tool to engage and upset the inner end of the spoke.

The hub-holder 11 before alluded to is in the form of a ring $62^{\times}$, provided in its upper edge with notches 63 to receive the spoke-bosses and seated loosely in a supporting-ring 64, fixed to the upper side of the guiding-casing $60^{\times}$, this arrangement permitting the ring, with a hub therein, to be turned to bring a new boss into position for the insertion of the next spoke. When seated in this holder, the hub is firmly held during the bending of the strip and heading of the spoke by a hub-clamping device adapted to be operated by the closing of the jaws. This device is in the form of an inverted-U-shaped arm 65, Figs. 1 and 2, fixed to the rear end of the upper jaw of the clamp and provided in its ends with notches adapted to straddle the diametrically-opposite bosses of the hub when the jaws are closed. It is seen, therefore, that the clamping-jaws perform two functions—namely, that of clamping the spoke and that of clamping the hub. In addition to these functions the jaws also act to clamp the strip to begin the operation of the machine. After the first spoke has been fastened, however, it is not necessary to clamp the strip by the jaws, for the latter is held in position across the curved ends of the jaws by the previously-secured spoke.

In order that the upper jaw of the clamp may be elevated above its operative position for the purpose of removing the finished wheel and inserting a new hub, I provide means for lifting the operating-lever 15, as shown by dotted lines, Fig. 1. This is effected by mounting the lower ends of links 16 loosely on eccentric-pins 66, Figs. 7, 8, and 9, projecting outward from a journal 67, mounted in a bearing in the upper cross-bar. At one side one of the pins is extended beyond the links and has secured to it an arm 68, connected by a rod 69 with a hand-lever 70 by a pivot-pin $70^{\times}$, which hand-lever is pivoted, as at 71, at the forward end of the cross-bar. When this lever is elevated to the position shown by dotted lines, Fig. 1, the journal 67 will be turned in its bearing by the crank-arm and the pins will be carried upward, as shown in Fig. 9, thereby lifting the links, raising the lever 15 bodily, and elevating the jaw of the clamp carried by the lever. When the pins are raised, as shown, the weight of the lever tends to depress them by exerting a downward pressure thereon, and in order to prevent the journal from turning and lowering the jaw I form in the rod 69 a bend 72, adapted when the lever is raised to straddle the pivot 71, thus permitting the pivotal connection $70^{\times}$ of the rod and lever to "pass center." In this position of the parts the pull on the rod due to the downward pressure exerted by the weight of the lever 15 will tend to throw the hand-lever still higher; but this being prevented by the bent portion of the rod engaging pivot 71 the parts are automatically locked and held in this position. The eccentric-pins are so located with reference to the journal and other parts that when the lever and links are lowered to their normal positions the pins will be slightly to one side of the axis of the journal, as shown in Fig. 8, so that there is a tendency for them to descend farther. This action, however, is resisted by a stop 73 on the hand-lever in position to engage the frame of the machine. It is seen, therefore, that the weight of the lever 15 and the connected parts serves to lock the lever when raised and to maintain it tightly in its depressed position.

The valves controlling the admission of fluid to the several cylinders are operated by a foot-lever 74 pivoted to the base and connected to the several valves in such manner that on the depression of this lever valves 25, 42, and 59 will be operated in succession to admit the fluid under pressure successively to the cylinder controlling the clamping-jaws, the cylinder controlling the bending apparatus, and the cylinder controlling the heading-tools. On the upstroke of the foot-lever the pressure is cut off from the respective cylinders successively and in reverse order, so that the heading-tools are at first retracted, the

bending mechanism next returned to its normal position, and the clamping-jaws finally opened. These actions of the parts are effected through the medium of a rocking disk 75, Fig. 2, mounted on the frame and having a crank-arm 76, Fig. 1, connected by a link 77 with the foot-lever. The disk is connected with valves 25, 42, and 59, respectively, by links $25^{\times}$, $42^{\times}$, and $59^{\times}$, so that the movement of the disk by the foot-lever will operate all the valves in the manner described.

Assuming that the foot-lever is in its normal position, as represented in Fig. 1, pressure to all the cylinders will be cut off, the clamping-jaws will be opened, and the bending-roller and heading-tools retracted. Hand-lever 70 is now raised to elevate the upper clamping-jaw to permit the insertion of the hub, after which the hand-lever is depressed and the upper clamping-jaw lowered to its operative position. A spoke, previously provided with shoulders at its opposite ends to bear against the outer end of the hub-boss and the inner side of the rim, is inserted with its inner end in the hub-boss and in line with the grooves in the clamping-jaws. A strip, of which the rim is to be formed, provided at intervals with holes to receive the outer ends of the spokes, is now held on edge with one end in position to be clamped by the lips 48 and 49 on the clamping-jaws when the latter are closed. The foot-lever is depressed, the first portion of the downward stroke resulting in the admission of fluid to cylinder 23 and the forcible closure of the clamping-jaws on the spoke between them. The jaws also close on the end of the strip and on the hub, so that the parts are all held firmly in position. The strip is held across the curved faces of the clamping-jaws, with the end of the clamped spoke projecting through a hole in the strip, and on the further depression of the foot-lever fluid under pressure is admitted to cylinder 41, causing the bending-roller to advance, pressing the strip firmly against the curved faces of the jaws and bending the same. On the final downward movement of the foot-lever fluid under pressure is admitted to cylinder 58, causing the two header-tools to act simultaneously on the outer and inner ends of the spoke, forming heads thereon, which, in connection with the previously-formed shoulders, will hold the spoke securely to both the hub and rim. The foot-lever is now permitted to rise under the influence of its retracting-spring $74^{\times}$, and on the first part of the upstroke pressure is cut off from cylinder 58 and the piston, descending, exhausts the cylinder and retracts the heading-tools. On the second portion of the upstroke of the lever pressure is cut off from cylinder 41, and its piston being retracted by the weight the bending-roller is drawn back to its former position. On the last part of the upstroke of the lever pressure is cut off from the cylinder 23 and the clamping-jaws are opened and the spoke and hub released. The hub is now turned in its holder in the direction of the arrow, Fig. 4, carrying with it the secured spoke and rim and another spoke inserted in the next hub-boss in position to be clamped and operated on. On the depression of the foot-lever, as before, the jaws are closed, the bending-roller advanced, and the heading-tool operated, thus bending a second section of the strip and securing another spoke in position. The operations are repeated until the entire strip has been bent step by step into circular form and all the spokes secured one after another in position. The wheel is now complete except as to the fastening of the two ends of the rim, which may be accomplished in any suitable manner, such as by welding or otherwise.

I prefer to heat the ends of the spokes before they are headed and to bend the strip while cold; but this is not absolutely necessary, for the spokes may be headed cold as well as the bending of the strip.

In the mechanism just described the bending of the strip was effected by a transverse traveling motion of a bending-roller, and while a bender of this character is suitable for certain classes of work I find for other kinds of work it is preferable to subject the strip to a direct straight pressure between curved dies. To adapt my machine for accomplishing this, I propose to employ the construction represented in Figs. 10, 11, 12, 13, and 13^{a}. Here it is seen that the bracket 35, sustaining cylinder 41 and the connected parts, has been removed from the central supporting-bed and in its place a bracket 78 substituted, which bracket is secured by bolts 36 to the central supporting-bed. The bracket extends outward between the two standards 4 of the frame and sustains at its outer end a vertical cylinder 79, having a piston 80 and piston-rod 81, jointed at its upper end to a rocking lever 82, pivoted, as at 83, to the bracket. The opposite end of this lever is connected by rods 84 with the opposite sides of a cap-plate 85, mounted to slide longitudinally on a guide-rib 86 on the bracket to and from the curved ends of the clamping-jaws. At its inner end the cap-plate has detachably connected with it a curved bending-die 87, adapted to act on the rim and bend the same against the curved ends of the jaws when the cap is advanced by the rise of the piston on the admission of fluid to the cylinder. The curved die at its center is formed with an opening through which extends the end of a heading-tool 88, mounted to slide horizontally to a limited extent in the central rib 86 and acted on by a retracting-spring similar to the construction hereinbefore described. The walls of the opening in the curved die engage behind the head of the heading-tool, the face of the latter being slightly in rear of the face of the die, so that when the curved die advances it carries with it the heading-tool in contact with the outer end of the spoke, the purpose of which is to

provide for the formation of a shoulder on the spoke at the inner side of the rim. The opposite end of this heading-tool is exposed through the rib and is in line with the upper end of the vibrating lever 52, before described, by which the header is operated to upset the outer end of the spoke. Cylinder 79 is provided with a valve $79^{\times}$, connected by a rod 79^{2} with the rocking disk 75, this rod taking the place of rod $42^{\times}$, which connected the valve of the transverse cylinder with the disk. This direct-acting bender is operated, as far as its relative action to the other parts is concerned, the same as the roller-bender, the admission of pressure to this cylinder occurring after the operation of the clamping-jaws and before the operation of the heading-tool. On the advance of the die it acts against the rim, and the header simultaneously presses on the outer end of the spoke. The rim is forced against the curved ends of the clamping-jaws, carrying with it the heading-tool, and the metal of the spoke between the rim and jaws is upset, forming a shoulder. After the die has advanced its full limit the vibrating lever 52 is operated, advancing the heading-tool still farther and upsetting the outer end of the spoke.

In cases where the rim has been previously bent into circular form I propose to employ the above mechanism with a slight change to secure the spokes to the rim by the formation, as before, of a shoulder at the inner side of the rim and a head on the outer end of the spoke. In such cases the curved die 87 is removed from the face of the cap and a die 90, Figs. 13 and $13^{\times}$, with a straight face substituted. This die has a vertical open slot 91 fitting around the head of the heading-tool and engaging behind it, so that when the cap is advanced to clamp the tire between the die and the ends of the jaws the heading-tool will be carried along with it, as before, and maintained in engagement with the outer end of the spoke. When the die is advanced its full distance, the heading-tool is operated independently and the outer end of the spoke headed. It will be understood, of course, that this mechanism and that represented in Figs. 10, 11, and 12, where the curved die is employed, operates in connection with the other parts of the machine, including the heading-tool for the inner ends of the spoke, the only change in the machine being the substitution for the transverse cylinder and laterally-acting bending-roller of the direct-acting die.

Having thus described my invention, what I claim is—

1. In a machine for making metal wheels, the combination with means for holding the spoke, of means for bending a strip to form the rim, and means for securing the spoke to the rim.

2. In a machine for making metal wheels the combination with means for holding the spoke, of means for progressively bending a strip to form the rim, and means for securing the spokes to the rim as the bending operation progresses.

3. In a machine for making metal wheels the combination with means for holding the spoke, of a bending mechanism acting by successive operations to progressively bend a strip to form the rim, and a spoke-fastening mechanism alternating in its action with that of the bending mechanism.

4. In a machine for making metal wheels the combination of means for holding the spoke, means for bending a strip progressively step by step, and means for securing the spokes to the strip as the bending operation progresses.

5. In a machine for making metal wheels the combination of means for holding the spoke, means for sustaining the hub, means for progressively bending a strip to form the rim, and means for simultaneously securing the spoke to the hub and rim as the bending operation progresses.

6. In a machine for making metal wheels the combination with a spoke-clamping device, of a bending mechanism adapted to bend the strip against the spoke-clamping device, and means for securing the spoke to the strip.

7. In a machine for making metal wheels the combination with spoke-clamping jaws provided with curved ends, of a bending mechanism adapted to act on the strip against the curved ends of the jaws, and a spoke-fastening device.

8. In a machine for making wheels the combination with clamping-jaws movable to and from each other in straight paths as distinguished from in the arcs of a circle of means for guiding the jaws in said movements, parallel operating-levers jointed at one end to the jaws and mounted between their ends on axes movable at right angles to the movement of the jaws, and means for moving the opposite ends of the levers to and from each other.

9. In a machine for making wheels the combination with clamping-jaws movable to and from each other, of operating-levers, an oscillating member, rods connecting the ends of the levers with said oscillating member respectively on opposite sides of its axis, a cylinder and a piston therein connected with the oscillating member beyond its axis.

10. In a machine for making metal wheels the combination of horizontal spoke-clamping jaws, vertical stems connected therewith and mounted in guides in the frame, horizontal operating-levers extending at right angles to the movement of the jaws and jointed to the stems and pivoted between their ends to links pivoted in turn to the frame, an oscillating member, means for oscillating the same, and connections between the member and levers.

11. In a machine for making metal wheels the combination with a spoke-clamping de-

vice, of a hub-clamping device operated thereby.

12. In a machine for making metal wheels the combination with spoke-clamping jaws, of a hub-clamping device carried by one of the jaws.

13. In a machine for making metal wheels the combination with a horizontal hub-support, of upper and lower spoke-clamping jaws movable vertically, and a hub-clamping device carried by the upper jaw and adapted to engage the hub when the jaw descends to clamp the spoke.

14. The combination with a hub-support, of a spoke-clamping jaw movable to and from the support parallel with the axis of the hub, and a hub-clamping arm carried by the jaw and formed to engage the opposite hub-bosses when the jaw is moved toward the support.

15. In combination with a spoke-clamp, a heading-tool movable to and from the same, a vibrating arm adapted to engage and move the heading-tool, a cylinder, a piston therein, and a rocking head connected with the piston and disconnected from the lever and adapted to engage and move the vibrating arm.

16. In combination with a spoke-clamp, a heading-tool movable to and from the same, a movable operating member disconnected from the heading-tool and adapted to engage the same, and means for actuating the operating member.

17. The combination with a spoke-clamp, of a heading-tool movable to and from the same, a vertical vibrating arm adapted to engage the heading-tool, a head mounted between its ends on a horizontal axis and arranged to engage the vibrating arm, a cylinder, and a piston therein connected with the rocking head.

18. The combination with a spoke-clamp of a heading-tool at one end, a second heading-tool at the other end, a rocking head adapted to operate one of the heading-tools, and a connection between the rocking head and the other heading-tool.

19. In a machine for making metal wheels the combination with spoke-clamping jaws, of means for operating the same to clamp the spoke, and means for moving one jaw away from the other independently of its clamping movement.

20. In combination with a hub-support, a spoke-clamp comprising upper and lower jaws movable to and from each other to clamp the spokes, and means for elevating the upper jaw to an inoperative position.

21. In combination with a movable clamping-jaw 7, an operating-lever connected therewith, means for actuating the lever to clamp the spoke, and means for elevating the lever bodily to raise the jaw to an inoperative position.

22. The combination with a lower clamping-jaw, of an upper clamping-jaw thereover, a vertical stem connected with the jaw, a horizontal operating-lever having a pivotal connection between its ends with the frame, and jointed at its forward end to the stem, means for rocking the lever, and means for elevating its pivotal connection with the frame.

23. In a machine for making metal wheels in combination with a lower spoke-clamping jaw, an upper clamping-jaw, a horizontal operating-lever having a jointed connection at one end with the jaw, a link pivoted at its upper end to the lever, a horizontal journal mounted in the frame and provided with an eccentric-pin on which the lower end of the link is loosely mounted, and means for turning the journal.

24. In a machine for making metal wheels the combination with a spoke-clamping jaw, of an operating-lever jointed thereto, a journal mounted in the frame, a link pivoted at one end to the lever and mounted at its other end eccentrically on the journal, a hand-lever pivoted to the frame, a rod connected at one end to the journal and at its other end with the hand-lever, and a stop to limit the upward movement of the hand-lever.

25. In a machine for making metal wheels the combination with a spoke-clamp, of a movable die adapted to act on the rim and provided with an opening, and a heading device adapted to act through the opening on the spoke.

26. In a machine for making metal wheels the combination with a spoke-clamp, of a movable die adapted to act on the rim, a heading-tool engaged by the die and movable with it, and means for moving the heading-tool independently of the die.

27. In a machine for making metal wheels the combination with a spoke-clamp, of a curved die movable to and from the same and adapted to act on the rim, and a movable heading-tool adapted to act on the spoke.

28. In a machine for making metal wheels the combination with a spoke-clamp having a curved end, of a curved die movable to and from the same, and provided with an opening therethrough, and a heading-tool adapted to act through said opening on the spoke.

In testimony whereof I hereunto set my hand, this 17th day of October, 1899, in the presence of two attesting witnesses.

EMIL EINFELDT.

Witnesses:
NATH. FRENCH,
MAY L. DODGE.