

No. 732,857.

PATENTED JULY 7, 1903.

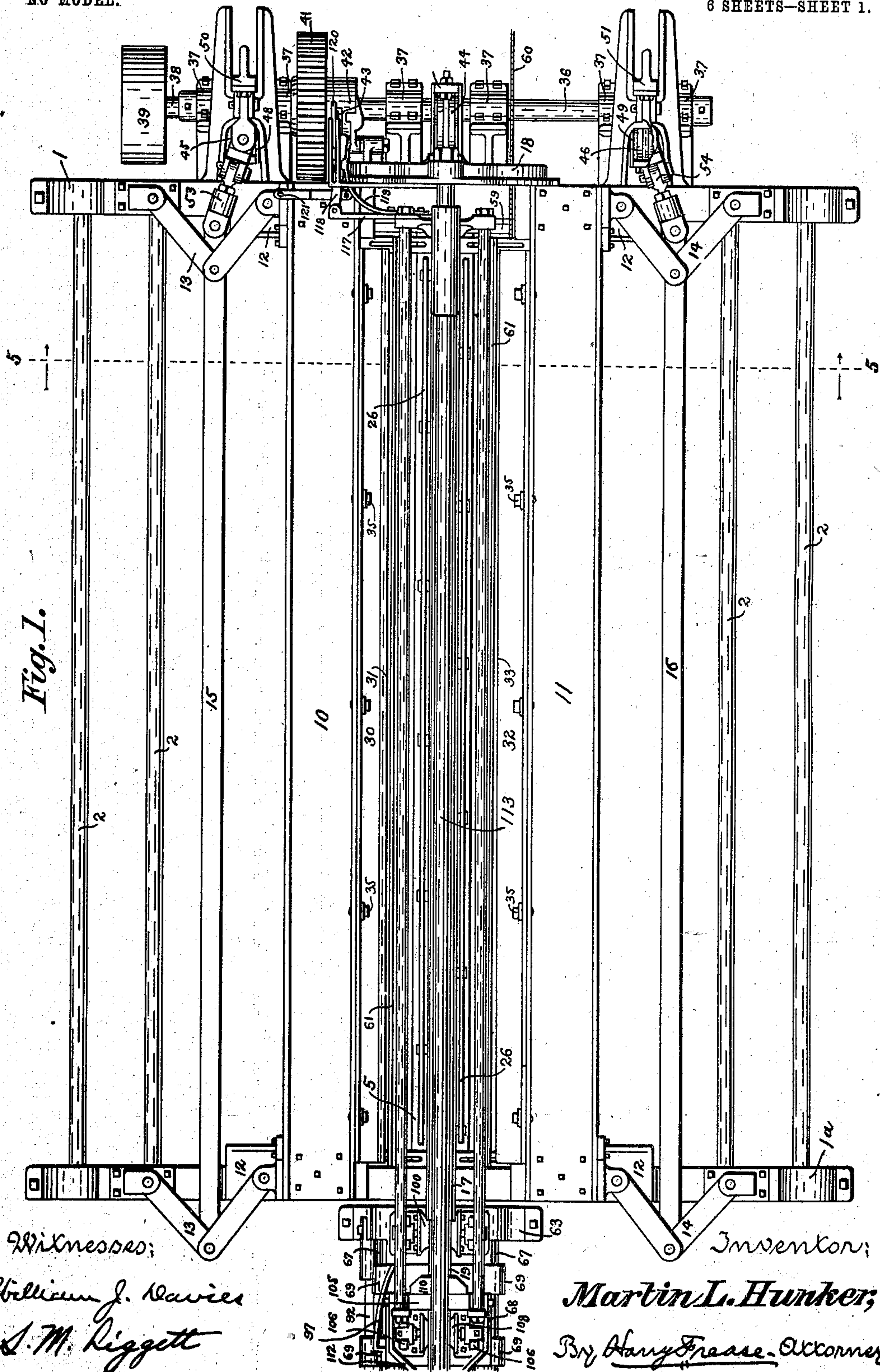
M. L. HUNKER.

SHEET METAL PIPE FORMER AND GROOVER.

APPLICATION FILED FEB. 11, 1902.

NO MODEL.

6 SHEETS—SHEET 1.



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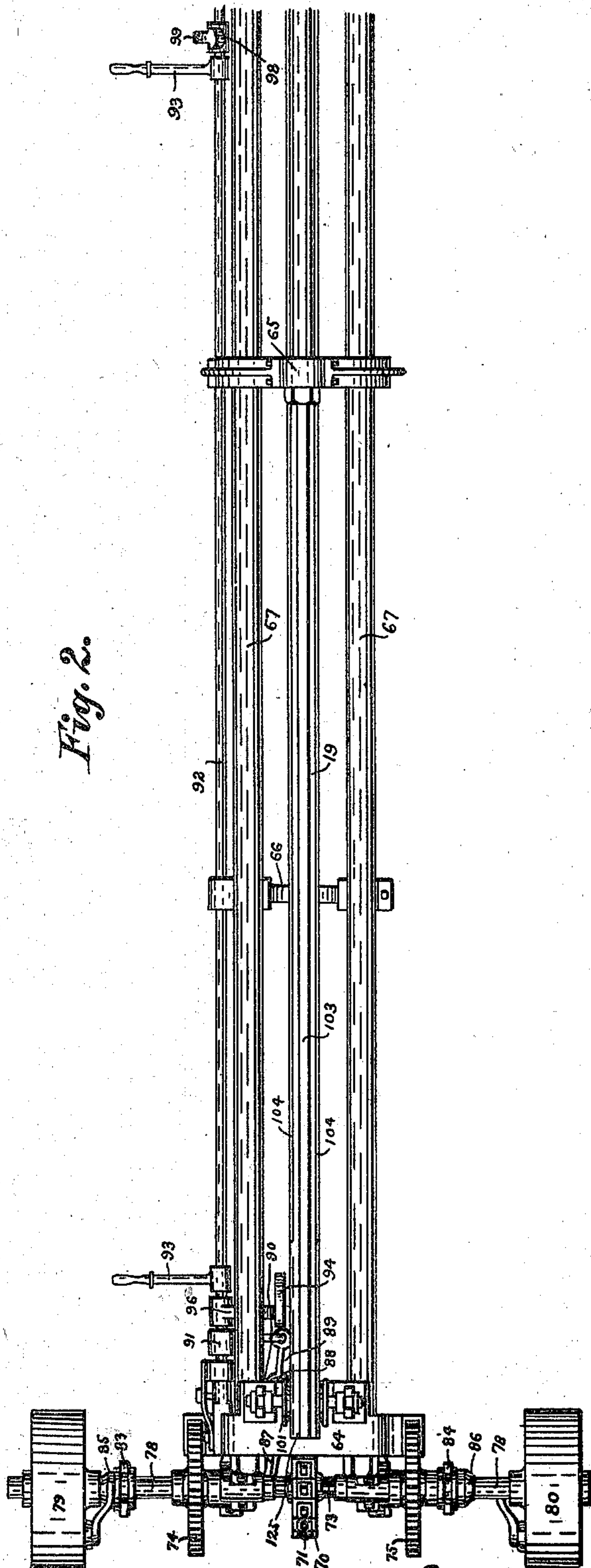
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6 SHEETS—SHEET 2.

Fig. 2.



Witnesses:
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Inventor:
Martin L. Hunter,
By Harry Freese, Attorney

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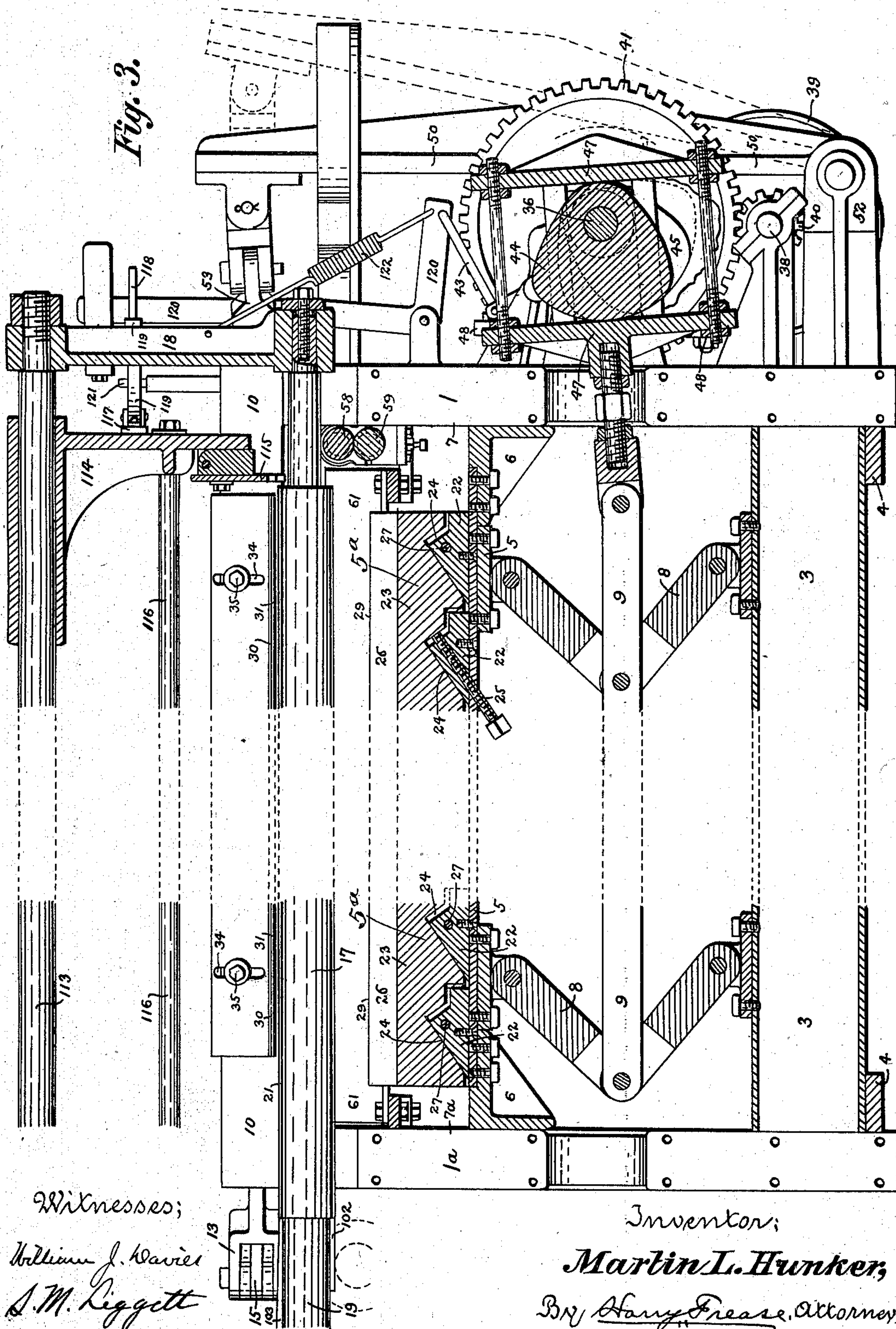
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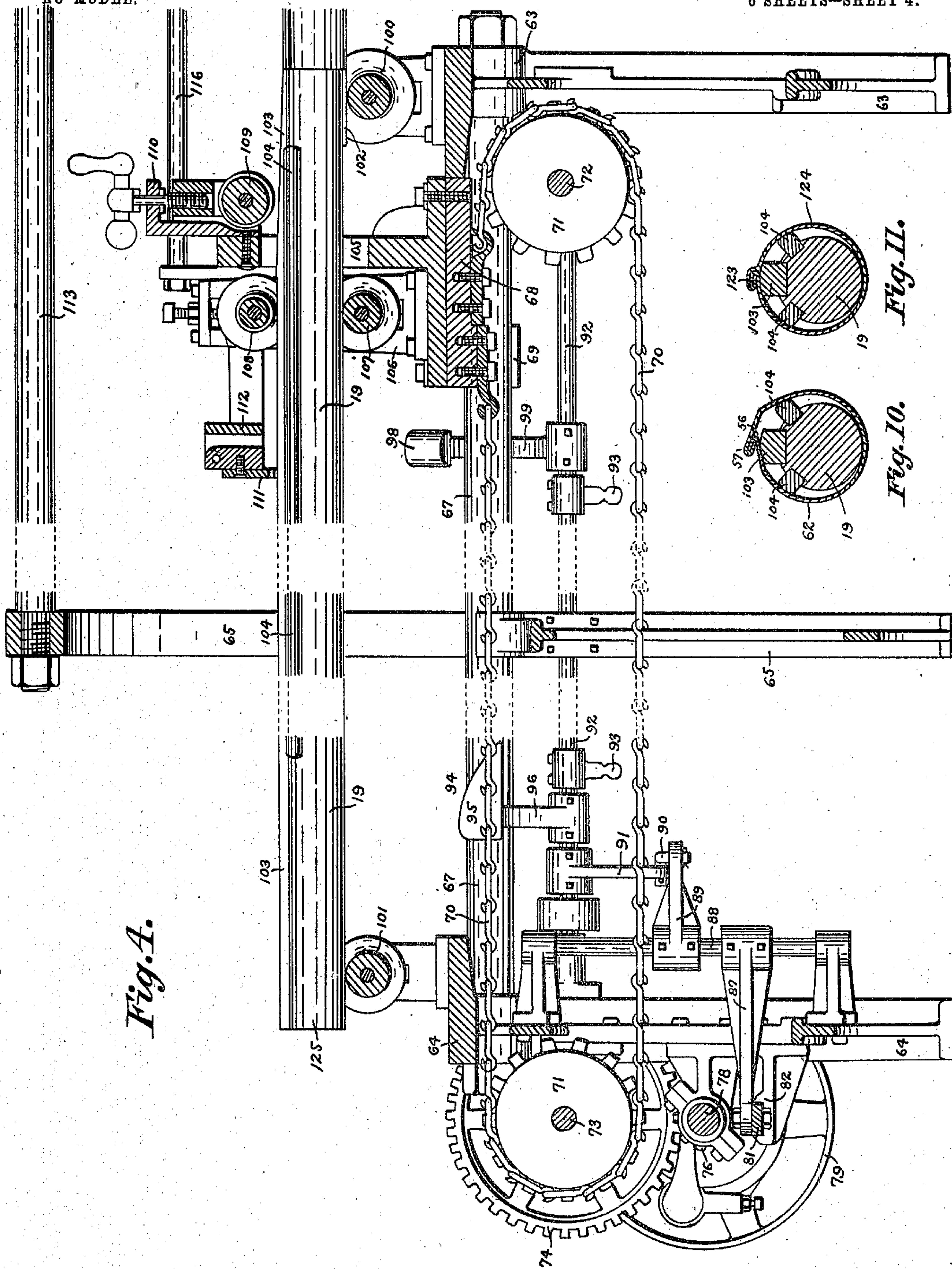


Fig. 4.

Fig. 11.

Fig. 10.

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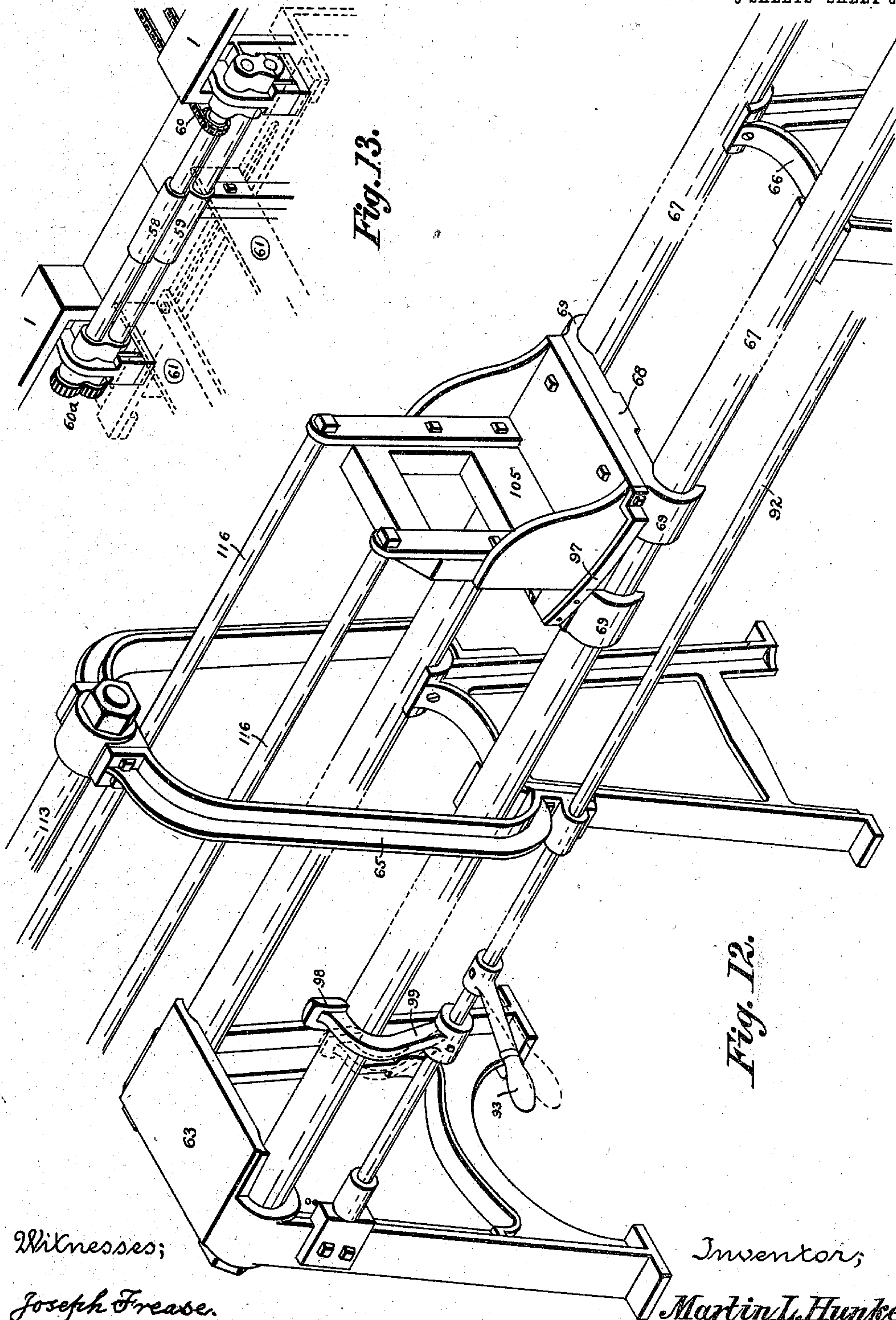
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NO MODEL.

6 SHEETS—SHEET 6.



Witnesses;

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Inventor;

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UNITED STATES PATENT OFFICE.

MARTIN L. HUNKER, OF CANTON, OHIO, ASSIGNOR, BY MESNE ASSIGNMENTS,
TO THE PIPE MACHINE AND MANUFACTURING COMPANY, OF PHILADEL-
PHIA, PENNSYLVANIA.

SHEET-METAL-PIPE FORMER AND GROOVER.

SPECIFICATION forming part of Letters Patent No. 732,857, dated July 7, 1903.

Application filed February 11, 1902. Serial No. 93,508. (No model.)

To all whom it may concern:

Be it known that I, MARTIN L. HUNKER, a citizen of the United States, residing at Canton, in the county of Stark and State of Ohio, have invented a new and useful Sheet-Metal-Pipe Former and Groover, of which the following is a specification.

My invention relates to pipe forming and grooving machines automatically operated in conjunction with each other in which the sheet metal having been edged is formed and the turned edges locked around a mandrel and the pipe thus formed is passed to another mandrel, where the locked seam is grooved and the pipe is thus finished; and the objects of my improvements are to provide a mechanism for forming and edge-locking the pipe with greater facility and speed than has heretofore been done, the forming and locking parts of which are adjustably adapted for various-sized mandrels and pipes; to so form and edge-lock the pipe that the edges will not open or come apart before or during the process of grooving the seam; to remove the formed and edge-locked and the grooved pipes from the respective mandrels and automatically stop the machine when this is done, and to groove the formed and edge-locked pipe by a return movement and automatically stop the grooving mechanism and start the forming and edge-locking mechanism when this is done. I attain these objects by the mechanism illustrated in the accompanying drawings, in which—

Figure 1 is a plan view of the former and part of the groover; Fig. 2, a plan view of the remainder of the groover; Fig. 3, a longitudinal vertical section of the former; Fig. 4, a longitudinal vertical section of the groover; Fig. 5, a cross-section on the line 5-5, Fig. 1; Fig. 6, a cross-section showing the first operation in pipe-forming and the complete operation in eaves-trough forming; Fig. 7, a cross-section showing the second operation in pipe-forming; Fig. 8, a cross-section showing the pipe-forming completed; Fig. 9, a cross-section showing the turned edges locked; Fig. 10, a cross-section showing the pipe ready for grooving; Fig. 11, a cross-section showing the pipe grooved and rounded; Fig. 12, a perspective view of part of the groover-

frame, showing the base-plate and frame of the grooving-carriage and the curved trip-bar attached to the side of said carriage; and Fig. 13 a perspective view of the sheet-metal feed-rolls, showing the mode of attachment and operation.

Similar numerals refer to similar parts throughout the drawings.

The frame of the pipe-former consists of the two similar members 1 and 1^a, connected by the frame-rods 2. The plate-girder 3 is supported by the brackets 4 between the frame members in the lower part in the middle line. Above the plate-girder 3 is located the vertically-movable bed-plate 5, the end brackets 6 of which are guided by the flanges 7 and 7^a on the frame members. Connecting the plate-girder and the bed-plate are the toggle-levers 8, the respective arms of which are pivoted to the girder below and to the plate above and the common joints to the plate-actuating bar 9.

The blade-girders 10 and 11 are supported on top of the frame members by the similar brackets 12, which are movable sidewise toward and from the middle line. Connecting the blade-girders, respectively, and the frame are the toggle-levers 13 and 14, the respective bars of which are pivoted to the outer parts of the frame members and to the blade-girders, respectively, and the common joints to the blade-actuating bars 15 and 16, respectively.

The forming-mandrel 17 is horizontally located in the middle line and is supported at the rear end on the frame member 1 by the bracket 18 there attached and is connected with and supported by the grooving-mandrel at the forward end. The forming-mandrel is round in its cross-section, except that the upper side is flattened, forming the angles 20 and 20^a on either side, and on one side, near the angle 20^a, projects the longitudinal bending-flange 21.

On the bed-plate 5 are attached the series of similar wedge-shaped blocks 22, on which rests the butting-plate 23, having inclined notches 24 in its lower side corresponding with the wedge-blocks. The butting-plate is adjusted to various heights by the screw 25. Resting on the bed-plate on either side of the

butting-plate are the forming-plates 26, which are attached to the wedge-blocks by the bolts 27 with the intervening washers 28. By varying the thickness of the intervening washers 5 the forming-plates can be adjusted sidewise, and they are properly spaced a little farther apart than the diameter of the forming-mandrel. The inner sides of the forming-plates are flat, and the upper edges 29 are preferably blunt or slightly rounded. The butting-plate 23 and the forming-plates 26, with their connecting and adjusting parts, together constitute the forming-die 5^a.

On the inner side of the girder 10 is attached the forming-blade 30, which has its upper side beveled to form the sharp projecting edge 31, and on the inner side of the girder 11 is attached the locking-blade 32, which has its projecting edge 33 preferably blunt or slightly rounded. These blades are preferably made of angle-iron, and the attaching sides are provided with slots 34, through which are passed the attaching-bolts 35, thus giving a vertical adjustment. The lower sides of the respective blades are formed substantially flat and horizontal.

The cam-shaft 36 is mounted in the journal-bearings 37, attached to the outer side of the frame member 1, and the pulley-shaft 38 is similarly mounted below the cam-shaft and carries the driving-pulley 39. Power is transmitted by means of the cog-pinion 40 on the pulley-shaft meshing with the cog-wheel 41 on the cam-shaft. The cog-wheel is mounted on the cam-shaft with the ordinary pin-clutch 42, which is thrown into engagement by the rod 43 and automatically throws out at the end of one revolution.

The three several cams 44, 45, and 46 are mounted on the cam-shaft. The cam 44 rotates in the frame 47, which is attached to the plate-actuating bar 9. The cams 45 and 46 rotate, respectively, in the frames 48 and 49, the outer bars 50 and 51 of which respective frames extend upward beyond the top of the machine-frame and also downward to a pivotal connection in the brackets 52, attached to the frame member 1. The upper ends of the cam-frame bars 50 and 51 are respectively attached to the blade-actuating bars 15 and 16 by the compound knuckle-joints 53 and 54. The several cams are similarly formed and are so located one ahead of another on the shaft that when rotated they will throw the respective cam-frames successively away from the machine-frame and then successively toward it in the same order. Thus the plate toggle-levers 8 and the blade toggle-levers 13 and 14, respectively, are operated successively by their respective actuating-bars 9, 15, and 16.

To form and edge-lock a sheet-metal pipe, the machine being in its normal position, as shown in Figs. 1, 3, and 5, and the sheet metal 55 having been cut to the proper length and width and the edges 56 and 57, respectively, flanged and turned back the sheet is

fed into the machine by means of the feed-rolls 58 and 59. The roll 58 is rotated by the sprocket-gear 60, which is driven from any convenient power-shaft, and the roll 59 is rotated in the reverse direction by the cog-gears 60^a on the ends of the roll-shafts. When the sheet enters the machine, it rests on the upper edges 29 of the forming-plates and is guided and held in proper alinement by the guides 61 on either side, as shown in Fig. 5. The pin-clutch is then thrown into engagement, (if automatically, as hereinafter described,) and by the rotation of the several cams the work is done as follows:

The butting and forming plates 23 and 26, respectively, are first thrown upward by the toggle-levers 8, the forming-plates being adjusted to bend the sheet metal around the lower half of the forming-mandrel, with the turned edges extending upward and the butting-plate being so adjusted as to hold the sheet metal in proper position by its pressure during the remainder of the operation, as shown in Fig. 6. The forming-blade 30 is then thrown inward by the toggle-levers 13, forming one side of the sheet metal over the mandrel with an acute bend at the angle 20, the blade being so adjusted vertically and in its lateral movement that its sharp edge 31 engages the angle of the turned edge 56 and with the lower flat side holds the sheet metal immediately above the flattened top of the mandrel and the turned edge just beyond the middle line, as shown in Fig. 7. The locking-blade 32 is then thrown inward by the toggle-levers 14, forming the other side of the sheet metal over the mandrel with an acute bend at the bending-flange 21, the blade being so adjusted vertically and in its lateral movement that its lower flat side will carry the turned edge 57 immediately above and clearing beyond the turned edge 56, as shown in Fig. 8. The butting and forming plates and the forming-blade are then successively thrown away from the mandrel by the reverse action of their respective toggle-levers, and the turned edge 56 springs up and engages and locks with the turned edge 57, as shown in Fig. 9, after which the locking-blade is thrown away from the mandrel to its normal position, when the machine stops, the cam-shaft having completed its one revolution, which leaves the formed and edge-locked pipe free to be removed to the grooving-mandrel 19.

By the acute bends of the sheet metal over the angle 20 and the flange 21 of the forming-mandrel the engagement of the turned edges 56 and 57 is rendered secure, and they will not become unlocked in the further operations, and by the adjustments of the butting and forming plates the same can be adapted to the various-sized mandrels and pipes, and they can also be used independently of the forming and locking blades for the forming of eaves-troughs, as shown by broken lines in Fig. 6.

The frame of the pipe-groover consists of the end members 63 and 64, the intermediate arched member 65, and when necessary the intermediate supporting member 66, all connected by and in turn supporting the round track-bars 67. The intermediate members engage the track-bars only on the lower and inner sides, respectively, leaving the upper and outer sides free between the end members for the travel of the grooving-carriage base-plate 68, the side projections 69 of which fit over and around the upper and outer sides of the track-bars, respectively. The grooving-carriage is moved forward and backward on the track-bars by a sprocket-gear, the chain 70 of which is attached to the base-plate 68 and passes around the sprocket-wheels 71, the shafts 72 and 73 of which are mounted on the forward sides of the respective end frame members. On the forward sprocket-shaft 73 are also mounted the cog-wheels 74 and 75, located on either side of the frame. These cog-wheels mesh, respectively, with the cog-pinions 76 and 77, which are mounted on the reversing-shaft 78, located below the forward sprocket-shaft. On either end of the reversing-shaft are mounted the ordinary friction-clutch pulleys 79 and 80, which are rotated in opposite directions. Under the reversing-shaft is located the cross-bar 81, which is movable endwise in brackets, as 82, attached to the forward end frame member. On the respective ends of the cross-bar are turned upward the yokes 83 and 84, engaging the clutch-actuating collars 85 and 86, respectively. To the cross-bar is pivoted the forward end of the reversing-arm 87, the rear end of which is attached on the vertical rock-shaft 88, mounted on the rear side of the forward end frame member. On the vertical rock-shaft is also attached the rearward-extending arm 89, the rear end of which is connected by the link 90 with the lower end of the depending arm 91, the upper end of which is attached to the horizontal rock-shaft 92.

The horizontal rock-shaft is mounted along the side of the groover-frame, and by its oscillation either one of the friction-clutches can be thrown into engagement or both of them thrown out by means of the reversing mechanism. The clutch-pulley 79 is thrown in by depressing either of the levers 93, attached to the horizontal rock-shaft, which is done by the operator and which causes the grooving-carriage to move forward. When the carriage approaches the forward end of the frame, the lower side of the base-plate 68 strikes the curved upper edge 94 of the trip-plate 95, which is attached to the horizontal rock-shaft by the curved arm 96 on the opposite side from the operating-levers, and depresses the same. This depression throws out the clutch-pulley 79 and stops the machine. The clutch-pulley 80 is thrown in by elevating either of the levers 93, which causes the grooving-carriage to move rearward. When the carriage approaches the rear end of the frame, the

curved bar 97 on its side strikes and throws out the rounded trip-head 98, which is attached to the horizontal rock-shaft by the curved arm 99 on the same side with the operating-levers, which outward movement throws out the clutch-pulley 80 and stops the machine.

The grooving-mandrel 19 rests on the grooved rollers 100 and 101, mounted, respectively, on the rear and forward members of the frame, and is preferably of less diameter than the forming-mandrel 17, to the forward end of which it is attached and furnishes support. The short rib 102 on the lower side of the grooving-mandrel at the rear end is flush with the lower surface of the forming-mandrel and extends this surface forward beyond the supporting-roller 100. In the middle line on the upper side of the grooving-mandrel is the grooving-ridge 103, which rises slightly higher than the upper surface of the forming-mandrel, but tapers down to meet it at the juncture. On either side of the grooving-ridge are the spreading-ribs 104, which need not be any longer than the pipe to be grooved.

The grooving-carriage consists of the carriage-frame 105, attached to the base-plate, on the forward side of which are attached the brackets 106, in which are mounted the forming-rollers 107 and 108, respectively below and above the grooving-mandrel. On the rear side of the grooving-frame is adjustably mounted the grooving-wheel 109 in the attached bracket 110, and in front of the grooving-frame is mounted the forward stripper 111 by the bracket 112.

The slide-bar 113 is horizontally located in the middle line above the machine and is supported at the rear end by the bracket 18 and at the forward end by the arched grooving-frame member 65. Depending from the slide-bar is the sliding bracket 114, at the lower end of which is attached the rear stripper 115. Attached to the grooving-carriage frame 105 at the forward end and to the sliding bracket at the rear end on either side are the connecting-rods 116, which carry the sliding bracket and the attached rear stripper forward and backward with the movements of the grooving-carriage.

Attached to and extending to one side of the sliding bracket is the trip-arm 117, to which is hinged the rearward-extending trip-bar 118, which is held in normal position by the curved spring 119. When the grooving-carriage and the connected sliding bracket are near the end of their rear movement, the trip-bar 118 strikes the upper end of the angle-lever 120, which is pivoted to the frame member 1 and carries it forward, thus depressing the lower rear end, to which is attached the pin-clutch-actuating rod 43, and thereby throws in the clutch and starts the forming-machine. When the blade-girder 10 is thrown inward, the trip-post 121, attached thereto, strikes the trip-bar 118 and carries

its rear end inward free from the upper end of the angle-lever, and the same is moved forward to its normal position by action of the coil-spring 122, attached to its lower rear end and to the bracket 18, thus permitting the pin-clutch to automatically throw out at the end of its one revolution. The pipe 62 having been formed and edge-locked, the operator starts the grooving-carriage and the connected sliding bracket forward and the rear stripper pushes the pipe forward onto the grooving-mandrel, and the grooving-carriage and connected parts are automatically stopped when this is done by action of the trip-plate 95. When another piece of sheet metal has been fed into the forming-machine, the operator starts the grooving-carriage rearward, and the locked turned edges 56 and 57 are grooved by the wheel 109, which completes the seam 123, as shown in Fig. 11.

Before and during the grooving process to keep the turned edges from coming apart the spreading-ribs 104 serve to expand the upper part of the pipe and by tension hold the edges in close engagement, as shown in Fig. 10. At the same time the upper forming-wheel 108 presses out the angular bends on either side of the upper part of the pipe, making the finished pipe 124 a true circle in section. When this is done, the grooving-carriage and connected parts are automatically stopped by action of the trip-head 98, and at the same time the forming mechanism is started by action of the trip-bar 118. The next time the grooving-carriage travels forward the finished pipe 124 is pushed off the forward free end 125 of the grooving-mandrel by the forward stripper 111.

In forming mandrels for certain sizes and kinds of pipe the bending-flange 21 can be omitted and the bending edge 20^a substituted therefor, or the flat surface can be omitted and an additional bending-flange similar to 21 substituted for the bending-edge 20.

I do not claim as my invention the vertically-adjustable and specially-shaped forming-blade and the locking-blade, which are illustrated and described in connection with my forming-machine.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. In a sheet-metal-pipe former, a mandrel, a forming-die below and a forming-blade on one side and a locking-blade on the other side above said mandrel, a shaft, cams on said shaft, and bars and toggle-levers connecting said cams and said die and blades respectively, the cams and levers being arranged to operate the die and blades successively toward and then successively away from the mandrel.

2. In a sheet-metal-pipe former, a mandrel and a die, the die consisting of two forming-plates and a butting-plate therebetween, the forming-plates being adjustably spaced apart on either side of the mandrel and the butting-plate being adjustable to and from the

mandrel, and means for moving the die to and from the mandrel.

3. In a sheet-metal-pipe former, a mandrel and a die, the die consisting of two forming-plates adjustably spaced apart on either side of the mandrel, and means for moving the die to and from the mandrel.

4. In a sheet-metal-pipe former, a mandrel having its upper face flat, a forming-blade on one side and a locking-blade on the other side operating near and above said flat face, and means for successively actuating said forming and locking blades inward and respectively above and beyond the middle line of said mandrel and then away therefrom.

5. In a sheet-metal-pipe former, a mandrel having a longitudinal flange projecting on one side of its upper part, a forming-blade on one side and a locking-blade on the other side operating near and above said mandrel and flange, and means for successively actuating said forming and locking blades inward and respectively above and beyond the middle line of said mandrel and then away therefrom.

6. In a sheet-metal-pipe former, a mandrel having its upper face flat and a longitudinal flange projecting near one side of said flat face, a forming-blade on one side and a locking-blade on the other side operating near and above said flat face and said flange, and means for successively actuating said forming and locking blades inward and respectively above and beyond the middle line of said mandrel and then away therefrom.

7. In a sheet-metal-pipe former and groover, end-connected forming and grooving mandrels, a stripper for the forming mandrel, a grooving-carriage for the grooving-mandrel, the stripper and the carriage being connected, and means for actuating the same.

8. In a sheet-metal-pipe former and groover, end-connected forming and grooving mandrels, a slide-bar located above said mandrels, a sliding bracket depending from said slide-bar, a stripper for the grooving-mandrel on said bracket, a grooving-carriage for the grooving-mandrel, the bracket and carriage being connected, and means for actuating the same.

9. In a sheet-metal-pipe former and groover, end-connected forming and grooving mandrels, mechanism for forming and edge-locking a pipe on said forming-mandrel, a grooving-carriage and means for moving the same along said grooving-mandrel, and a trip for starting said forming and locking mechanism, automatically actuated by the movement of said carriage.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

MARTIN L. HUNKER.

Witnesses:

CHAS. A. DRUMM,
HARRY FREASE.