

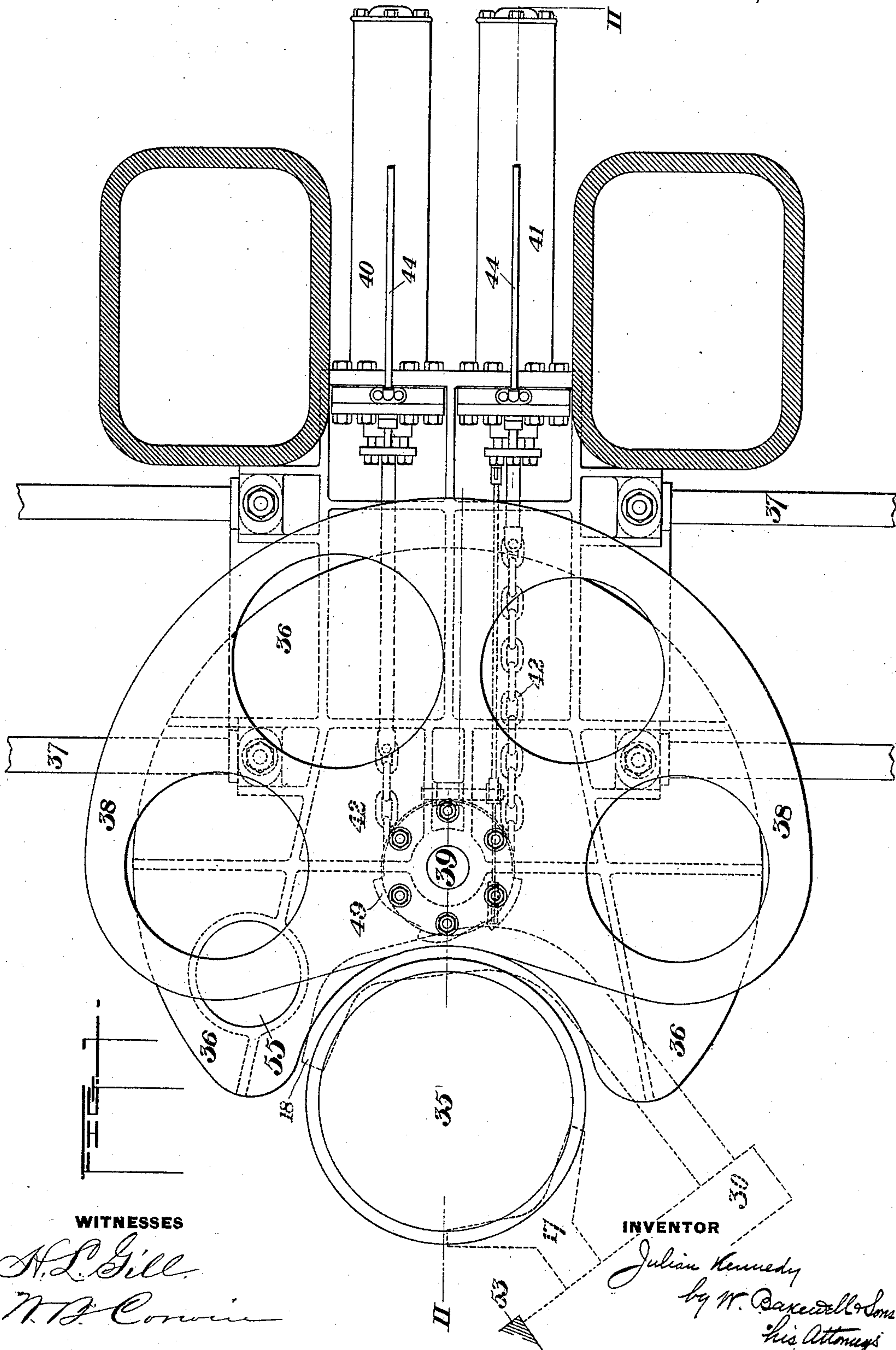
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3 Sheets—Sheet 1.

J. KENNEDY.  
FORGING APPARATUS.

No. 442,899.

Patented Dec. 16, 1890.



WITNESSES

*H. L. Gill*  
*W. B. Corwin*

INVENTOR

*Julian Kennedy*  
*by W. Baxendale & Sons*  
*his Attorneys*

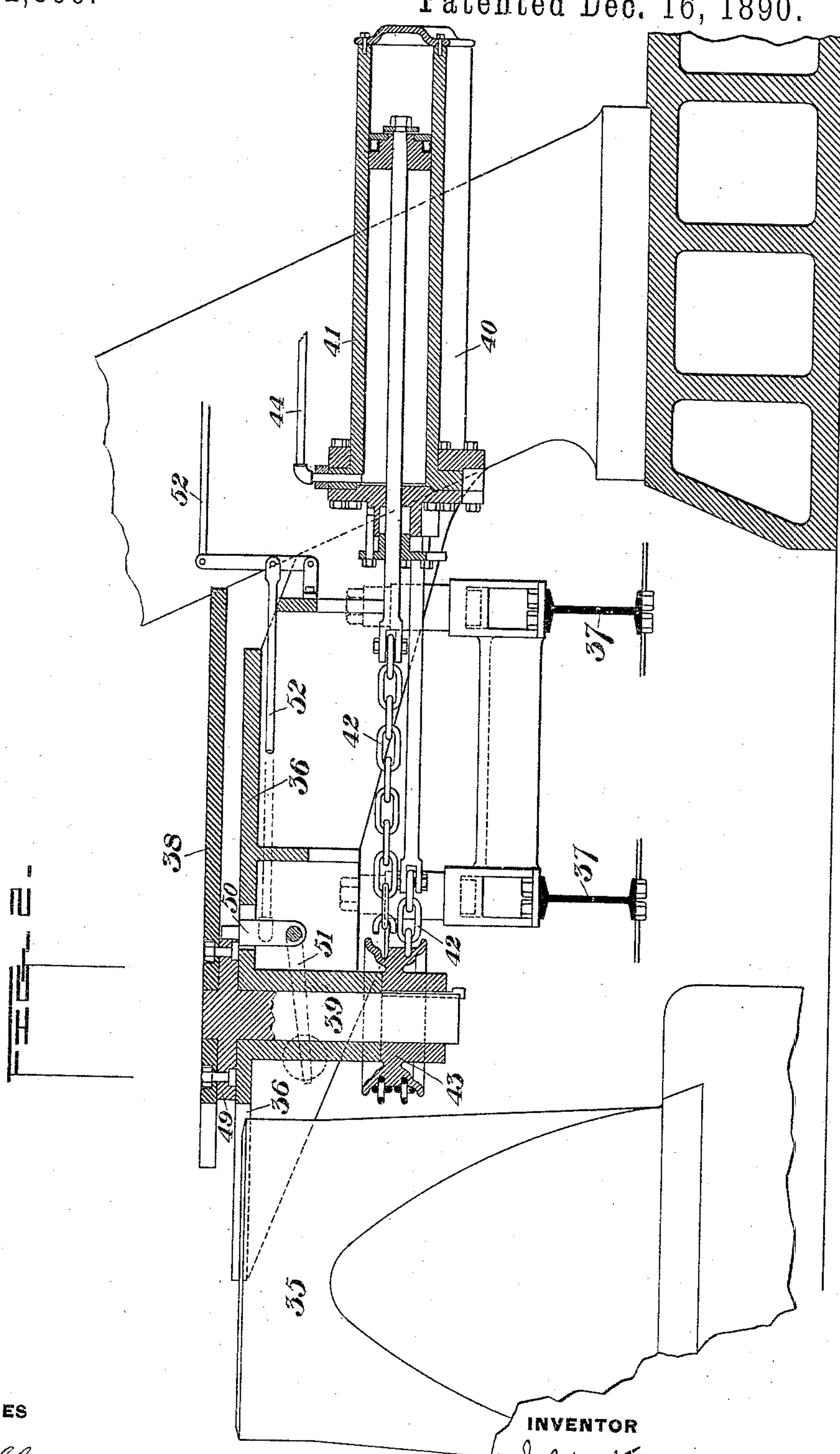
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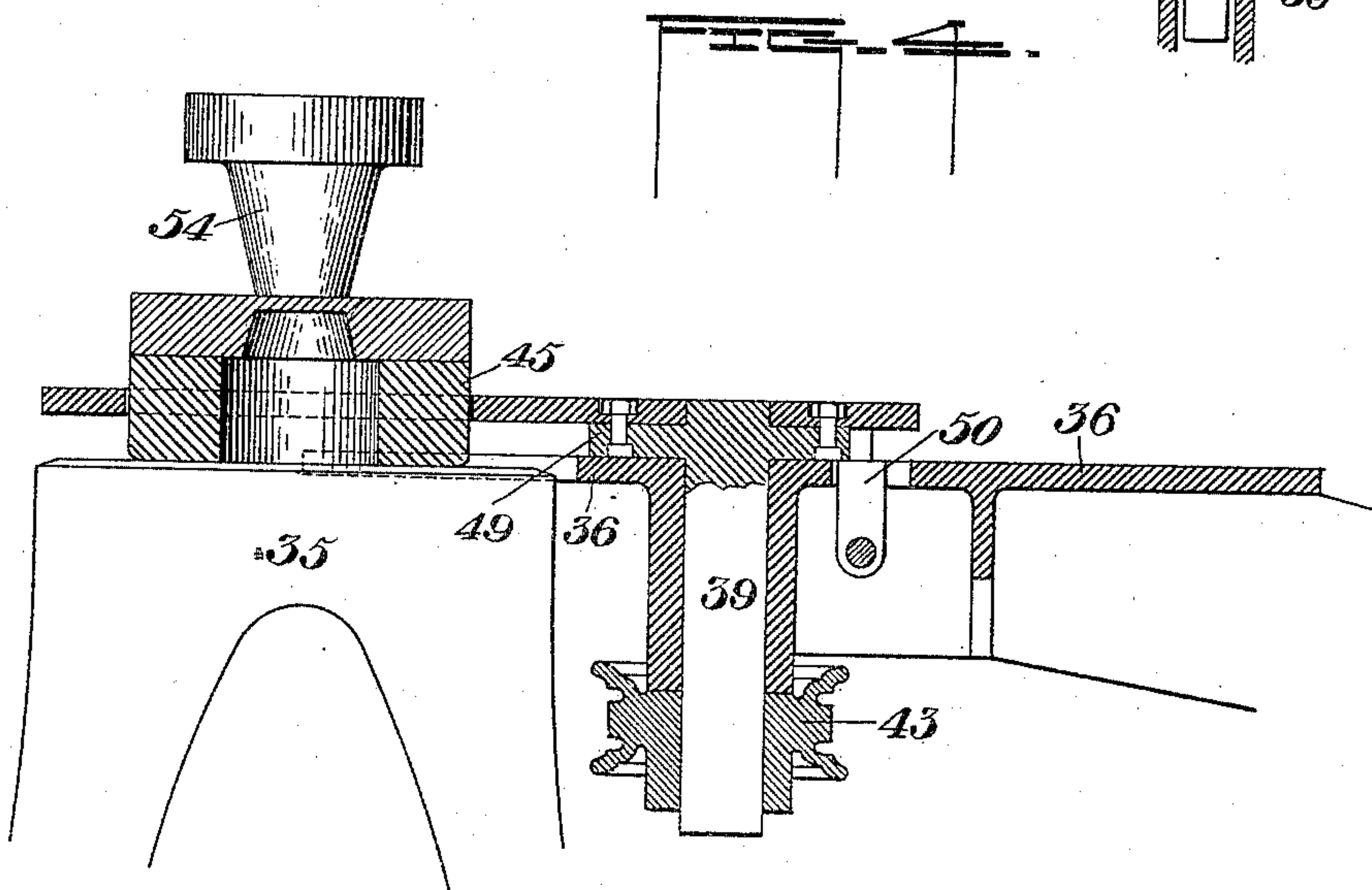
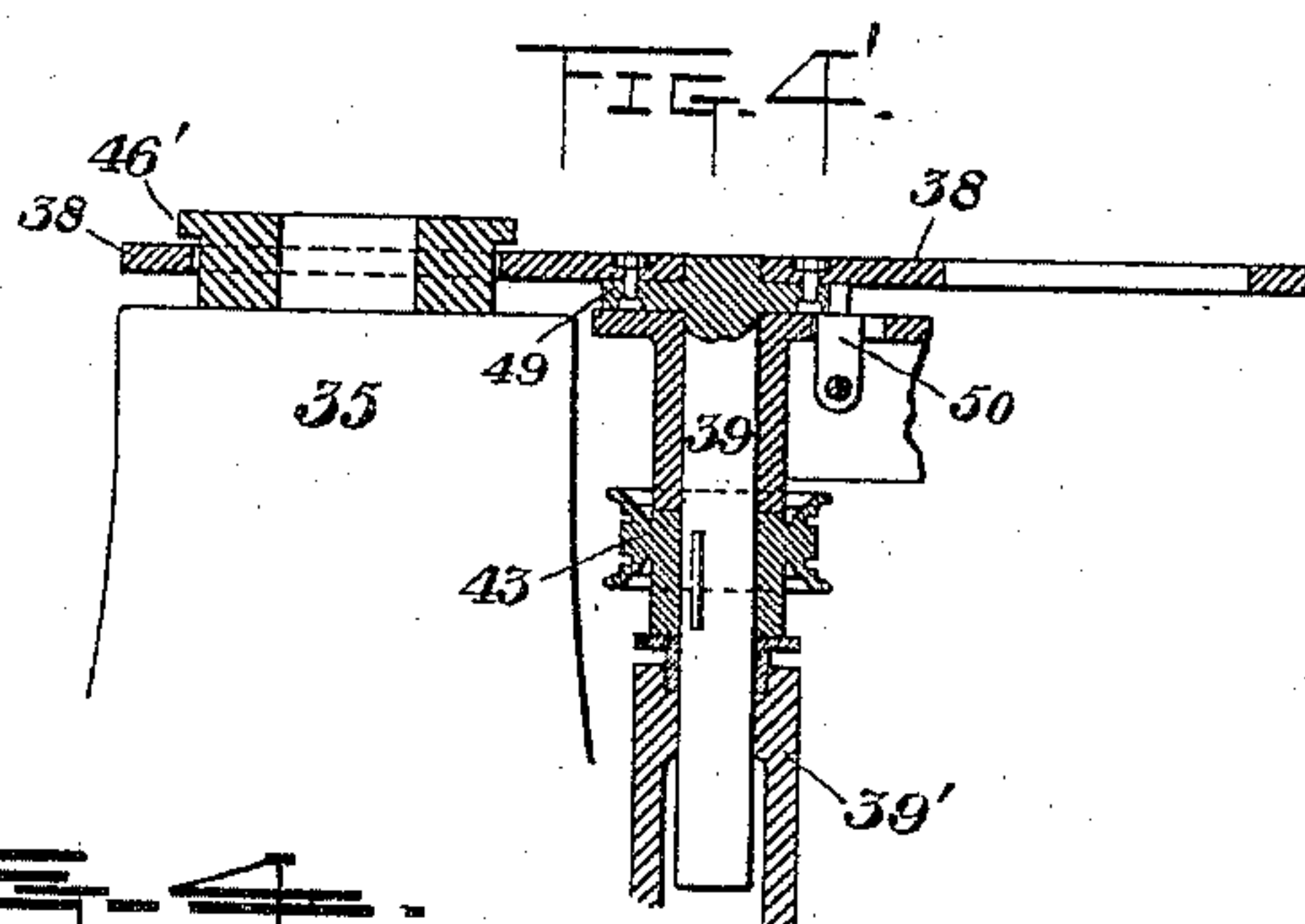
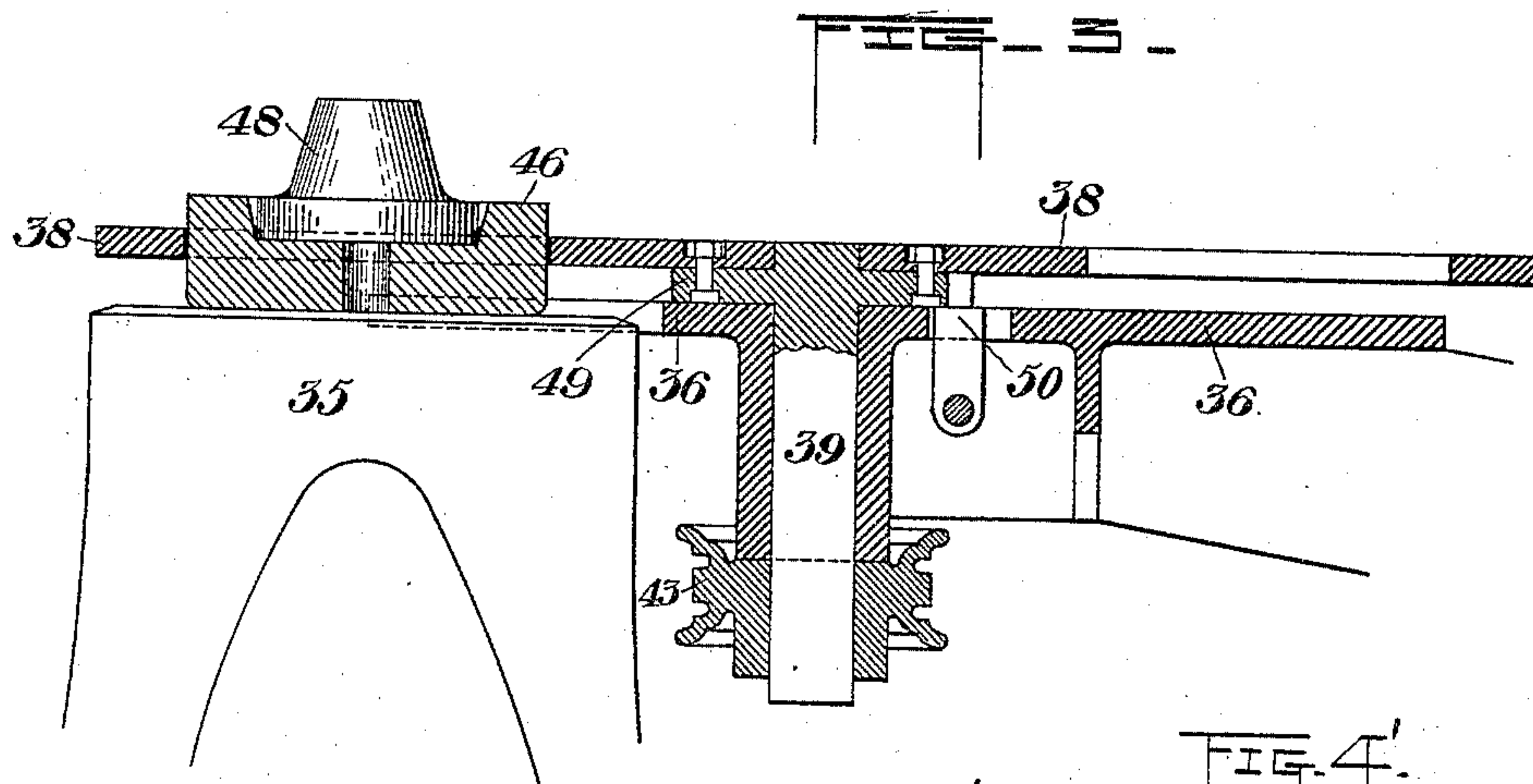
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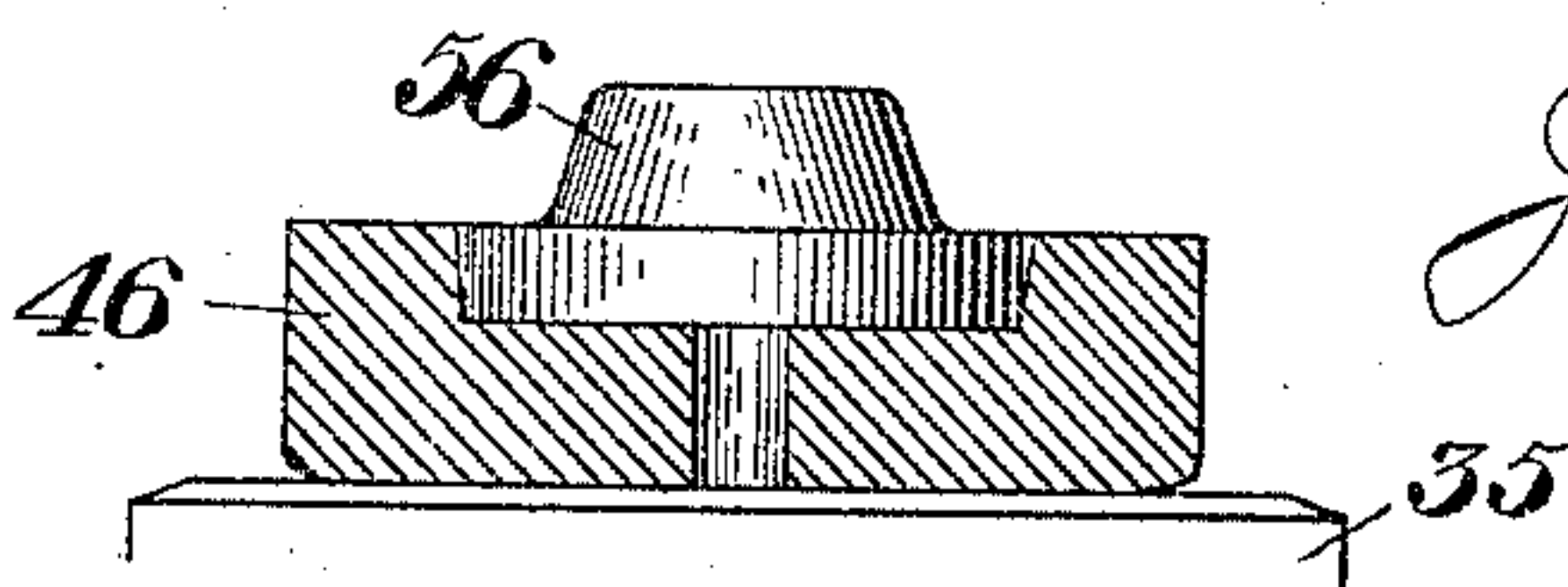
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# UNITED STATES PATENT OFFICE.

JULIAN KENNEDY, OF LATROBE, PENNSYLVANIA.

## FORGING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 442,899, dated December 16, 1890.

Original application filed December 30, 1889. Serial No. 335,359. Divided and this application filed April 18, 1890. Serial No. 348,480. (No model.)

*To all whom it may concern:*

Be it known that I, JULIAN KENNEDY, of Latrobe, in the county of Westmoreland and State of Pennsylvania, have invented a new and useful Improvement in Forging Apparatus, of which the following is a full, clear, and exact description.

My invention relates to an improvement in apparatus for use in connection with hammers or presses for forging metal. It is especially adapted to use in forging annular blooms used in the manufacture of railway-wheel tires, and in such use possesses many material advantages in saving of labor and reducing the cost of manufacture.

The method of making tire-blooms as heretofore practiced is to take a cylindrical ingot, place the same on end on an anvil under a hammer or press, and reduce it in length until it takes the form of a cheese. A punch is then placed upon it with a pair of tongs and driven partly through the piece of steel. It is then removed and the cheese is thrown over on the anvil, bringing the other side up by means of men with levers. It is then lifted from the anvil and a ring having a hole in it somewhat larger than the punch slipped under it. A second punch is then set on top of the piece, as nearly as possible over where the first was driven, and driven through, shearing out a punching and forcing it down into the ring. This punch is then removed, and the piece is again reversed by the lever-men, and a third punch driven into the hole from the same side as the first punch. The piece is then hung upon the horn of a hammer-anvil and forged out into a ring or bloom suitable for rolling. As the punches are often of considerable size and the blooms sometimes quite heavy, the manual labor of handling the punches and turning the blooms over is very severe. It is necessary that the hole should be punched as nearly as possible in the center of the bloom, and in this method the centering of the metal and of the punches has been dependent entirely upon the eye of the workman, who is very liable to err.

In the use of my apparatus I pick up a bloom by a crane or similar carrier having grippers which hold the bloom with its center exactly above the center of the anvil. I then

move the first punch under it by a device which places the punch also exactly centrally with the anvil. I then lower the bloom upon the punch and drive it down with a hammer or press the proper distance. I then lift the bloom off the punch by means of the grippers, remove the punch from under the anvil, and move under it a ring, which is also placed exactly centrally. The bloom can now be lowered upon this ring, and by means of the same grippers the punch can be taken from a table standing alongside at a convenient distance and placed upon the bloom and automatically centered with great exactness. The punching is then driven through into the ring, when the bloom and punch can be lifted together, and a third punch slipped under, the bloom dropped on it, and the second punch carried away by the grippers. The bloom is now forced down upon the third punch, which, having a broad base and fillet, expands the bloom and makes even the edges of the hole, the handling of the punches by machinery allowing the large base to be used on the punch, which could not be used, or only with great care, where punches are handled with tongs in the ordinary way. The fact that the centering of the bloom and the punches is done mechanically takes away the element of personal skill required in the old method and does much better work, while fewer men are required, and the labor on these few is not nearly so severe as under the old way.

In the drawings, Figure 1, Sheet 1, is a plan view showing the metal-gripping apparatus in connection with the anvil and table of a steam-hammer. Fig. 2, Sheet 2, is a vertical section on the line IIII of Fig. 1. Figs. 3 and 4, Sheet 3, are vertical sections of the table and tool-carrier. Fig. 4' illustrates on a smaller scale a modification. Fig. 5 is a side view of the tool used to expand the tire-bloom.

I shall now describe the construction of the anvil of the forging hammer or press and the table with which the crane is designed to co-operate in the forging and punching of tire-blooms.

35 is the anvil of the hammer or press.

36 is a table situate at the side of the anvil and shaped so that its surface shall fit



nearly against the edges thereof, as shown in Figs. 1 and 2. The frame of the table is supported on suitable beams 37, which have a bearing on the floor of the mill separate from the foundation of the anvil, and preferably considerably removed therefrom, so that the shocks given to the anvil by the hammer or press shall not be transmitted to the table.

38 is a carrier plate or frame situate above the table and fixed to a vertical shaft 39, which has its bearings in the table-frame, as shown in Fig. 2.

40 and 41 are single-acting hydraulic cylinders whose piston-rods are connected to chains 42, which pass around and are fixed to a double-grooved sheave 43 on the shaft 39, so that by retracting one or the other of said piston-rods the sheave, the shaft, and the carrier 38 may be rotated in either direction. The supply-pipes 44 of these cylinders are connected with a suitable valve (not shown) under the control of the operator, who by proper manipulation thereof may turn the carrier-frame in either direction.

It will be understood that instead of constructing the carrier to be rotatory over the table and anvil it may be arranged to move longitudinally thereover.

The carrier is formed with a number of holes (shown in Fig. 1) which are adapted to receive and carry punches or blocks by which the metal is shaped. In one of these holes is a block having a semi-cylindrical or trough-shaped surface, its base extending below the carrier-plate and resting on the table 36, by which it is supported. In one of the other holes is a ring 45 (shown in Fig. 4) and in the other two holes are punch-holders 46, consisting of metal blocks having sockets in their surfaces for receiving the punches. Neither the ring 45 nor the holders 46 are rigidly connected to the carrier, but extend loosely through the holes therein, so that when in use their weight shall not be supported by the carrier, but by the anvil on whose surface they rest. In the device constructed as shown in the drawings they are supported when not over the anvil by the table 36; but it will be understood that my invention may be modified so that the carrier shall support these blocks and rings at all other times except when they are in use and situate directly above the anvil.

The operation of the carrier in forging a tire-bloom is as follows: The carrier is turned in the manner before described, so as to bring the block with the trough-shaped surface directly upon the anvil. The ingot having been properly heated is laid on said block, and by the hammer or press is forged laterally so as to close any surface cracks or imperfections, the ingot being turned on the block after each stroke in order to subject all parts of its surface to the blows. The jib 30 of a suitable crane, Fig. 1, is then swung so as to bring its oppositely-moving gripper-jaws 17 and 18 on

opposite sides of the ingot. The hammered bloom is then grasped by the grippers between gripping points or teeth 47, formed on the ends of the jaws, care being taken that it should be seized at points between its top and the center of gravity, so that when the jib is raised the bloom, being grasped between these two points, will of its own gravity swing into a vertical or nearly vertical position. The grippers 17 and 18 are operated, as described in my patent application, Serial No. 335,359, filed December 30, 1889, so that in grasping the ingot or bloom they move to an equal extent toward each other, and so that the blooms shall therefore occupy a constant position on the crane-jib. The carrier 38 is now turned so as to expose the surface of the anvil, the bloom is set in an upright position on the latter by lowering the jib and spreading the gripping-jaws, and then by means of the hammer it is flattened down from its cylindrical form into the form of a cheese or thick disk. The flattened bloom is now picked up from the anvil by means of the grippers, and the carrier is turned on its axis so as to move the holder 46 of the punch 48 into such position as to bring the center of the punch directly below the center of the hammer.

In order to insure the stopping of the carrier in the proper position, I provide it with a ratchet 49, and a dog or lock 50, which is normally held in engagement with the periphery of the ratchet by a counterweighted lever 51, and is adapted to be disengaged therefrom by a rod 52, which may be worked by the same operator who controls the valves of the cylinders 40 and 41, the ratchet-teeth being so placed as to afford positive stops for the carrier in the several positions required to bring the centers of the holes in the table 36 over the center of the anvil. The act of picking up the bloom between the jaws 17 and 18, on account of the angular or wedge-shaped conformation of these jaws and the symmetrical motion thereof before explained, centers it between them, and the jib is then moved radially to bring the bloom over the center of the punch under the hammer. It is automatically checked in the proper position by means of a stop 53, suitably placed on the hammer-frame, which engages the jib when the grippers are in the desired place beneath the hammer. The bloom having been set by the crane centrally on top of the punch, the grippers are released and the hammer or press is then caused to descend, thus forcing the bloom down on the punch and forming therein a hole extending nearly through the bloom. The bloom is then picked up by the grippers, the carrier is turned so as to bring the ring 45 into position beneath the hammer, the bloom is deposited centrally on the ring, a second punch 54 is placed centrally on the bloom, as shown in Fig. 4, the hammer or press is caused to descend so as to force the punch through the bloom, the small punch-



ing of displaced metal dropping through the hole in the ring 45 upon the anvil below, from which, at the next rotation of the carrier, it is carried to a hole 55 in the table 36, through which it drops upon the mill-floor. When the bloom has thus been punched entirely through, the punch 54 is stripped therefrom and removed by the crane, the bloom is lifted, and, if desired, the carrier may then be moved so as to bring a third punch or mandrel 56 under the hammer, Fig. 5. The bloom having been set on the mandrel may be forced thereon by the hammer or press, so as to widen and shape the hole previously punched therein. The bloom may then be lifted and removed by the crane to a second hammer or forging apparatus, (not shown,) which is situated in the path of the radial sweep of the jib, and equidistant with the first hammer from the axis of the crane-mast. At this second hammer the forging is continued and the bloom brought into condition for the usual rolling operation, by which it is reduced to the form of a finished tire. It will be noticed that the punches shown in Figs. 3, 4, and 5 are in form of truncated cones with enlarged bases, and are provided with fillets between the sides and bases. With punches of this form I am enabled to make regularly-shaped holes in the bloom without producing ragged edges.

In Fig. 4' I show a modified construction of apparatus which makes it unnecessary to use the supporting-table 36. To this end I provide the punch-holders 46 with shoulders 46', which fit on the surface of the carrier 38. The shaft 39 is provided with a lifting-cylinder 39', by which the shaft and carrier may be lifted while the carrier is rotated to bring the punch-holder over the anvil. When the punch-holder has been brought into this position, the water is exhausted from the lifting-cylinder, so as to lower the carrier 38, and to remove it from contact with the shoulder 46', leaving the punch-holder on the anvil out of engagement with the carrier and not liable to be effected by the blows imparted thereto.

The advantages of my improved apparatus have been already indicated in a general way. It is a means of saving a considerable amount of labor. It is simple in its construction and is very rapid and efficient in its action. Although it is designed especially for use in manipulating circular ingots or blooms, it will be understood that the parts and combinations of the apparatus separately claimed by me are not limited in their application to such use; but that they may be employed for any other purpose to which they are suited.

I claim—

1. The tapering punch having an enlarged filleted base, substantially as and for the purposes described.

2. The combination, with the anvil and the hammer or press, of a tool carrier or support

in which the tools are carried over the anvil to rest thereon loosely, whereby the stress and jars in work shall be transmitted directly to the anvil, substantially as and for the purposes described.

3. The combination, with the anvil and the hammer or press, of a tool carrier or support in which the tools are carried over the anvil to rest thereon loosely, whereby the stress and jars in work shall be transmitted directly to the anvil, and a table beneath the carrier, on which the tools rest while being carried to the anvil, substantially as and for the purposes described.

4. The combination, with the anvil and the hammer or press, of a rotary tool carrier or support on which the tools are carried over the anvil to rest thereon loosely, whereby the stress and jars in work shall be transmitted directly to the anvil, substantially as and for the purposes described.

5. The combination, with the anvil and a movable tool-carrier, of locks by which the carrier may be arrested to bring the tools into proper position, substantially as and for the purposes described.

6. The combination, with the rotary tool-carrier, of cylinders and plungers connected with the carrier to rotate it in opposite directions, substantially as and for the purposes described.

7. The combination, with the anvil, of the tool-carrier and its frame, said frame being supported independently of the anvil foundation or support, substantially as and for the purposes described.

8. The combination of the anvil and punch-carrier with a supporting-table having a hole for the discharge of the punchings, substantially as and for the purposes described.

9. In combination with a forging-machine and its anvil, a carrier movable to place punches or rings upon the center of the anvil, and a crane or carrier movable to place circular blooms centrally on the punches or rings and to place other punches upon the center of the bloom, substantially as and for the purposes described.

10. In combination with a forging-machine and its anvil, a carrier movable to place punches or rings upon the center of the anvil, and a crane or carrier movable to place circular blooms centrally on the punches or rings and to place other punches upon the center of the bloom, and a stop by which the motion of the crane is arrested at said central position, substantially as and for the purposes described.

In testimony whereof I have hereunto set my hand this 10th day of April, A. D. 1890.

JULIAN KENNEDY.

Witnesses:

W. P. POTTER,  
JNO. K. SMITH.