

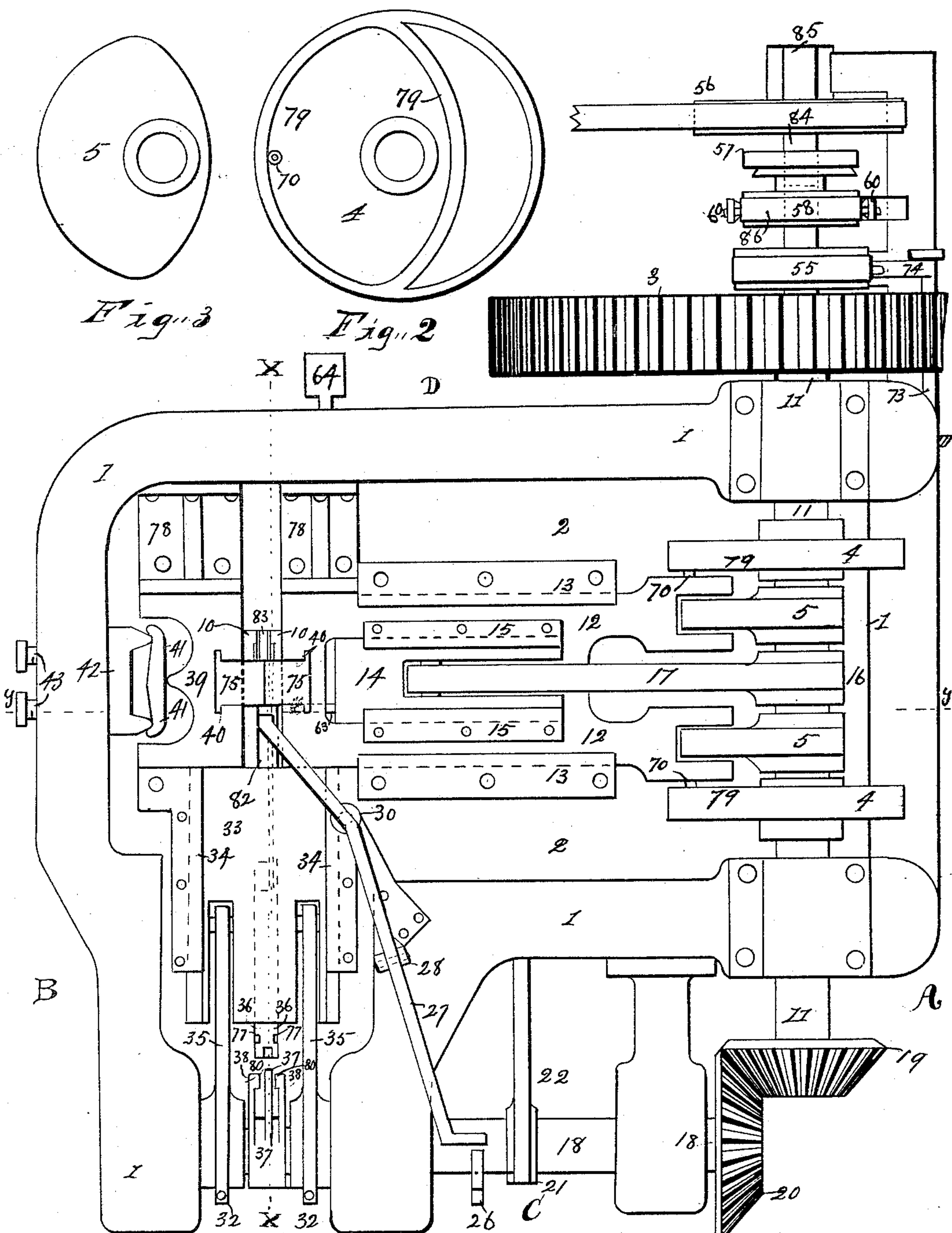
(No Model.)

5 Sheets—Sheet 1.

J. S. STEVENSON.
MACHINE FOR FORMING LADDER IRONS.

No. 435,864.

Patented Sept. 2, 1890.



Witnesses

George Dixon.

Elliott & Muddard John S. Stevenson

Inventor

(No Model.)

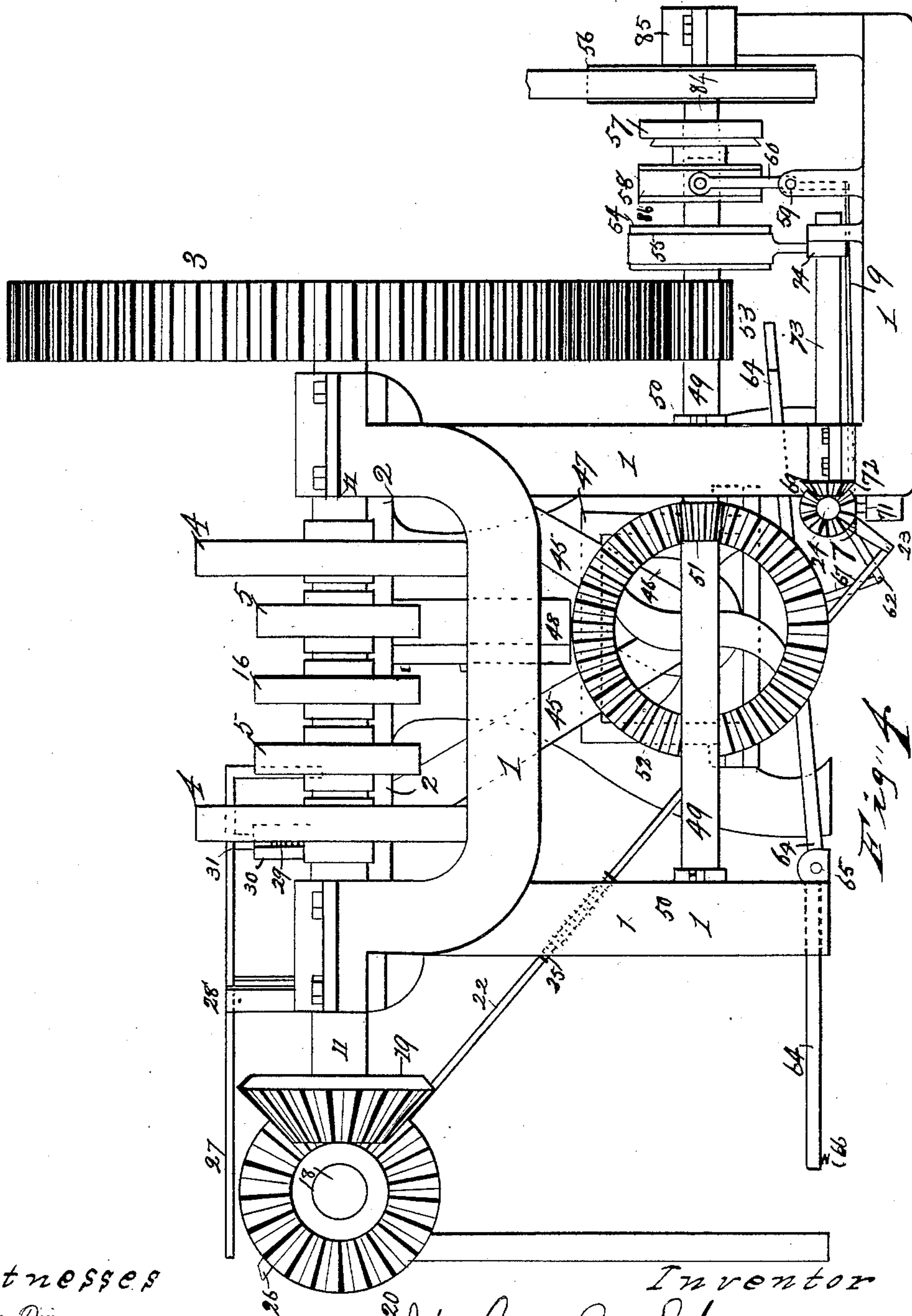
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Elliot Stoddard

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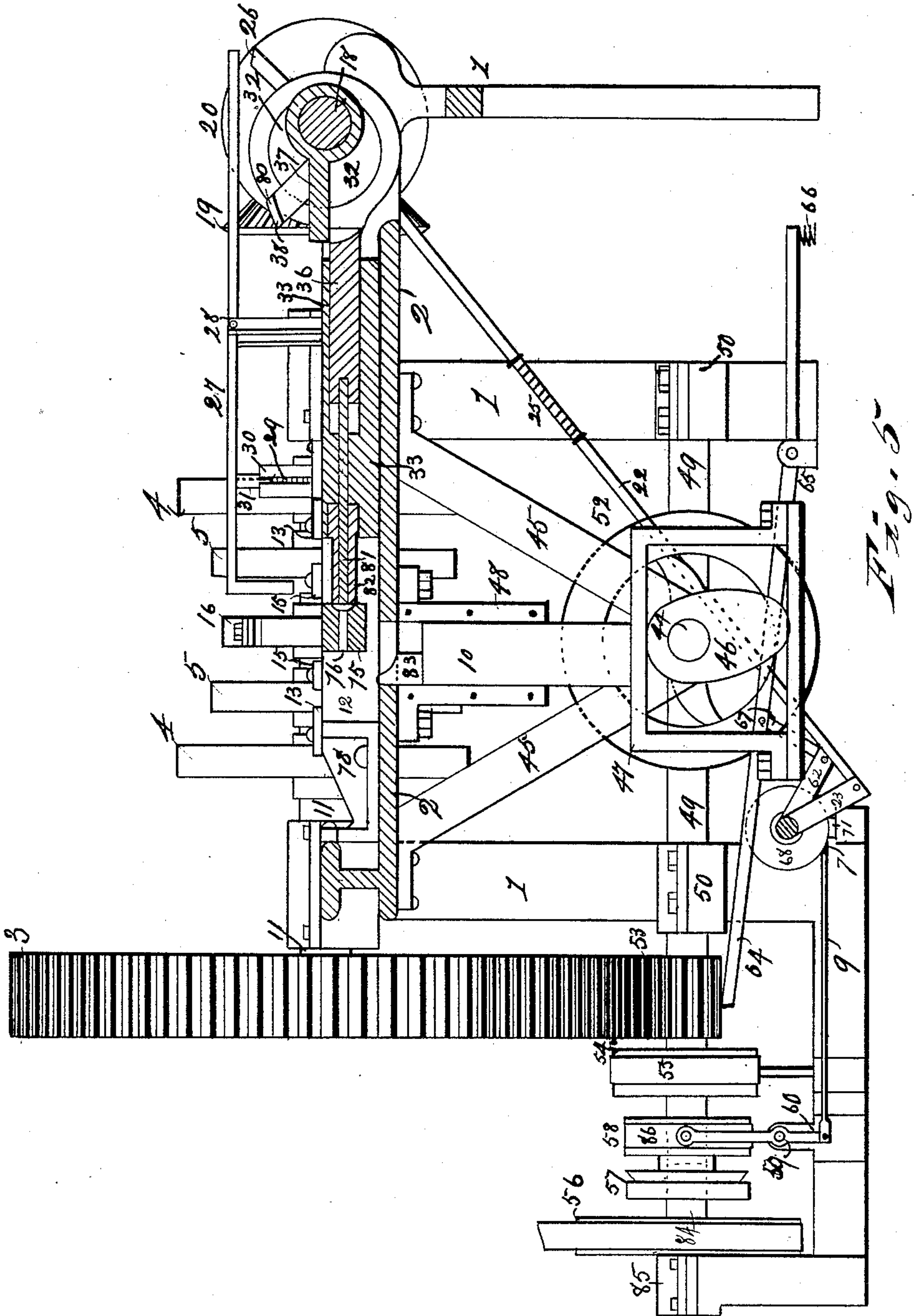
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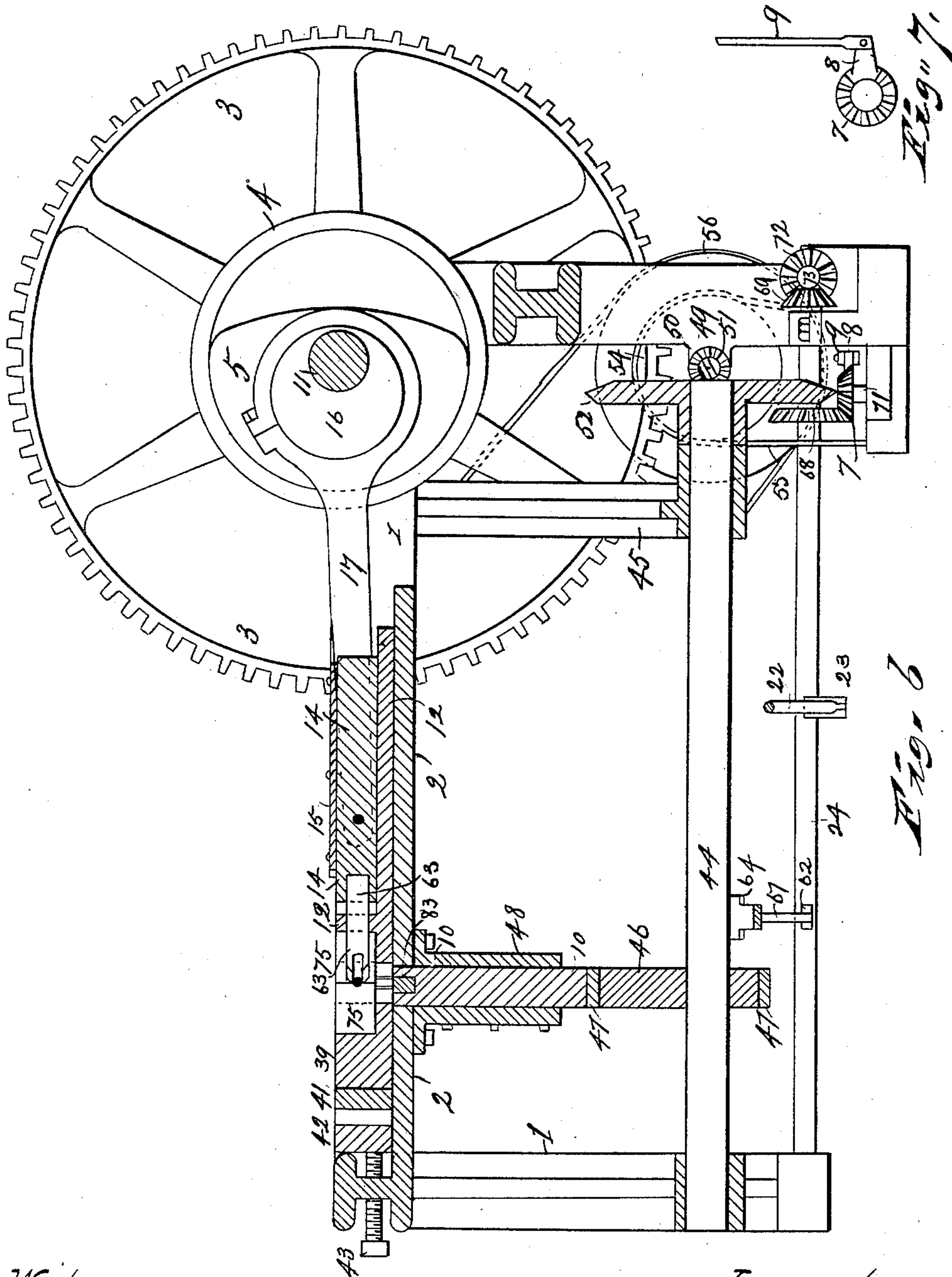
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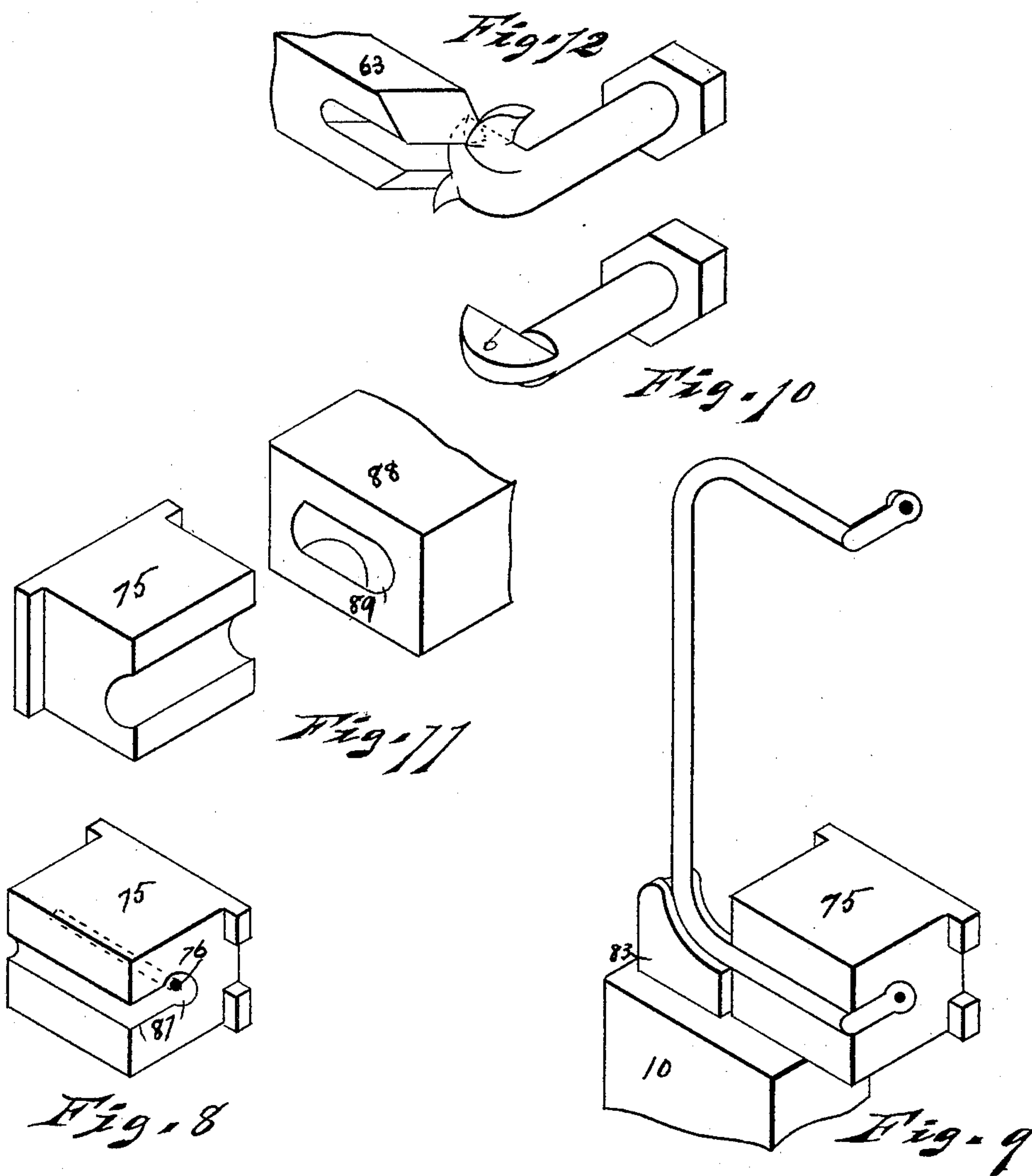
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UNITED STATES PATENT OFFICE.

JOHN S. STEVENSON, OF DETROIT, MICHIGAN, ASSIGNOR OF ONE-THIRD TO
JOSEPH H. AMES, OF SAME PLACE.

MACHINE FOR FORMING LADDER-IRONS.

SPECIFICATION forming part of Letters Patent No. 435,864, dated September 2, 1890.

Application filed October 24, 1889. Serial No. 328,085. (No model.)

To all whom it may concern:

Be it known that I, JOHN S. STEVENSON, of Detroit, in the county of Wayne and State of Michigan, have invented a new and useful Improvement in Machines for Forming Ladder-Irons, of which the following is a specification.

My invention relates to an improved machine for forming metal; and the objects of my invention are to make ladder-irons for freight-cars and to form the end 6 of the bolt shown in Figure 10. I attain these objects by the mechanism illustrated in the accompanying drawings, in which—

Fig. 1 is a plan view of the entire machine, part of the toothed wheel 3 being broken away to economize space. Fig. 2 is a side elevation of one of the disks 4 4. Fig. 3 is a side elevation of one of the cams 5 5. Fig. 4 is an elevation of the entire machine from the side marked "A," Fig. 1. Fig. 5 is a section on the line *x x*, Fig. 1, in elevation, looking from the side marked "B," Fig. 1. In this figure the plunger 10 is shown in its lowest position, so that it shall not obscure other parts of the machine. Fig. 6 is a section on the line *y y*, Fig. 1, in elevation, looking from the side marked "C," Fig. 1. Fig. 7 is a detail view of the bevel gear-wheel 7, its arm 8, and a part of the rod 9. Fig. 8 is an isometric view of one of the dies used in the operation of forming a ladder-iron. Fig. 9 is an isometric view of the die shown in Fig. 8, the ladder-iron in its position in said die, the bending-tool, and the end of the plunger carrying said bending-tool. Fig. 10 is an isometric view of a bolt, the end 6 of which is formed by the machine embodying my invention. Fig. 11 is an isometric view of two of the dies used in the operation of forming the end 6 of the bolt shown in Fig. 10, and Fig. 12 is a detail isometric view of the unfinished bolt and the cutting end of the shearing-tool.

1 is the frame of the machine.

3 is a toothed wheel through which the power is communicated to the machine.

11 is a shaft extending transversely across the machine upon one side and resting in bearings on the frame 1. The toothed wheel 3 is keyed to the shaft 11.

12 is a sliding cross-head adapted to recip-

rocate in the guides 13 13 upon the web 2, which web extends between the sides of the frame of the machine.

14 is a sliding cross-head adapted to reciprocate in the guides 15 15 upon the sliding cross-head 12.

5 5 are cams keyed upon the shaft 11, bearing against the sliding cross-head 12, and adapted to drive said sliding cross-head forward.

4 4 are metal disks keyed upon the shaft 11, and provided with flanges 79 79, extending from their inner sides, of the shape shown in Fig. 2.

70 70 are pins extending horizontally from the sides of the sliding cross-head 12. The pins 70 rest against the surfaces of the flanges 79 79, which are toward the centers of the disks 4 4.

16 is an eccentric keyed upon the shaft 11.

17 is an eccentric-rod pivoted at one end to the sliding cross-head 14 and provided at the other end with an eccentric-strap passing around the eccentric 16.

18 is a shaft resting in bearings upon the frame 1 at one side of the machine and extending at right angles to the shaft 11.

19 is a bevel gear-wheel keyed upon the shaft 11, and 20 is a bevel gear-wheel keyed upon the shaft 18. The teeth of the bevel gear-wheels 19 and 20 mesh together, and through said bevel gear-wheels the motion of the shaft 11 is communicated to the shaft 18.

21 is an eccentric upon the shaft 18.

22 is an eccentric-rod provided at one end with an eccentric-strap passing around the eccentric 21, and at the other end pivoted to the end of the arm 23, which arm extends from the rock-shaft 24. The eccentric-rod 22 is composed of two rods fastened together by a yielding connection 25.

26, Fig. 1, is a cam on the shaft 18.

27 is a lever pivoted in the upper end of a standard 28, which standard extends vertically from the frame of the machine.

29, Fig. 4, is a coil-spring confined in the guide 30.

31 is a stud extending vertically downward from the lever 27 into the guide 30 and resting upon the end of the spring 29. The in-

ner end of the lever 27 is bent downward, as shown in Fig. 5, to a point just above the level of the top of the dies.

32 32, Fig. 1, are eccentrics upon the shaft 18.

33 is a sliding cross-head adapted to reciprocate in the guides 34 34 upon the frame of the machine.

35 35 are eccentric-rods pivoted to the sliding cross-head 33 and provided with eccentric-straps passing around the eccentrics 32 32.

36 is a rod adapted to reciprocate in an aperture formed longitudinally in the sliding cross-head 33 and having its end which is toward the shaft 18 protruding from said cross-head.

37 is a cam upon the shaft 18, adapted to drive the rod 36 forward when the shaft 18 is rotated.

38 38 are rods extending parallel to each other and at right angles to the shaft 18. The rods 38 38 are provided at their ends with flanges 80 80, which flanges extend toward each other and are adapted to pass through the slots 77 77 in the sides of the rod 36. Said flanges are formed in the arc of a circle having its chord extending in a direction which forms an acute angle with the direction of the length of the arms 38 38, as shown in Fig. 5. When the shaft 18 is rotated, the flanges 80 80 pass through the slots 77 77 and act as cams against the sides of said slots to retract the rod 36 after it has been driven forward by the cam 37.

81, Fig. 5, is a round punch fixed in the end of the rod 36 and passing through an aperture formed for that purpose through the sliding cross-head 33 and through the die 82, which die is attached to the end of said sliding cross-head.

78 78 are braces secured to the frame of the machine and abutting one against the side of the anvil 39 and the other against the sliding cross-head 12 at the end of said sliding cross-head.

39 is an anvil resting against the center of a piece of cast-iron 41, called a "chip-breaker." The chip-breaker 41 rests at its ends upon projections from the metal block 42.

43 are set-screws, by means of which the block 42, and consequently the anvil 39, may be adjusted forward and backward.

40 40 are slots in the anvil 39 and sliding cross-head 12 for receiving and retaining the dies 75 75.

44 is a shaft resting at the side of the machine marked "B" in Fig. 1 in a bearing upon one of the standards of the machine and near the opposite side of the machine in a bearing in the lower end of a hanger 45, which hanger is secured to the frame of the machine.

46 is a cam secured to the shaft 44 and operating in a yoke 47 to reciprocate vertically a plunger 10 when the shaft 44 is rotated.

48 is a guide for the plunger 10.

52 is a bevel gear-wheel keyed to the end of the shaft 44.

49, Figs. 4 and 6, is a shaft extending horizontally below and parallel to the shaft 11 and resting in bearings 50 50 upon the standard of the machine.

53, Fig. 4, is a pinion on the shaft 49, the teeth of which mesh with the teeth of the wheel 3.

51 is a bevel gear-wheel secured to the shaft 49 and meshing with the bevel gear-wheel 52. The bevel gear-wheel 51 should bear the same relation to the bevel gear-wheel 52 that the pinion 53 does to the toothed wheel 3.

75 75, Fig. 6, are gripping and forming dies adapted to fit into the slots 40 40 in the end of the sliding cross-head 12 or in the anvil 39.

76 is an aperture formed through that one of the dies 75 75 upon the side of which the ear upon the end of the ladder-iron is formed.

63 is a forked shearing-tool carried by the sliding cross-head 14 and passing through an aperture formed for that purpose through the end of the sliding cross-head 12.

83 is a bending-tool attached to the upper end of the plunger 10.

In using the above-described machine it is convenient to employ apparatus by which the machine may be readily started and may be automatically stopped when its work is done to allow the operator to insert another piece of metal. I accomplish these objects by the following devices:

24, Figs. 4 and 6, is a rock-shaft resting in bearings at the lower ends of the standards of the machine upon the side marked "D," Fig. 1.

62 23, Figs. 5 and 6, are arms extending at right angles from the rock-shaft 24.

64 is a foot-lever pivoted at 65, and provided at its interior end with a coil tension-spring 66, which spring acts to hold the interior end of said lever down.

67, Fig. 5, is a rod connecting the arm 62 with the lever 64.

68 69, Fig. 6, are bevel gear-wheels keyed upon the rock-shaft 24. The bevel gear-wheel 68 meshes with a similar wheel 7, which last-mentioned wheel is keyed upon a vertical shaft 71, which shaft bears in an extension of the frame of the machine.

8 is an arm extending from the bevel gear-wheel 7. The bevel gear-wheel 69 meshes with a similar wheel 72, keyed upon a rock-shaft 73, which shaft rests horizontally in bearings upon an extension of the frame of the machine at right angles to the rock-shaft 24.

56, Fig. 4, is a pulley keyed upon a shaft 84, which shaft rests in a bearing upon an extension of the frame of the machine. The shaft 84 is of the same size as the shaft 49, and is arranged parallel to and concentric with it, and has its end abutting against the end of the shaft 49. The pulley 56 and shaft 84 are kept in continuous rotation by a belt from the source of power passing over said

pulley. The two shafts 84 and 49 may turn independently of each other, except when connected by a suitable clutch.

57 58 are the constituent parts of a cone-clutch by which the shafts 49 and 84 may be connected and disconnected by moving the part 58 toward or away from the part 57.

86 is a band passing around the part 58, so that said part may rotate freely in said band, but being restrained from movement in the direction of the axis of said part.

60 is a lever pivoted at 59 to the top of a standard, which extends vertically upward from an extension of the frame of the machine. The lever 60, Figs. 4 and 5, is pivoted at its upper end to the band 86.

9 is a rod connecting the lower end of the lever 60 with the arm 8 of the bevel gear-wheel 7.

54 is a pulley upon the shaft 49.

55 is a brake-strap passing over the pulley 54. Said brake-strap is secured to an extension of the frame of the machine at one end and to an arm 74, extending from the rock-shaft 73, at the other end.

The operation of the machine embodying my invention is as follows: Dies 75 75, having half-round slots horizontally across their faces, are placed in the slots 40 40 in the anvil 39 and sliding cross-head 12. One of said dies is hollowed out upon its side to form the matrix 87, Fig. 8, into which the metal of the end of an iron rod is forced to form the ear by which the ladder-iron is secured to the car. An upsetting-die 82, having an aperture through it to permit the passage of the punch 81, Fig. 5, attached to the rod 36, is attached to the end of the sliding cross-head 33. A bending-tool 83, Fig. 1, having its upper end shaped as shown in Fig. 9, is attached to the upper end of the plunger 10. The operator presses with his foot upon the outer end of the lever 64, thus forcing down the arm 62 and turning the rock-shaft 24, which carries with it the bevel gear-wheel 68, Fig. 6. The turning of the bevel gear-wheel 68 turns the bevel gear-wheel 7, which carries with it the arm 8, thus drawing upon the rod 9 and oscillating the lever 60 about its pivot 59 and forcing the part 58 of the cone-clutch against the part 57, thus connecting the shafts 49 and 84. The shaft 49 being thus set in motion, the motion of the pinion 53 is communicated to the toothed wheel 3, and the motion of the bevel gear-wheel 51 is communicated to the bevel gear-wheel 52, thus rotating the shafts 11 and 44. The motion of the shaft 11 is communicated through the bevel gear-wheels 19 and 20 to the shaft 18. The rotation of the shaft 18, Fig. 6, carries the cam 26 against the outer end of the lever 27, oscillating said lever upon its pivot in the standard 28 and forcing its inner end down below the level of the slots in the faces of the dies 75 75. A straight round bar of suitable length heated to a welding heat is placed in the slot upon the face of the die in the anvil 39 and moved in-

ward until its end comes against the end of the lever 27, which indicates that a sufficient length of said bar protrudes from the slot in the face of the die to furnish sufficient metal to form the ear upon the end of the ladder-iron or the hook upon the end of the bolt. (Shown in Fig. 10.) When the cam 26 has passed the lever 27, the inner end of said lever is raised by the spring 29 out of the way of the dies. The cams 5 5, Fig. 1, drive the sliding cross head 12 forward, clamping the bar to be operated upon between the dies 75 75. The sliding cross-head 33 is driven forward by the eccentrics 32 32, the die 82 upon said sliding cross-head being forced against the end of the bar to be operated upon and forcing the metal of the protruding end of said bar into the matrix upon the side of the die 75 in the sliding cross-head 12 or in the anvil 39. This operation forms the ear upon the end of the ladder-iron by which said iron is attached to the car. The rod 36 is driven forward by the cam 37, forcing the punch 81 through the end of the ear as above formed, making the hole through which the bolt by which the ladder-iron is attached is passed. The chips formed by the punch 81 are driven through the aperture 76. The shaft 44 in rotating carries with it the cam 46, which forces the plunger 10 upward, bending the rod to be operated upon by means of the bending-tool 83, as shown in Fig. 9. Of course, if one of the ears upon the end of the ladder-iron is formed in a matrix upon the side of the die in the sliding cross-head 12 the other ear should be formed in a matrix in the die upon the anvil 39 in order to have both ears extend in the same direction. In forming the ladder-iron the forked shearing-tool 63 is not used. In forming the end 6 of the bolt (shown in Fig. 10) neither the punch 81 nor the bending-tool 83 is used, and the die 82 is replaced by a die 88, Fig. 11, having a matrix 89 in its end. The end of the unfinished bolt is formed roughly in the required shape by the pressure of the die 88, and is finished by the forked shearing-tool 63 shearing off the sides, as shown in Figs. 12 and 10. After the machine has been set in motion by the operator pressing upon the foot-lever 64 the shaft 18, continuing to rotate, turns the eccentric 21, first pressing on the arm 23 by means of the eccentric-rod 22, holding the cone-clutch 58 57 engaged in a manner entirely analogous to that hereinbefore described, and then, pulling upon said arm, disengaging said clutch by an operation the reverse of that by which it was engaged. When the eccentric-rod 22 draws upon the arm 23, the rock-shaft 24 is turned, turning the bevel gear-wheel 69, which turns the bevel gear-wheel 72, which turns the rock-shaft 73, carrying down the arm 74, thus drawing upon the brake-strap 55 and stopping the machine. Should any chip lodge between the dies 75 75, the chip-breaker 41 is broken, thus relieving the parts of the machine from the strain due to the

momentum of the parts. After the end of the ladder-iron or the bolt shown in Fig. 10 has been formed as above described the dies 75 75 are separated by the flanges 79 79 acting as cams upon the pins 70 70 to retract the sliding cross-head 12.

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

1. In a metal-forming machine, the combination of the anvil 39, provided with a slot to receive and hold a die, the sliding cross-head or die-carrier 12, the cams 5 5, and the disks 4 4, mounted on shaft 11 and engaging with cross-head 12, and the sliding cross-head or shearing-tool carrier 14, mounted in ways 15 upon cross-head 12 and connected by rod 17 with the eccentric 16 on shaft 11, substantially as shown and described.

2. In a metal-forming machine, the combination, with the clamping-die, of the sliding cross-head or die-carrier 33, carrying an upsetting-die and connected by rods 35 35 with eccentrics 32 32 on shaft 18, the reciprocating rod 36, lying in a hole formed in cross-head 33 and its upsetting-die, and cam 37 on shaft 18, substantially as shown and described.

3. In a metal-forming machine, the combi-

nation of the anvil 39 and cross-head 12, carrying the two halves of a clamping-die 75, the vertically-movable plunger 10, carrying on its end a bending-die 83, the cam 14, and the shaft 44, substantially as shown and described.

4. In combination with the driving-shaft 49, pulley 56, and clutch 58 57, a foot-treadle adapted to force the clutch into engagement with the pulley and a spring-connection between the clutch-operating mechanism and movable part of the machine, whereby the clutch is disengaged from the pulley when the machine has made one cycle and movement of the treadle permitted when the machine is to be started, substantially as shown and described.

5. The combination, with clutch-actuating mechanism, of the foot-treadle 64, the connecting-rod 22, having a spring-section 25, and the eccentric 21 on shaft 18, substantially as shown and described.

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