No. 831,604. PATENTED SEPT. 25, 1906.

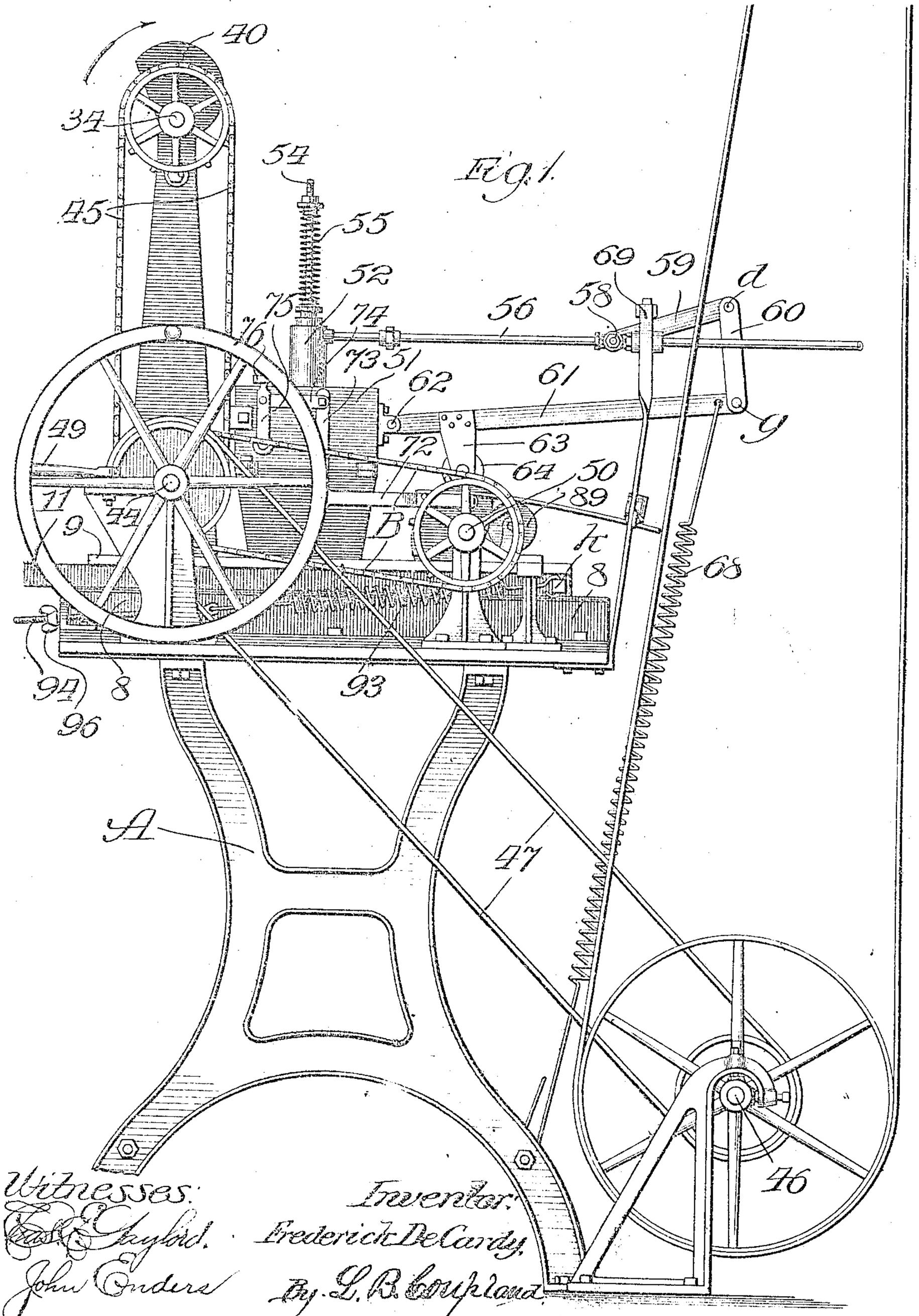
F. DE CARDY.

METAL CASTING MACHINE.

APPLICATION FILED MAY 16, 1904.

5 SHEETS—SHEET 1.

Fig. 1.



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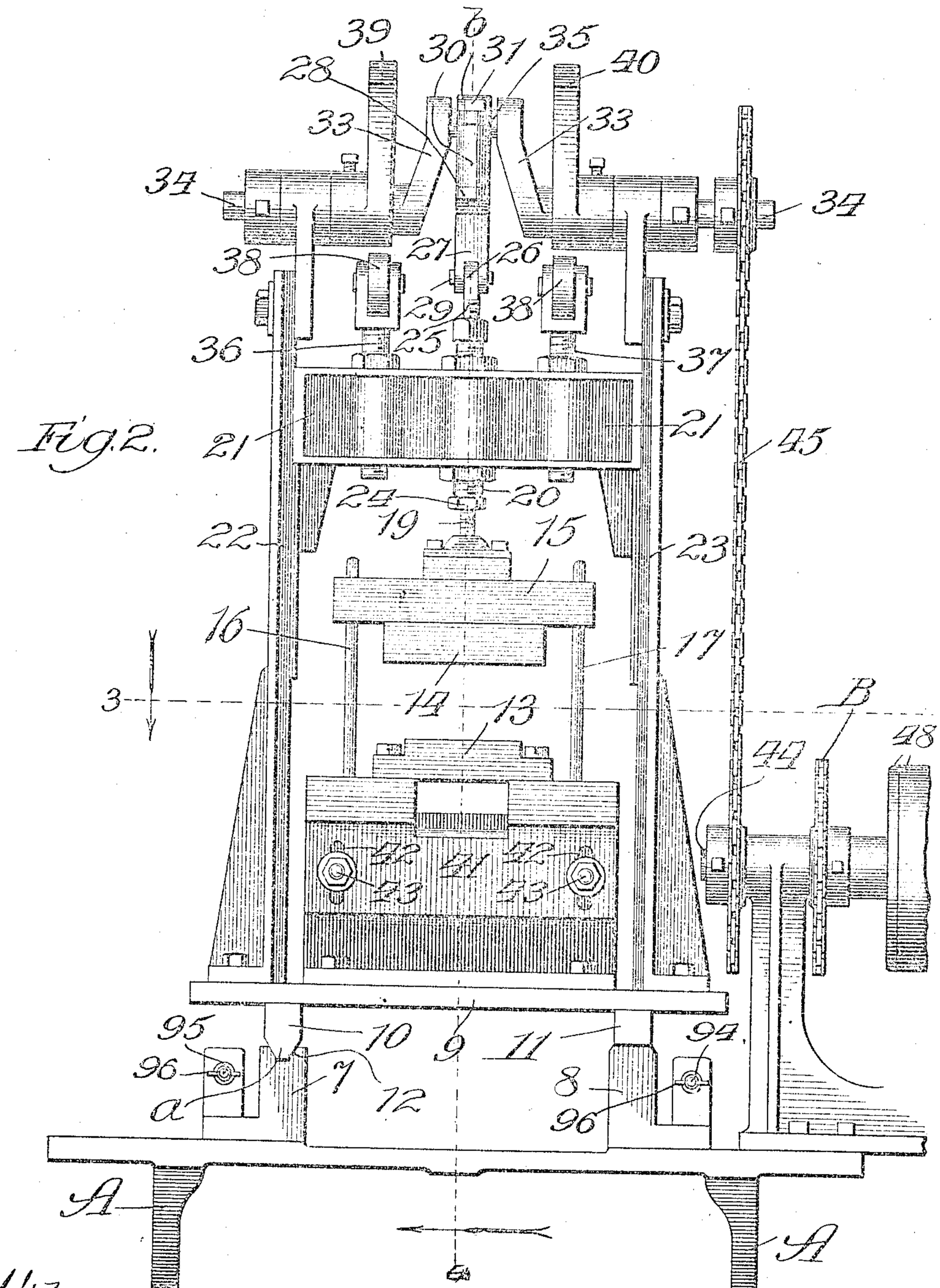
5 SHEETS—SHEET 2.

Fig. 2.



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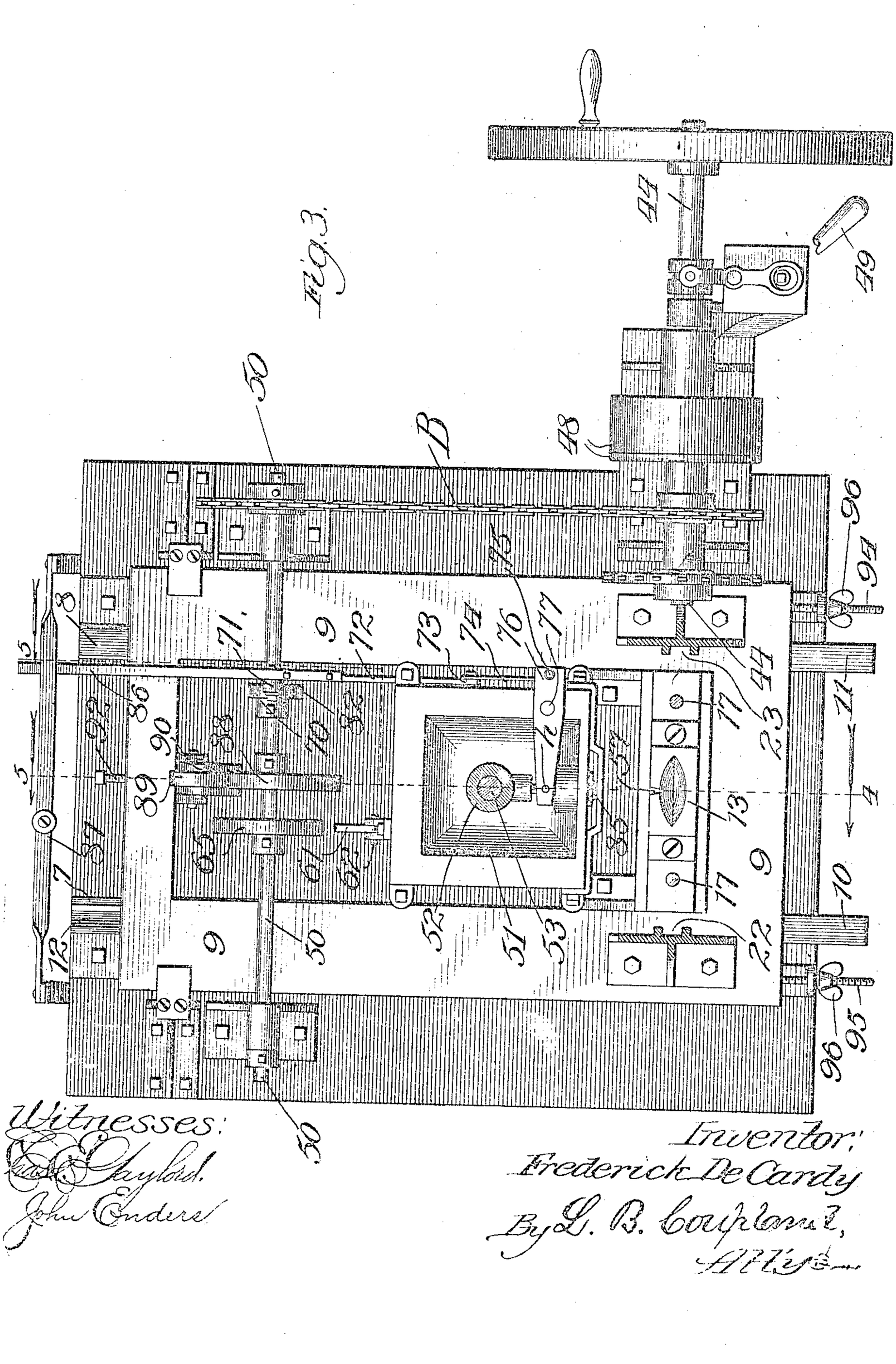
5 SHEETS—SHEET 3.



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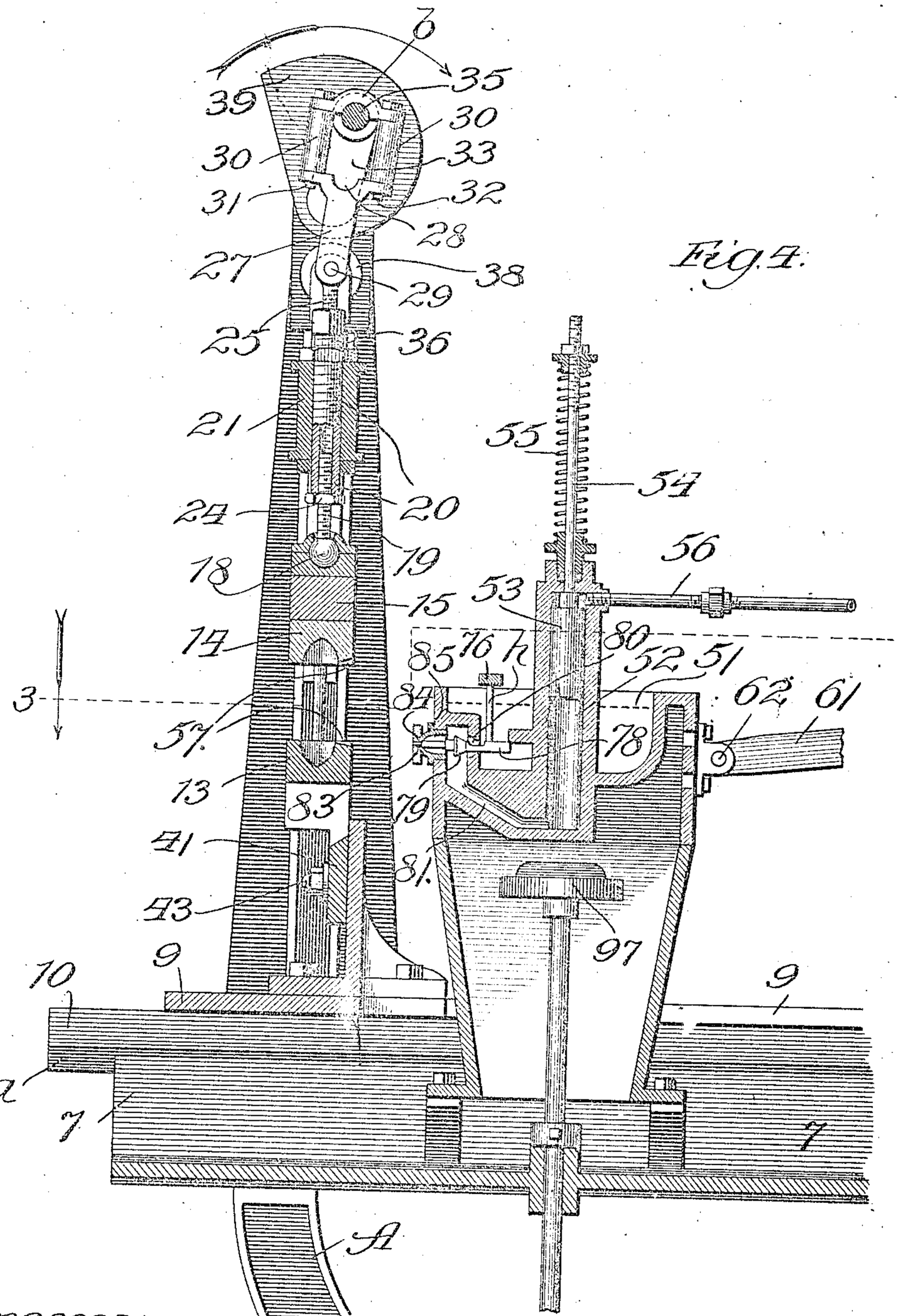
5 SHEETS—SHEET 4.

Fig. 4.



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5 SHEETS—SHEET 5.

Fig. 6.

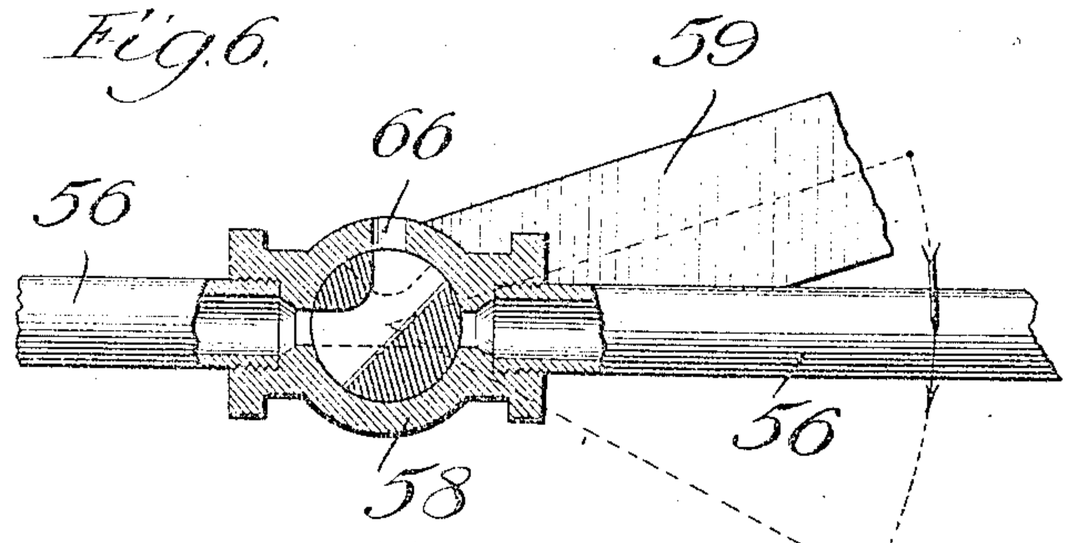
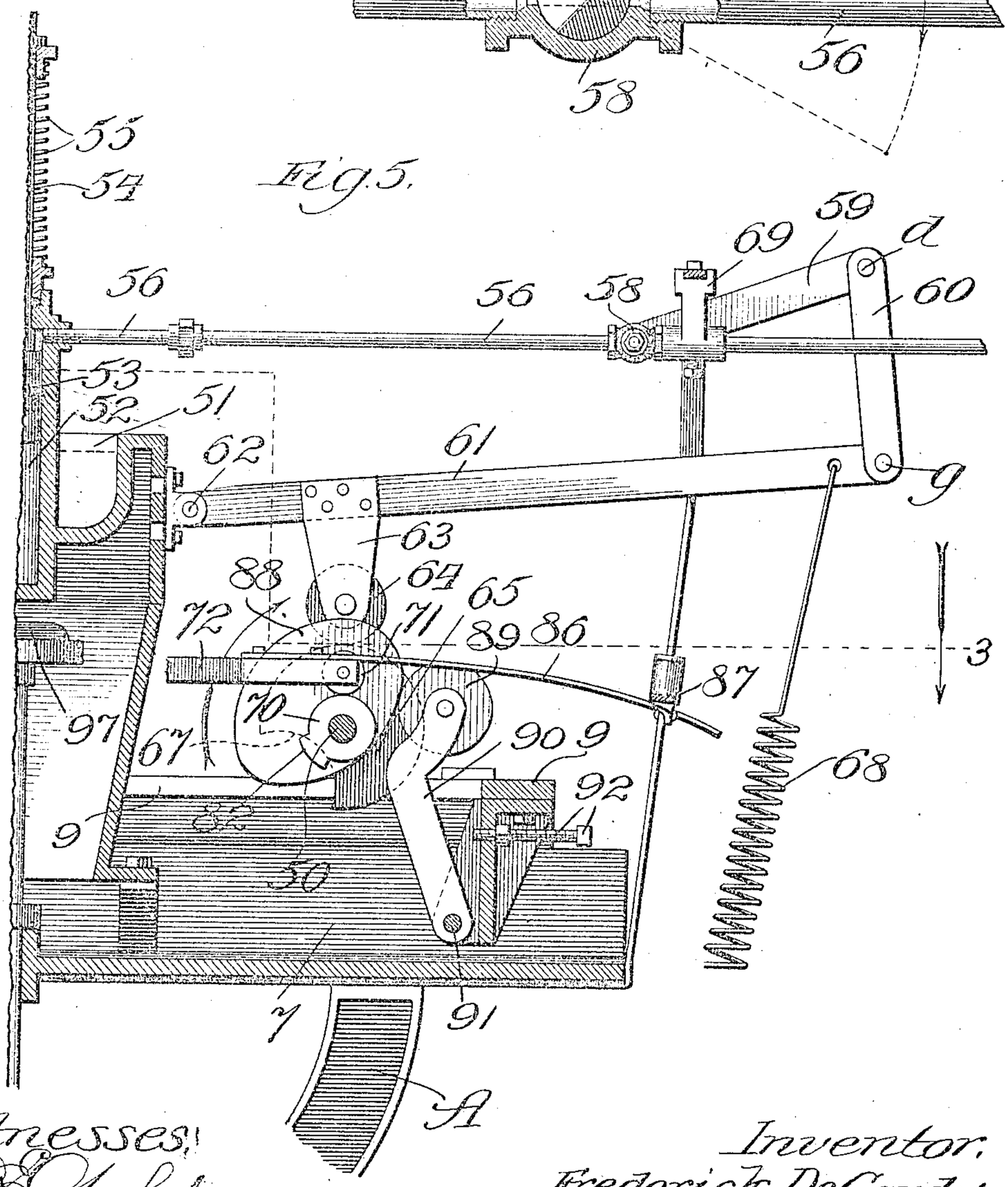


Fig. 5.



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UNITED STATES PATENT OFFICE.

FREDERICK DE CARDY, OF CHICAGO, ILLINOIS, ASSIGNOR TO WHITE BRASS CASTINGS CO., OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

METAL-CASTING MACHINE.

No. 831,604. Specification of Letters Patent. Patented Sept. 25, 1906.

Application filed May 16, 1904. Serial No. 208,182.

To all whom it may concern:

Be it known that I, FREDERICK DE CARDY, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented new and useful Improvements in Metal-Casting Machines, of which the following is a specification.

This invention relates to improvements in metal-casting machines, and has for its object to provide mechanism of this character by means of which the work of casting metal articles may be accomplished with facility.

Another object is to provide a machine in which metal or an alloy thereof fusing at a high temperature may be successfully used in the production of commercial articles possessing a hard smooth finish and in condition ready for use without the necessity of preliminary dressing by hand.

In the drawings, Figure 1 is a side elevation of a machine embodying the improved features. Fig. 2 is a front elevation. Fig. 3 is a plan section on angular line 3, Figs. 2, 4, and 5. Fig. 4 is a vertical section on line 4, Figs. 2 and 3. Fig. 5 is a vertical section on the lines 5 and 5, Fig. 4. Fig. 6 is a detail of the air pipe and valve.

A may represent the main supporting-frame as a whole; but minor parts thereof may be indicated by other reference characters in locating connecting details of the operating mechanism.

The track-rails 7 and 8 are a rigid part of the table-bed frame and have the reciprocating carriage or apron 9 mounted thereon. This carriage is provided on the under side with guide-ribs 10 and 11. The guide-rib 10 has its bearing edges beveled, as at *a*, and engages a V-groove 12, formed in the top of rail 7, as best shown in Fig. 2. This retains the carriage in its proper position and prevents a lateral movement thereof. The rail 8 and the rib 11 have flat engaging surfaces, Fig. 2, and provide for expansion and contraction, as these parts are liable to be heated from the mold or die members in the operation of casting, and if both rails were grooved the carriage would be liable to stick at times and prevent a free movement thereof.

The reciprocating carriage 9 carries the casting-molds and the necessary mechanism for operating the same. The molds comprise the lower stationary die member 13 and the upper movable die member 14, removably secured to a die-block 15, the respective ends of which are mounted on the retaining guide-posts 16 and 17 and provide for a vertical movement of the upper die member in opening and closing the same in the operation of casting. The head end 18 of a threaded bolt 19, Fig. 4, is loosely inserted in the upper side of the die-block 15, so as to have a slight swiveling action in conforming to any inequalities. This bolt is threaded in a sleeve 20, which is in turn fixed in the longitudinal center of a cross-head 21, having a vertical movement in the companion guide-standards 22 and 23 of the reciprocating carriage 9. The bolt 19 provides means for lengthening or shortening the travel of the upper die member in accordance with the requirements of the work and is locked in place of adjustment by a nut 24. The sleeve 20 extends through the cross-head and is threaded and adjustable therein in connection with a threaded bolt 25, the lower end of which engages the upper end of the sleeve. The upper flattened head end 26 of bolt 25 is inserted in the lower bifurcated end of a crank-rod 27, having one-half of a bearing-box 28 formed on the upper end thereof, as best shown in Fig. 4. The engaging ends of bolt 26 and the crank-rod are pivotally connected by a pin 29. The upper half *b* of the bearing-box is held apart from the companion half 28 by sleeves 30, through which clamping-bolts 31 and 32 are inserted in retaining the boxes in the relative position shown. A double crank 33 is mounted on a revoluble crank-shaft 34, suitably supported from and located above the top of the carriage. The crank-pin 35 is shown in the upper half of the box, the mold being open. When the mold is closed, the pin will be in the lower half of the box, this change taking place with each revolution or the opening and closing movement of the mold. The bolts 36 and 37 are threaded in the cross-head and located at each side of the crank connection. A friction-roller 38 is revolubly mounted in the head ends of the companion bolts 36 and 37. The companion cams 39 and 40 are adjustably mounted on the crank-shaft and in line with the rollers 38 and adapted to come in contact therewith once in each revolution and impart a downward movement to the cross-head and close the mold at the proper time to receive the injec

tion of molten metal. As the cams pass out of contact the cross-head is returned to its upper normal position and the mold opened by the crank connection before described. The bottom die-block 41 is made adjustable by means of slots 42 and clamping-bolts 43 inserted therein, as shown in Fig. 4.

Motion is transmitted from a clutch-shaft 44 to the crank-shaft by a sprocket-chain 45, the clutch-shaft receiving motion from a driving-shaft 46 through the medium of a belt connection 47, as shown in Fig. 1. The movement of the carriage and the opening and closing of the molds are controlled by hand, the clutch mechanism 48 being thrown into and out of engagement by a proper manipulation of clutch-lever 49. A cam-shaft 50, Figs. 1, 3, and 6, is located on the back part of the machine and is provided with suitable journal-bearings, motion being transmitted thereto from the clutch-shaft by a sprocket-chain B. This shaft has a number of cams mounted thereon for different purposes, as will be hereinafter described.

The molten-metal reservoir 51 has a pump-cylinder 52 located therein, as best shown in Fig. 4. A pump piston or plunger 53 is movably inserted in the pump-cylinder and is provided with a piston-rod 54. This rod has a spring 55 mounted thereon, which serves to return the piston to its upper normal position after each down movement. The discharge end of an air-pipe 56 opens into the pump-cylinder at a point above the highest position of the piston. This air-pipe connects with an air-tank, (not shown,) which contains air under pressure for supplying power in forcing the pump-piston downward and injecting a charge of molten metal into the mold-cavity 57. This air-supply is automatically controlled by means of a valve 58, Figs. 1, 5, and 6, located in the air-pipe, the valve being opened and closed at predetermined intervals by actuating mechanism to be next described.

One end of a link 59 is connected to the air-valve, the opposite end being pivoted to one end of a second link 60, as at *d*, and set at an angle with reference to the first link. The opposite end of link 60 is pivoted, as at *g*, to the outer end of a lever 61, the inner end of which is supported from the metal-reservoir and has a pivotal bearing 62. A hanger 63 is secured to the lever 61 and has a roller 64 journaled in the free end thereof and in line with and contacting a cam 65, mounted on cam-shaft 50, as shown in Figs. 3 and 5. The high side of cam 65 is normally in contact with roller 64, the cam-shaft being at rest and the air-valve open to the atmosphere through an exhaust-aperture 66, the passage from the air-supply under pressure being closed. This position of the air-valve and its actuating mechanism corresponds to the position of the pump-piston in Fig. 4. When the cam-shaft is put in motion through the medium of the hand clutch mechanism hereinbefore referred to and the cam 65 rolls around in position for roller 64 to engage the low part 67 thereof, the spring 68 has the effect of pulling the outer end of lever 61 down and closes the air-valve from the outer atmosphere and opens the passage through the air-pipe from the air-tank to the pump-piston when the same is to be forced downward in practical working. A stop 69 limits the upward movement of the air-valve mechanism. A second cam 70 is also mounted on the cam-shaft and in position to have a rolling contact with a roller 71, journaled in the outer end of a horizontal lever 72, the inner end of which is bent upward at right angles to form the bell-crank extension 73, pivotally connecting with a link 74, which in turn connects with a link 75, as best shown in Fig. 1. One end of a shifting arm 76 is attached to the upper end of link 75, which is adapted to have a slight oscillating movement. The shifting arm is provided with a fulcrum-bearing 77, Fig. 3, and has a working movement in a horizontal plane. This arm extends inward over the top of the molten-metal reservoir and has a pin *h*, Fig. 4, fixed in the inner end thereof, which extends downward and is secured to a valve-stem 78. This stem carries a valve 79, which at the proper time is adapted to close an aperture 80, opening into the metal-reservoir, and through which the charge of molten metal flows into the walled passage 81, leading into the pump-cylinder. When the cam-shaft is rotated and the high part 82 of cam 70 comes in contact with roller 71 it raises the corresponding end of lever 72 and transmits therefrom, through the series of jointed links, a rocking movement to arm 76, throws the inner end inward, imparts a corresponding movement to the valve-stem, seats the valve 79 in and closes the aperture 80, and shuts off the flow of metal from the reservoir to the pump. This movement withdraws the valve end 83 of stem 78 from its position in closing an orifice 84 in the injector-nozzle 85, through which the molten metal is forced into the molds. By the time the high part of cam 70 has rolled on out of contact the molds have been backed up and received the charge of metal and the injector-orifice closed and the aperture between the metal-reservoir and pump reopened for another supply of metal to flow into the latter. The molten metal flows into the pump through the passage 81 and is forced outward through the same passage when the piston descends. One end of a spring-arm 86 is attached to the lever 72, the other end passing under a brace 87 and bent downward just far enough so that the pressure on lever 72 will be heavy enough to maintain a working contact between the cam 70 and its roller 71. A third cam 88 is also

eccentrically mounted on the same cam-shaft and serves the purpose of moving the carriage on which the molds are mounted in one direction—that is, inward—to receive the casting charge of metal. A roller 89 is journaled in the upper end of a link 90 and positioned to be contacted by cam 88. The link 90 extends downward through the carriage, the lower end having a pivotal bearing 91, as shown in Fig. 5. These parts are shown in their normal position corresponding to the other operative parts, the cam-shaft being at rest. When the cam-shaft is rotated, the higher part of the cam 88 gradually comes in contact with its roller and imparts a backward movement to the carriage and brings the molds into position against the injector-nozzle. A set-screw 92, inserted in the rear end of the carriage and in line with link 90, provides means for regulating the throw of said link with reference to the movement of the carriage. The carriage is returned to its normal position after the high part of cam 88 passes out of contact with its roller 89 by companion springs 93, Fig. 1, one end of which is attached to the carriage, as at *k*, and the other ends to screw-threaded rods 94 and 95, extending through the front end of the stationary bed-frame and located on opposite sides of the carriage. The wing-nuts 96, threaded on the projecting ends of rods 94 and 95, serve the purpose of maintaining the proper tension of springs 93.

A burner 97 is located under the metal-reservoir and connects with gas or other fuel supply in maintaining the casting metal in a molten condition for injection into the molds.

The different parts of the machine are shown in the normal position of rest, the molds being open. In practical working the operator throws the clutch mechanism into engagement, which has the effect of imparting motion to the crank and cam shafts, which operates to close the molds and impart a forward movement to the carriage in bringing the molds into position to receive a casting charge of metal. At the same time the double valve controlling the flow of metal into the pump and the injector-nozzle is moved to the opposite position from that shown in Fig. 4 and the opening from the reservoir into passage 81 closed and the orifice in the injector-nozzle opened as the pump-piston is forced downward by the air-pressure and a charge of metal injected into the molds. As the carriage returns the molds open, the object cast is removed, and the operation repeated. The travel of the reciprocating carriage is only three inches or less. The change of centers over which the sprocket-chain runs is so slight that the said chain readily allows therefor, and the operation of the machine is not impeded.

Having thus described my invention, what I claim is—

1. In a metal-casting machine, a reciprocating carriage, the molds carried thereby and comprising a stationary die member and a movable die member, a cross-head, an adjustable connection between the cross-head and movable die member, a crank-shaft, the operative connection between the cross-head and crank-shaft, and means carried by the latter for periodically contacting and imparting a downward movement to the cross-head in the operation of closing the mold.

2. In a metal-casting machine, a reciprocating carriage, the molds carried thereby and comprising a movable and a stationary member, a cross-head positioned in the guide-standards of said carriage and having the movable die member connected therewith, a crank-shaft supported from and located above the guide-standards of said carriage the crank connection between the cross-head and crank-shaft, whereby the cross-head is returned to its upper normal position, after each down movement thereof, the companion cams mounted on the crank-shaft, and means interposed between the cams and cross-head and positioned to be contacted by the cams once in each revolution and impart the downward movement to the cross-head.

3. In a metal-casting machine, a reciprocating carriage, the casting-molds mounted thereon, the operative means carried by said carriage for opening and closing the molds at the proper time, a molten-metal reservoir, a pump-cylinder located therein, a piston inserted in the pump-cylinder, an inlet-passage from the reservoir into said cylinder, an outlet-passage therefrom into the molds, means for alternately opening and closing said passages in accordance with the direction in which the pump-piston is moving, an air-pipe charged under pressure and opening into said cylinder, a valve inserted in the air-pipe and having two positions therein, viz; one position opening the passage from the air-supply into said cylinder, and the second position closing the working pressure from the source of supply and opening the exhaust from the cylinder into the atmosphere, and means for actuating said valve.

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

FREDERICK DE CARDY.

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