No. 881,956. PATENTED MAR. 17, 1908.

F. H. RICHARDS.

CARVING MACHINE.

APPLICATION FILED APR. 19, 1902.

4 SHEETS—SHEET 1.

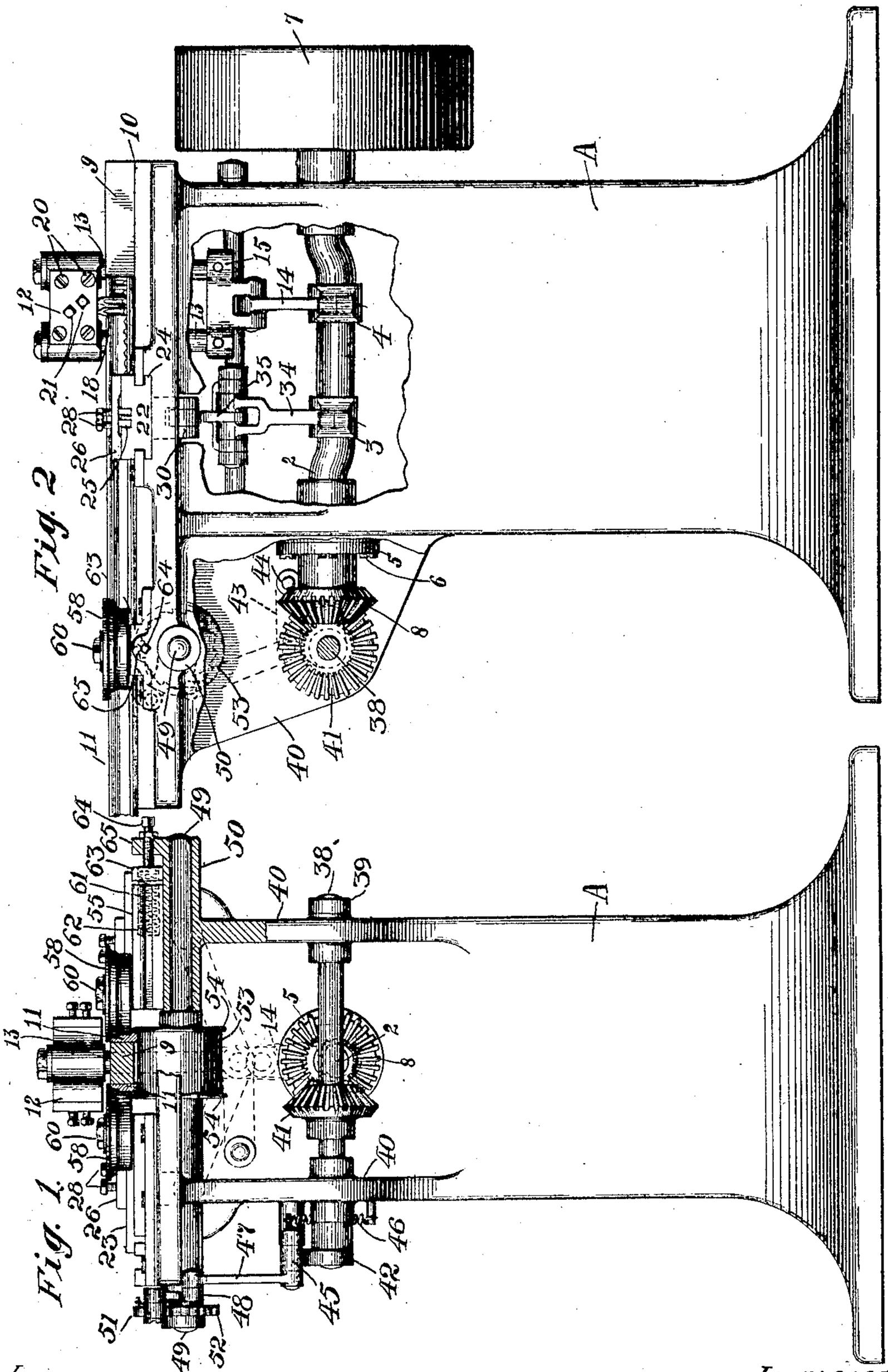

Fig. 1.

Fig. 2

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4 SHEETS—SHEET 2.

Fig. 3

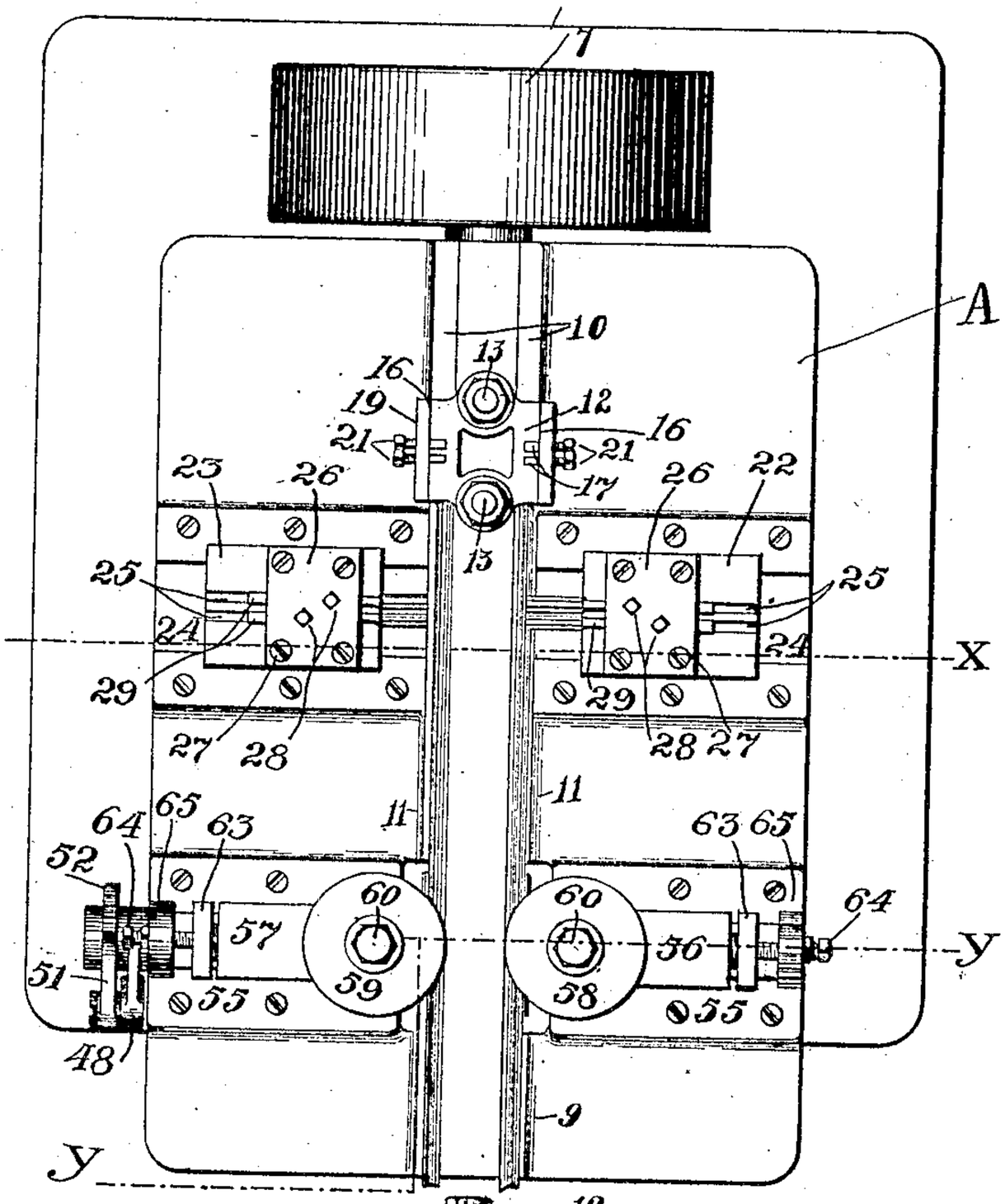
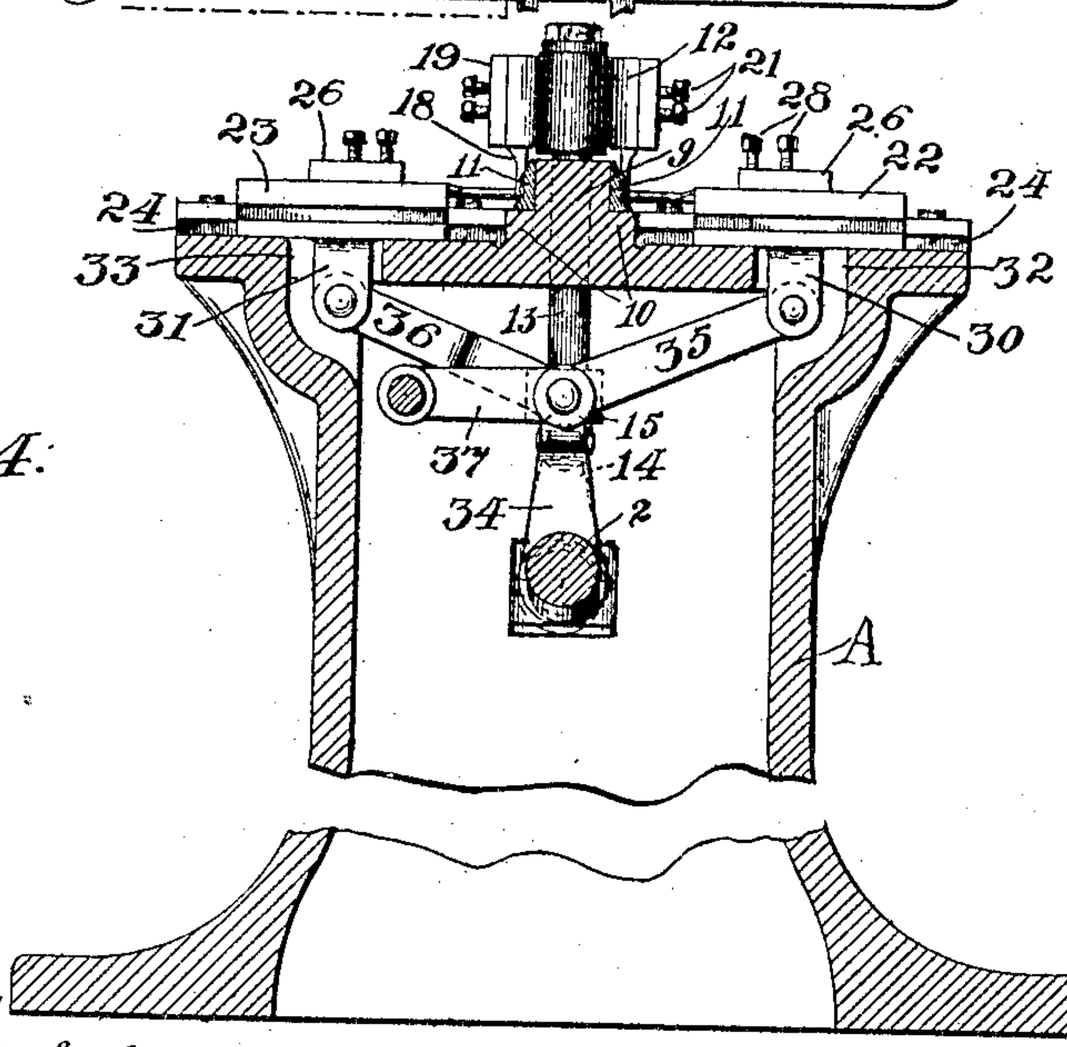


Fig. 4.



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4 SHEETS—SHEET 3.

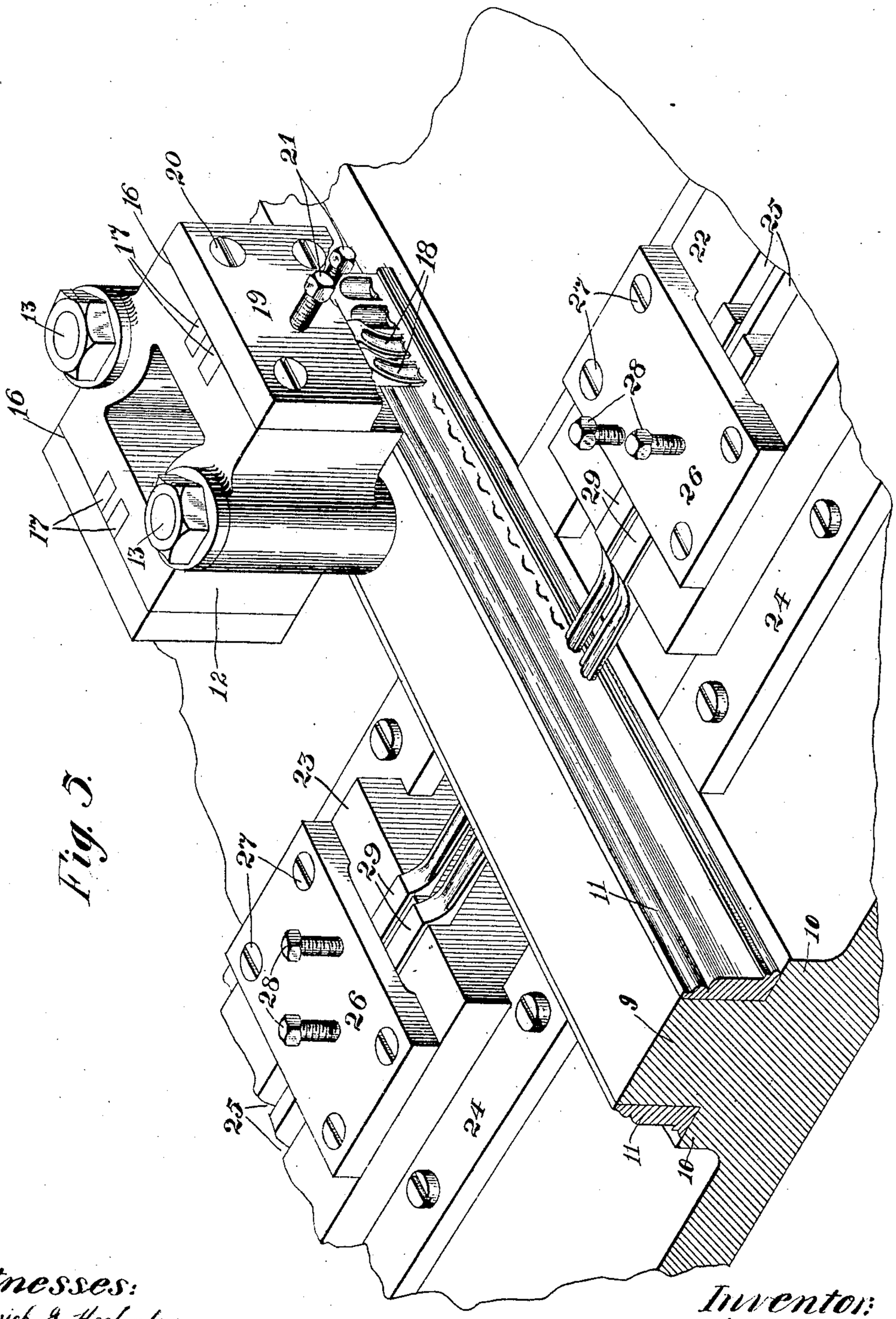

Fig 3.

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4 SHEETS—SHEET 4.

Fig. 6.

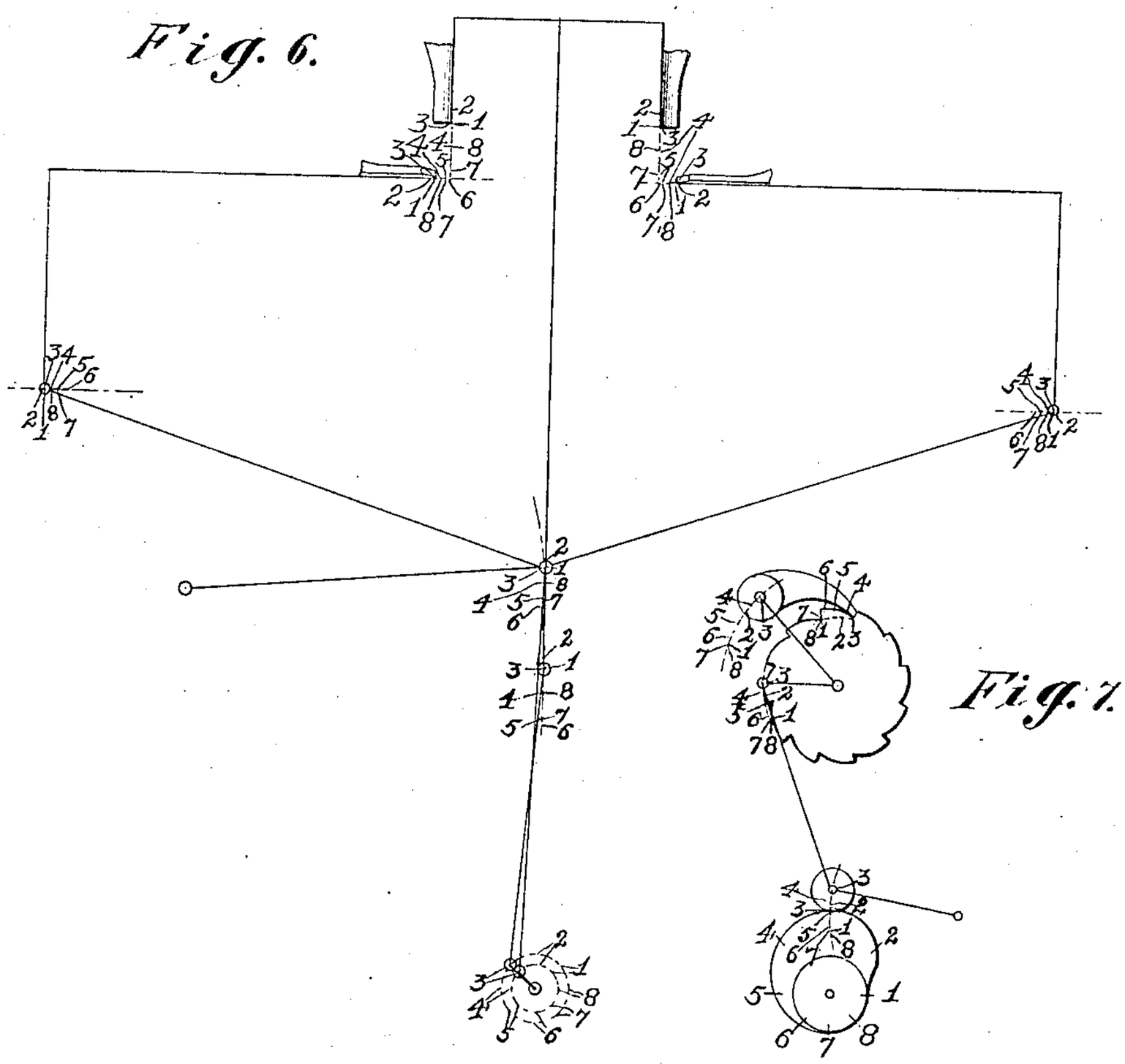

Fig. 7.

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UNITED STATES PATENT OFFICE.

FRANCIS H. RICHARDS, OF HARTFORD, CONNECTICUT.

CARVING-MACHINE.

No. 881,956. Specification of Letters Patent. Patented March 17, 1908.

Application filed April 19, 1902. Serial No. 103,705.

To all whom it may concern:

Be it known that I, FRANCIS H. RICHARDS, a citizen of the United States, residing at Hartford, in the county of Hartford and State of Connecticut, have invented certain new and useful Improvements in Carving-Machines, of which the following is a specification.

This invention relates to machines for carving repeat ornaments or a repeating series of ornaments on wood moldings, or the like wherein two or more tools or sets of tools, one or more for incising the contour of an ornament or a part thereof, and another or others for making one or more complemental cuts meeting said incision or incisions, coact to carve the desired design; and more particularly relates to a machine of the character just named in which a plurality of stock members may be operated upon simultaneously.

It is highly desirable where a great quantity of stock is to be operated upon, and it is one object of this invention, to provide means which will complete said operation upon as great a quantity of said stock as possible in a given time; and also the mechanism should be capable of an increased output, be compactly organized and occupy as little space as possible commensurate with the work required to be accomplished.

I have illustrated my invention as embodied in a carving machine in the accompanying drawings in which like reference characters refer to like parts throughout the several views.

Figure 1, is a front elevation partly sectional on line *y*—*y* of Fig. 3, Fig. 2, a side elevation showing side wall of frame broken away, Fig. 3, a plan view, Fig. 4, a vertical cross section on line *x*—*x* of Fig. 3, Fig. 5, a detail in perspective of the cutter carriages and immediately surrounding parts; Fig. 6, a diagram of the movements of the several operative parts, and Fig. 7, a diagram of the feed actuating mechanism.

Referring to the drawings the machine is shown mounted and assembled upon a box-like frame A. A shaft 2 is horizontally and longitudinally mounted in bearings in the walls of the frame A. In order to allow the insertion within the frame A of the one piece crank shaft 2 an aperture is provided in one wall of the frame A of sufficient diameter to admit said crank 2 which aperture is closed after the insertion of said crank by a bushing bearing 5 insertible from without the frame A and securable to said frame by machine screws 6. The crank shaft 2 projects without the frame A at either end thereof and is provided upon one projecting end with a power pulley 7 and upon its other projecting end with a miter gear 8.

The top of the frame A has a central longitudinal ridge or raised portion 9 which extends throughout the length of said frame and is parallel to and directly above the crank shaft 2. Upon either side of the ridge or raised portion 9 are formed rectangular stock guides 10. In the machine illustrated these stock guides 10 are designed to accommodate molding stock 11 shown lying in said stock guides 10 in Fig. 5. The molding stock 11 for which this machine is particularly designed has one dimension in cross section greater than the other as shown in Fig. 5, the longer side of said stock being adapted to lie against the vertical walls of the stock guides 10. It should also be noted here that the particular ornament to be carved upon the molding by this machine requires one of the complemental incisions be of greater length than its meeting incision. And I have chosen to place this stock guide 10 so that the incision of greater length shall be the vertical, all as clearly shown in Fig. 5 and the reasons for which will appear hereinafter.

A cross head 12 is carried upon the end of two parallel rods 13 and secured thereto by jam nuts. The rods 13 are slidably mounted in parallel guide bores through the projecting ridge 9, and lie in a plane parallel and equidistant to the stock guides 10 and perpendicular to and directly above the crank shaft 2. The lower ends of the rods 13 are connected by a cross head 15 which cross head is connected with the crank portion 4 of the crank shaft 2 by a connecting rod 14. These connections allow the rotary motion of the crank 4 to impart a vertical reciprocating motion to the rods 13 and the cross head 12 carried thereby. The guide bores in the projecting ridge 9 being of considerable length serve to maintain the alinement of the rods 13. Upon either side of the cross head 12 is provided a tool bed 16 having tool seats 17 in which tools 18 are adapted to lie. A clamp plate 19 is secured to each of the tool beds 16 by screws 20. And set screws 21, mounted in said clamp plate, are designed to bear upon and secure the tools 18 in the tool seats 17. The tool seats 17 are preferably

made parallel with the motion to be imparted to the cross head 12 and the tools 18 may then be provided with straight shanks terminating in their cutting edges. It will be seen that the vertical reciprocating motion of the cross head 12 will carry the tools 18 into engagement with the stock 11 lying in the stock guides 10 and withdraw the same, making the longer incision of the ornament desired.

Tool carriages 22 and 23 are mounted to slide in guides 24 on the top of the frame A perpendicularly of the stock guides 10. The tool carriages 22 and 23 are each provided with tool seats 25 in their upper faces or tool beds, and are also provided with clamp plates 26 secured to their upper surfaces or tool beds by screws 27. Set screws 28 are mounted in the clamp plates 26 and are adapted to bear upon and secure tools 29 in the tool seats 25. The tool seats are preferably disposed to the carriages, 22 and 23 parallel with the movement of said carriages hereinafter described, so that the shanks of the tools 29 may be made straight terminating in the cutting edges of said tools.

It will be noted that the guides 24 are illustrated directly opposite, and in alinement with one another, upon opposite sides of the projecting longitudinal ridge 9; and that the movement of the carriages 22 and 23 therein is such as to approach and recede from the stock guides 10.

The carriages 22 and 23 are respectively provided with depending ears 30 and 31 extending down through apertures 32 and 33 in the top of the frame A, and which apertures 32 and 33 are at all times covered and closed by the carriages 22 and 23 said carriages being of such length that their reciprocation in the guides 24 will not carry them from a position covering said apertures nor will their reciprocation be of such an extent as to bring the ears 30 and 31 into engagement with the frame or walls of said apertures.

The ears 30 and 31 are respectively connected with the upper end of a connecting rod 34 by links 35 and 36 of equal length, which connecting rod embraces at its lower end the crank portion 3 of the crank shaft 2. A guide link 37 is pivoted at the meeting point of the links 35 and 36 and the connecting rod 34, and is pivoted to the frame A at its other end. The guide link 37 is of such length that the arc described by its point of connection with the links 35 and 36 and the connecting rods 34 will be practically imperceptible owing to the short throw of the crank 3. The link 37 serves the purpose of a sliding cross head, that is confining the travel of the said point of connection between the links and the connecting rod to a path closely approximating a straight line. These connections transpose the rotating motion of the crank shaft 2 through the crank portion 3 and the toggle formed by the connecting rod 34 and links 35 and 36 to reciprocating movements in the carriages 22 and 23 simultaneously approaching the stock 11 lying in the stock guides 10 and simultaneously receding from said stock guides 10. This organization simultaneously brings the tools 29 horizontally into engagement with the stock lying in the stock guides making the shorter incision of the ornament desired.

The crank members 3 and 4 of the crank shaft 2 are set at the same angle to produce the incising movements in the cross head 12 and the carriages 22 and 23 simultaneously, but the throw of the crank portion 3 is less than that of the crank portion 4 as the incisions to be made by the carriages 22 and 23 are much shorter than those to be made by the cross head 12.

The application of the toggle to the movement of the carriages 22 and 23 reduces the crank movement to a shorter reciprocating movement in the said carriages, but a further reduction of the length of said movement is accomplished by reducing the throw of said crank. This arrangement distributes the strain and application of power to the carriages 22 and 23 throughout the connecting mechanism and secures a much more powerful action in the carriages 22 and 23. The distance between the cross head 12 and the carriages 22 and 23 along the stock guides 10 is such that the tools 18 will exactly register with the incisions previously made by the tools 29 simultaneously with the making of subsequent incisions by said tools. A shaft 38 is horizontally mounted in bearings 39 in extensions 40 of the frame A, said shaft 38 lying in the same plane with crank shaft 2 and carrying a miter gear 41 of equal size and meshing with miter gear 8 on the projecting portion of crank shaft 2, driving shaft 38 at a speed equal to that of crank shaft 2. The shaft 38 projects beyond its bearing 39 and is provided upon its projecting portion with a peripheral cam 42. An arm 43 pivoted to the extension 40 of the frame A at 44 carries upon its free end a roller 45 which travels upon the periphery of cam 42 and is constantly maintained in contact therewith by a spring 46. A link 47 connects the free end of arm 43 with a pawl-carrying-arm 48 loosely mounted upon the shaft 49 which shaft 49 is mounted parallelly of the shaft 38 in bearings 50 in the frame A. The pawl-carrying-arm 48 carries a spring pawl 51 which engages a ratchet wheel 52 mounted fast on shaft 49. The variation in the diameter of cam 42 during each revolution of the shaft 38 or crank 42 accomplishes an upward movement of the pawl-carrying-arm 48 during which upward movement the pawl 51 engages with a tooth of the ratchet wheel 52 rotating said ratchet wheel and the shaft 49 the distance of one tooth on said ratchet wheel.

A feed roll 53 is mounted fast on the shaft 49 directly beneath the projecting ridge 9 in which the stock guides 10 lie and its periphery extends through a cut-away portion of the frame A and said ridge, slightly above the floors of said stock guides 10, being common to both of said stock guides and actively grips the bottom sides of the stock 11 lying in said stock guides. Those portions of the periphery of feed roll 53 which engage the stock 11 may be provided with upstanding teeth or otherwise roughened surfaces to better grip said stock. Flanges 54 upon the edges of the feed roll 53 aid in maintaining the stock 11 in close contact with the walls of the stock guides 10.

Directly above the shaft 49 and on opposite sides of the projecting ridge 9, guides 55 are mounted on the top of frame A, perpendicularly of the stock guides 10, in which guides carriages 56 and 57 are designed to slide. The carriages 56 and 57, respectively carry presser rolls 58 and 59 loosely mounted on vertical studs 60 on said carriages which presser rolls 58 and 59 peripherally conform to the faces of the stock 11. Compressible springs 61 disposed in cylindrical recesses 62 in the rear ends of the carriages 56 and 57 are seated in and bear against spring heads 63 slidable in guides 55. Adjusting screws 64 mounted in upstanding ears 65 on the guides 55 and provided with jam nuts bear against the spring heads 63 and provide means for regulating the tension on said springs 61. The springs 61 tend to force the carriages 56 and 57 toward stock guides 10 and cause the presser rolls 58 and 59 to press upon the faces of the stock members retaining said stock within the stock guides 10, and in engagement with the feed roll 53.

The length of the diameter of the feed roll 53 is proportioned to the distance required between the centers of alternate ornaments to be carved on the stock, so that with the rotation of the feed roll 53 one tooth on the ratchet wheel 52, the stock will be fed said distance.

I use two tools upon each of the tool carrying members and thereby accomplish twice the amount of work in a single operation of the machine. It is obvious that I may use a greater number of tools or only one as may appear expedient in dealing with work of different characters. The use of two tools necessitates the feed between alternate ornaments as noted above.

The operation of the machine may be more clearly understood in connection with Fig. 6, in which the concurrent position of the several movable parts is indicated upon their paths by numerals 1 to 8, corresponding to eight equal points in the revolution of the main driving shaft, as shown upon the two circles at the lowermost part of the figure, corresponding to the paths of the cranks 3 and 4. It is well to say here that the tools come in contact with the stock in entering the same at the point 3 and remain within the profile of the stock from the point 3 until the point 1 is reached, when they leave the stock and remain entirely without the same during the rotation of the main shaft from point 1 to point 3. The feed takes place between the point 1 and the point 3 during the sojourn of the tool entirely within the profile of the stock, which in the present machine is about one quarter of the time taken for a single revolution of the main shaft.

Referring to Fig. 7, it will be seen that the cam 42 raises the arm 47 between the points 1 and 3, accomplishing the feed and withdrawing the pawl during the movement of the main shaft from point 3 to point 8, during which time the feed roll and the stock remain stationary. I attain all the advantages of operating upon the various pieces of stock simultaneously in this machine, and furthermore a balanced arrangement of the driving mechanism which tends to prevent any vibration whatever of the machine upon its frame or base. However, with the arrangement shown, what vibration may occur will be vertical to the machine frame, and be taken upon the base, while the tendency to lateral vibration so often noticeable in machines of this character, as well as in many other automatic machines and which is injurious in many ways, is entirely counteracted. For instance the movements of the carriages 22 and 23 balance perfectly, and the driving mechanism for said carriages acts in a perpendicular plane of the driving shaft; the cross-head 12 which accomplishes the bulk of the work and which has the greatest throw, which would tend to produce vibration, works in a vertical plane to the main driving shaft. Again, the working stroke when the tools are in the stock takes up the greater part of the rotation of the main shaft, while at that point where the tools are entirely without the stock, and when the driving mechanism for the cross-head 12 is just passing the dead center and very little work is being done, the feed is operated, thereby balancing the amount of work accomplished throughout the cycle to a great extent. It will be seen that the action of the mechanism is very direct, considering the requirements of the machine.

The feed illustrated in this machine does not enter into my invention except as an intermittent feed in connection with the other mechanism illustrated and not as being novel in itself, as I may use various forms of intermittent feed without departing from the scope of my invention.

The feature of constructing machinery of this character so organized as to operate in a balanced condition, should appear at once to the mind of the mechanist as of first im-

portance in a practical and commercial device.

Having described my invention, I claim—

1. In a carving machine, a tool-carriage consisting of parallel rods, a cross-head connecting the lower ends of said rods, a second cross-head connecting the upper ends of said rods, guides for said rods between said cross-heads, and parallel tool-beds on opposite sides of said second cross-head.

2. In a carving machine, the combination of a table provided with parallel guide-bores therethrough, a tool-carriage mounted in said guide-bores and consisting of rods passing through said bores, a cross-head connecting the ends of said rods below said table, and a second cross-head connecting the ends of said rods above said table, and tool-beds upon opposite sides of said second cross-head parallel with the said guide-bores.

3. In a carving machine, the combination of a table provided with a plurality of parallel guide-bores therethrough, a plurality of parallel stock-guides upon opposite sides of said bores, a tool-carriage mounted in said guide bores and consisting of rods passing through said bores, a cross-head connecting the ends of said rods below said table, and a second cross-head connecting the ends of said rods above said table, and tool-beds upon opposite sides of said second cross-head parallel with said guide-bores and said stock-guides.

4. In a carving machine, the combination of a box-like frame, the top of said frame being provided with a plurality of parallel stock-guides and with parallel guide-bores through said top between said stock-guides, a tool-carriage mounted in said guide bores and consisting of rods slidably mounted in said guide bores, a cross-head connecting the ends of said rods below said top, a second cross-head connecting the ends of said rods above said top, tool-beds upon opposite sides of said second cross-head parallel with said guide-bores and stock-guides, a shaft mounted in said frame perpendicular of and in the same plane with said cross-heads, a crank on said shaft lying entirely within and inclosed by said frame, and a rod connecting said crank with the first-mentioned cross-head.

5. In a carving machine, the combination of a box-like frame, the top of said frame being provided with a plurality of parallel stock-guides arranged back-to-back, and with parallel guide bores through said top between said stock-guides, a tool-carriage mounted in said guide-bores and consisting of a plurality of rods slidably mounted in said guide bores, a cross head connecting the ends of said rods below said top, a cross-head connecting the ends of said rods above said top, said second cross-head projecting transversely of and over said stock-guides, a plurality of tools carried by the projecting portions of said second cross-head and directed toward said stock-guides and parallelly of said guide-bores, a shaft mounted in said frame, a crank on said shaft within and entirely inclosed by said frame, said crank directly in alinement with the line of motion of said carriage, and a rod connecting said crank and the first mentioned cross-head.

6. In a carving machine, the combination of a pivoted arm, means for vibrating said arm, a plurality of tool-carriages, connecting rods between said arm and carriages the organization being adapted to produce a simultaneous reciprocation of said carriages toward and away from one another, and stock-guiding and feeding means.

7. In a carving machine, the combination of a carriage driving member, a shaft, a crank on said shaft, a connecting rod between said crank and driving member, a plurality of tool-carriages guided for movement in a direction substantially perpendicular to the path of said driving member, and links connecting said carriages and said driving member to produce a simultaneous reciprocation of said carriages toward and away from one another and the work in the same line.

8. In a carving machine, the combination of a frame, a stock-guide on said frame, alined slide-ways oppositely disposed of and perpendicular to said stock-guide, a plurality of tool-carriages mounted in said slide-ways, a guide-link mounted on said frame, a plurality of links of like length connecting said carriages with the free end of said guide-link, a driving shaft mounted in said frame, a crank on said shaft, and a rod connecting said crank and guide-link to impart movement to the free end of said guide-link in a direction substantially perpendicular to said slideways.

9. In a carving machine, the combination of a frame, a plurality of parallel stock-guides arranged back-to-back on said frame, a plurality of vertically reciprocatory cutters, a plurality of opposed horizontally reciprocatory cutters, vertically acting driving mechanism for actuating all said cutters in unison, and stock-feeding means.

10. In a carving machine, the combination with a plurality of independent stock guides, of a tool-carriage associated with each stock guide, a driving shaft, a linkage connecting said shaft with said carriages, means to actuate the same in unison with the said carriages, means also operable by said shaft for penetrating the stock in a direction transverse to the movement of said carriages, and means for feeding the stock.

11. In a carving machine, the combination with a pair of parallel stock-guides, of a duplex tool-carriage reciprocatory perpendicularly thereto, a pair of tool-carriages

movable transversely of said duplex carriage, said carriages having complemental tools operative in sequence upon the feed of the stock, feed mechanism, and connections between said feed mechanism and carriages for positively actuating said feed mechanism and retracting and advancing said carriages in unison.

12. In a carving machine, the combination with a plurality of parallel stock-guides arranged back-to-back in pairs upon a single member, of a tool-carriage mounted between each pair of said stock-guides and reciprocatory toward and from the same and projecting transversely of the guides of said pair for carrying a tool therefor, a plurality of tool carriages arranged in pairs and equal in number to the stock-guides and movable transversely of said guides, each of said carriages carrying a tool, complemental tools being provided for each guide, a driving shaft, feed mechanism, and connections between said shaft, feed mechanisms and all of said carriages, including means for causing the members of each of said pairs of transversely movable carriages to approach and recede from each other in unison.

13. In a carving machine, the combination with a frame provided with a plurality of parallel stock-guides, of stock feeding means, slideways through said frame between said stock-guides, a tool-carriage mounted in said slideways and projecting over said stock-guides, tools carried by each such projecting portion, a driving shaft mounted in said frame, a crank upon said shaft, a rod connecting said tool-carriage and crank, two transversely moving tool carriages, one upon each side of said guides, tools carried by said transversely moving carriages for coöperation with the tools on the carriage mounted on said slideways whereby one tool will supplement the cut of its complementary tool upon the feed of the stock, and means connecting said transversely movable carriages and said stock feeding means to said shaft for actuating said tools in opposite directions into and out of the stock in unison and for causing one tool to complete the cut of the complementary tool.

14. In a carving machine, the combination with a member provided upon opposite sides with stock-guiding faces, of a carriage individually associated with each of the several stock-guides, carving tools upon each of said carriages, a carriage common to said stock-guides, carving tools upon said common carriage for each of said stock-guides and disposed relatively to the tools upon the individual carriages for sequential operation, one tool supplementing and completing the cut of the other, means for feeding the stock, and means for reciprocating said individual carriages toward and from each other in unison and in unison with the feed to give the tools simultaneous working strokes and whereby the thrust from the working tools carried by one individual carriage will be absorbed by the opposite thrust from the tools carried by the oppositely disposed individual carriage.

15. In a carving machine, the combination with a plurality of independent but parallel stock-guides, of a feed roller common to said stock-guide, a tool-carriage asociated with each stock-guide, and shiftable toward and from the same, a driving shaft, a linkage connecting said shaft with said carriages for advancing these toward the work in unison, a tool-carriage common to said guides and movable in a direction transverse to the movement of the first-mentioned carriages, a linkage connecting said shaft to said common carriage, means for actuating the common carriage from said shaft, and means also connected to said shaft for actuating the feed roll.

16. In a carving machine, the combination with a plurality of independent parallel stock guides, of a tool carriage associated with each stock guide and shiftable toward and from the same, a crank shaft, a pair of links pivoted together and pivoted to said tool carriages, a rod connecting said links at their pivotal connections with said crank shaft, a tool carriage common to said guides and movable in a direction transverse to the movement of the first mentioned carriages, and a link connecting said shaft to said common carriage.

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