No. 842,422. PATENTED JAN. 29, 1907.

F. H. RICHARDS.

CARVING MACHINE.

APPLICATION FILED APR. 8, 1902.

3 SHEETS—SHEET 1.

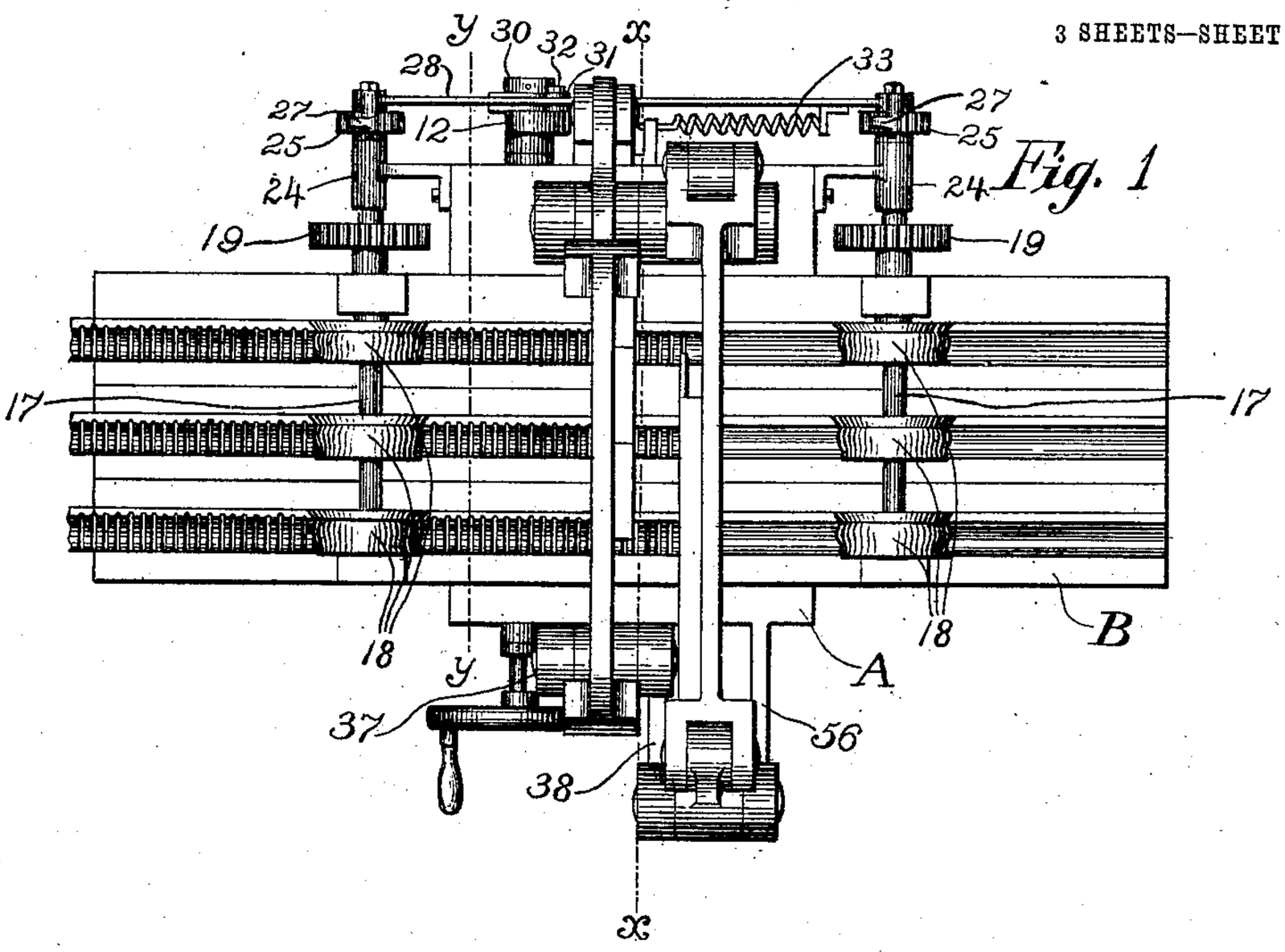


Fig. 1

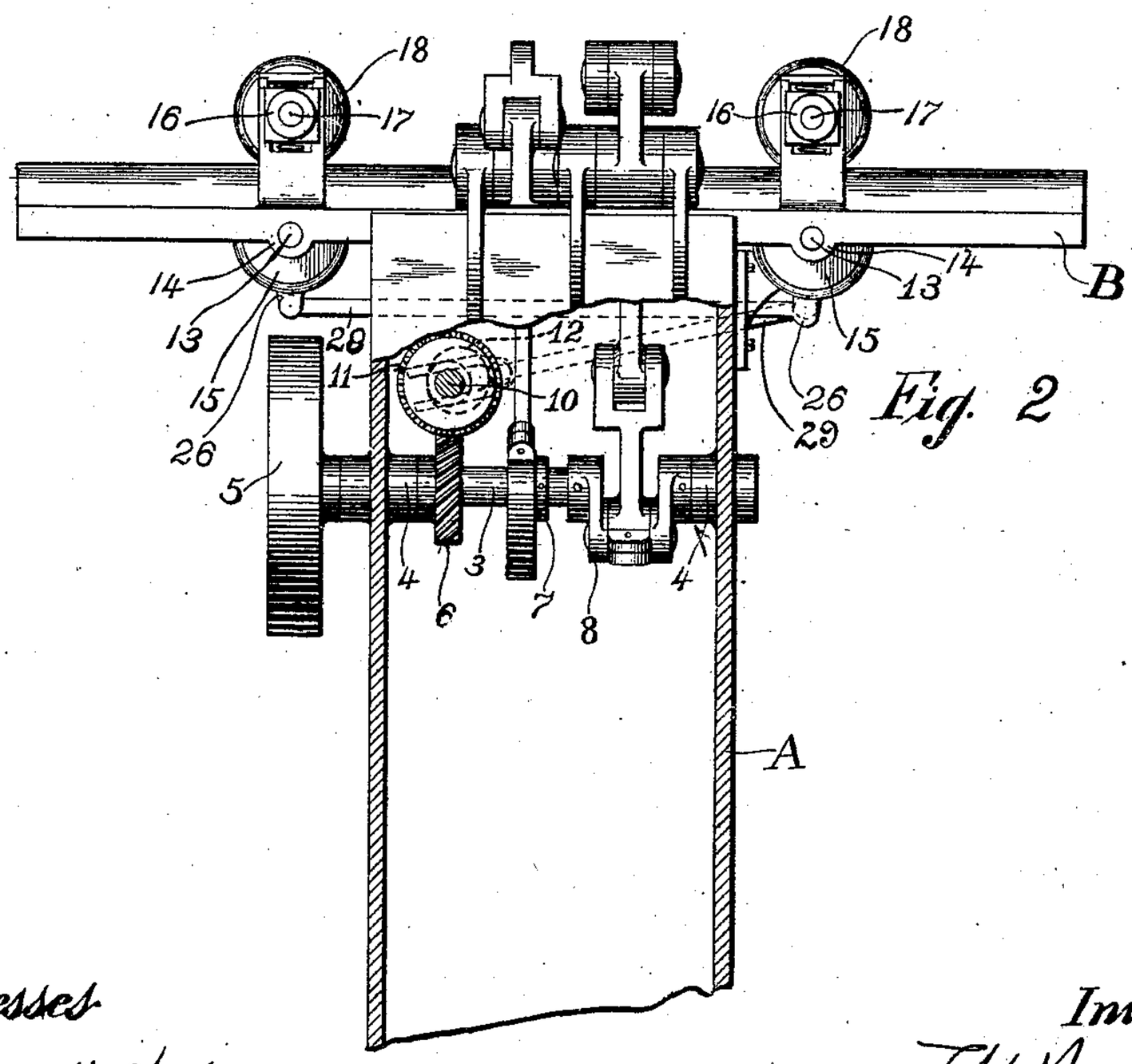


Fig. 2

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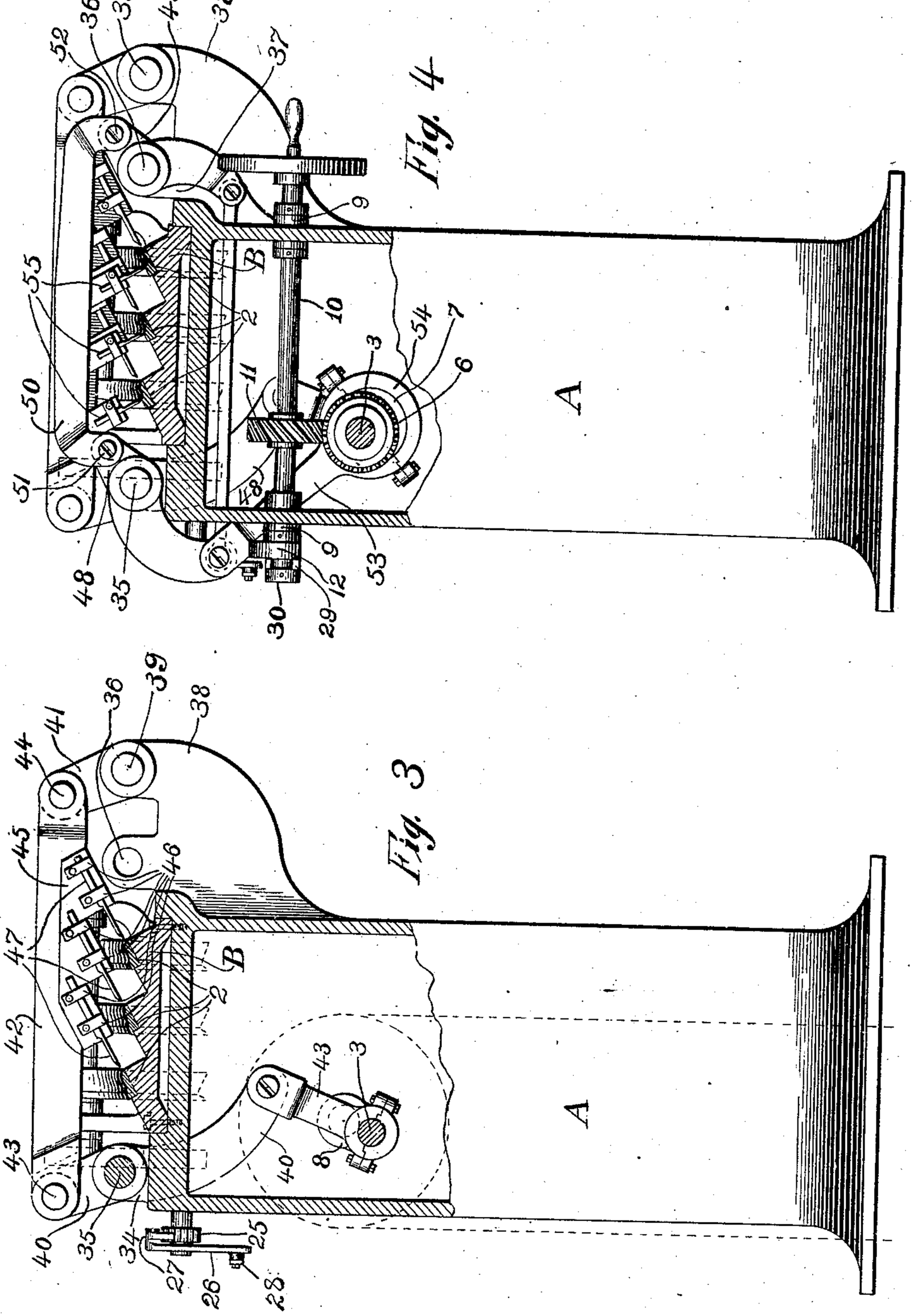


Fig. 4




Fig. 3

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3 SHEETS—SHEET 3.

Fig 5

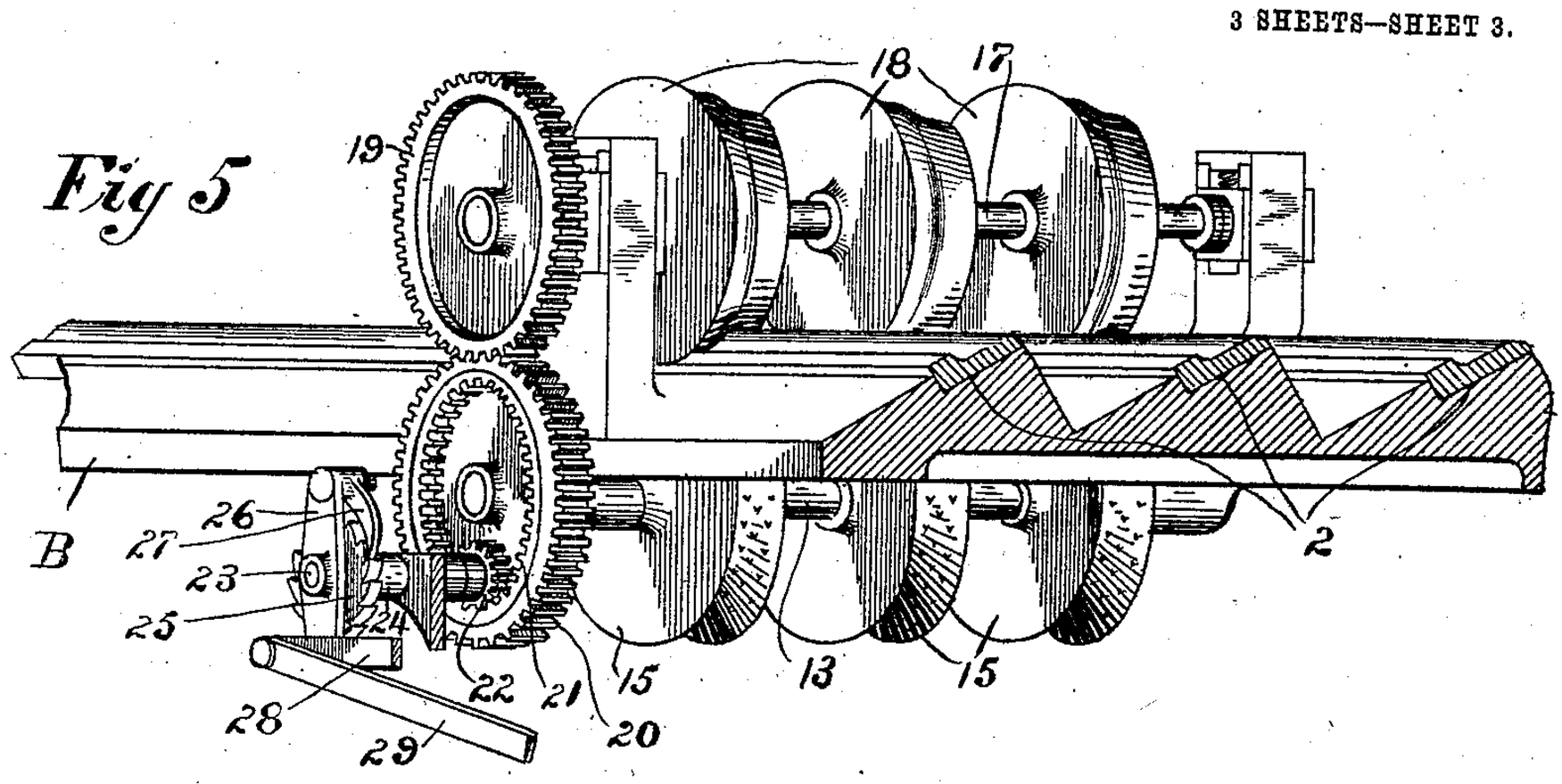



Fig 6

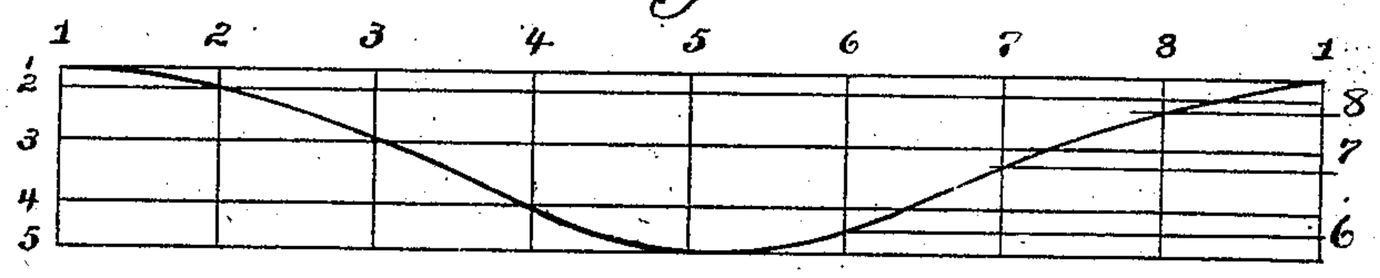



Fig 7

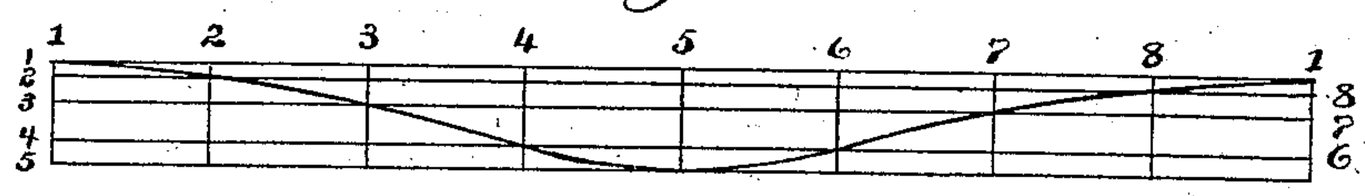
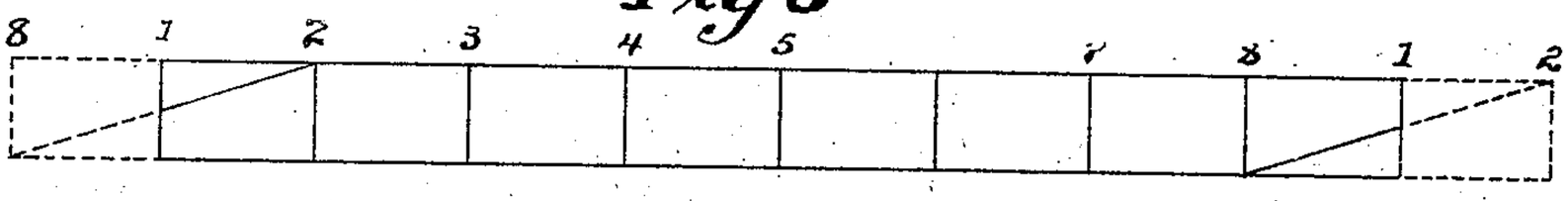



Fig 8




Witnesses

W. Everett Wade

C. A. Jarvis.

Inventor

F. H. Richards.

# UNITED STATES PATENT OFFICE.

FRANCIS H. RICHARDS, OF HARTFORD, CONNECTICUT.

## CARVING-MACHINE.

No. 842,422. Specification of Letters Patent. Patented Jan. 29, 1907.

Application filed April 8, 1902. Serial No. 101,888.

*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 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.

My invention consists in improved mechanism for actuating a plurality of tools at high speed to operate upon a plurality of stock members, improved means for feeding to said tools a plurality of stock members, and improved and compact structure, practical combination and mechanical organization for greatly increasing the output of a machine of this character.

It is highly desirable where a great quantity of stock is to be operated upon, and 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 to construct a machine capable of an increased output which will 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 plan view of a carving-machine embodying my invention; Fig. 2, a side elevation showing side wall and base broken away; Fig. 3, a partial section on line *x x* of Fig. 1; Fig. 4, a partial section on line *y y* of Fig. 1; Fig. 5, a detail in perspective of one of the feed-roll mechanisms; and Figs. 6, 7, and 8, respectively, time-charts of the movements of the tools having the greater travel, the tools having the lesser travel, and the stock-feed.

Referring to the drawings, the machine is mounted and assembled upon a box-like frame A. A stock-bed B is longitudinally mounted on the top of the frame A. The stock-bed B is provided with a plurality of parallel stock-guides 2, running longitudinally of said stock-bed. The stock-guides 2 are formed in the upper surface of the stock-bed B and are ordinarily rectangular in cross-section. I have shown three such stock-guides 2 set parallel to and having the same angular relation to the top of frame A. The stock-guides 2 are angularly inclined from the horizontal to allow of the operation of the tool-carrying beams, as hereinafter described. A shaft 3 is mounted longitudinally of the frame A and parallel with the stock-guides 2 in bearings 4 in said frame. The shaft 3 projects without the frame A, and a driving-pulley 5 is mounted upon its projecting portion. Upon that portion of shaft 3 lying entirely within the frame A are consecutively mounted from left to right (referring to Fig. 2) a spiral gear 6, an eccentric 7, and a crank 8.

Mounted in bearings 9 in the frame A above and at right angles to the shaft 3 is a shaft 10, carrying a spiral gear 11, meshing with spiral gear 6 on shaft 3. The spiral gears 6 and 11 being of equal diameter, the shaft 10 is driven at the same speed as the driving-shaft 3.

Referring to Fig. 4, the shaft 10 projects without the frame A at its left end, and upon its projecting portion is mounted a peripheral cam member 12. At either end of the frame A shafts 13 are mounted in bearings 14 in the stock-bed transversely of the stock-bed B. Each of the shafts 13 is provided with feed-rolls 15, one for each stock-guide, the periphery of which feed-rolls 15 extend slightly above the bed of their respective stock-guides through apertures in the stock-bed B. Mounted in spring-pressed bearings 16 on the stock-bed B, parallel with and directly above the respective shafts 13, are shafts 17. Upon each of the shafts 17 are mounted presser-rolls 18, one for each stock-guide, and which presser-rolls 18 are adapted to bear upon the stock at a point directly above the corresponding feed-roll 15, and having active peripheries of corresponding diameter to that of said feed-rolls 15. The shafts 17 respectively carry gears 19, respectively meshing with and driven by gears 20, respectively mounted on shafts 17. The gears 20 are each provided with an internal

rack 21, in which rack gears 22, one-quarter the diameter of said racks, mesh. The gears 22 are mounted upon shafts 23, journaled in bearings 24 on the frame A. Each of the shafts 23 carries a ratchet-wheel 25, the teeth of both of said ratchet-wheels being pitched in the same direction. Pivoted upon each of the shafts 23 is a rocking arm 26, carrying at one end a pawl 27, engaging the ratchet-wheel 25, and connected together at their other ends by a link-bar 28. The connection between the rocking arms 26, accomplished by the link-bar 28, is such that the rocking arms 26 will always remain substantially parallel. A connecting-rod 29 is pivoted at one of the joints between the link-bar and the rocking arms 26 and is bifurcated at its free end and embraces the projecting portion of the shaft 10 adjacent the peripheral cam 12, retained in such embrace by a collar 30. A roller 31, mounted upon a stud 32, fixed to the connecting-rod 29, is adapted to roll upon the periphery of the peripheral cam 12 and actuate said rod 29 in conformity with said cam. The connecting-rod 29 is retracted by a spring 33, causing the roller 31 to travel on the face of cam 12 and preventing the bifurcated portion of rod 29 from disengaging with the shaft 10.

The operation of the feed and presser roll mechanism is as follows: The rotation of driving-shaft 3 is imparted to shaft 10 through spiral gears 6 and 11 at an equal speed. The cam 12 is a one-quarter three-quarter cam—that is, it moves the connecting-rod 29 through the roller 31 forward during one-quarter revolution of the shaft 10, rocking the rocking arms 26, which, through the engagement of the ratchet-wheels 25 by the pawls 27, rotate the shafts 13 and the feed-rolls 15 thereon and the shafts 17, geared thereto and carrying presser-rolls 18, during said forward movement, while during the remaining three-quarters revolution of the shaft 10 the connecting-rod 29 and the rocking arms 26 are allowed to be retracted by the spring 33, the pawls 27 riding over the ratchet-wheels 25 and imparting no motion to the feed and presser rolls. The feed-rolls 15 are provided with toothed or roughened active peripheries to better grip the stock, and the presser rolls 18, moving in unison therewith, press the stock down upon said active peripheries.

Referring to Fig. 3, in upstanding ears 34 of the frame A a pivot-stud 35 is mounted parallel to the stock-guides 2. A pivot-stud 36 is mounted parallel to the stock-guides in upstanding ears on extensions 37 of the frame A and also lies in the same parallel plane to the stock-bed B as the pivot-stud 35. A pivot-stud 39 is similarly mounted in upstanding ears on extensions 38 and 56 of the frame A. Two arms 40 and 41 of exactly equal lengths between pivot centers are respectively pivoted to pivot-studs 35 and 39 and are each connected to a beam 42 by pivots 43 and 44, the distance between the centers of pivots 43 and 44 being exactly equal to that between the centers of pivot-studs 35 and 39. This construction renders the beam 42 translationally movable toward and away from the stock-guides 2 and at all times equidistant from the several stock-guides. The arm 40 is extended below the pivot-stud 35 and is connected by a connecting-rod 43 with the crank 8. The arms 40 and 41 are set so that at the center point of their oscillation produced by crank 8 they will be substantially perpendicular to the cut desired to be made by tools carried upon the beam 42. The beam 42 is provided with a multiple-tool bed 45, which depends therefrom and conforms somewhat closely to the cross-section of the stock-guides 2. The tool-bed 45 has a tool-face perpendicular to the stock-guides, and tool-clamps 46 are arranged thereon for holding the shanks of a series of tools 47. Each of the tools 47 is adapted to engage and incise a stock member lying in the corresponding stock-guide 2, substantially parallelly of one wall of the stock-guide 2 as the beam is rocked by the crank 8. All of the tools 47 incise the several stock members simultaneously and in the same degree. The arms 40 and 41 should be of such length that the oscillation necessarily given to them to produce the desired length of incision of the tools 47 will take place in an arc so closely approaching a straight line as to be almost imperceptible, and the tools 47 may be so formed as to admit of no disastrous results from this arc motion in making the incision. The tools 47 should remain within the peripheries of the stock about three-fourths of a revolution of the main shaft 3 and without one-fourth. Two arms 48 and 49 of exactly equal lengths between pivot centers are respectively pivoted to pivot-studs 35 and 36 and are each connected to a beam 50 by pivots 51 and 52, the distance between the centers of pivots 51 and 52 being exactly equal to that between the centers of pivot-studs 35 and 36. This construction renders the beam 50 translationally movable toward and away from the stock-guides 2 and at all times equidistant from the several stock-guides. The arm 48 is extended below the pivot-stud 35 and is connected by eccentric-rod 53 and straps 54 with the eccentric 7. The arms 48 and 49 are set so that at the center point of their oscillation produced by eccentric 7 they will be substantially perpendicular to the cut desired to be made by tools carried upon the beam 50.

I have seen fit to operate the beam 50 by an eccentric, as the throw required in this particular machine is very short, being much less than that required in beam 42; other-

wise the beams 42 and 50 are actuated in substantially the same manner. The beam 50 carries a plurality of tools 55, arranged in like manner, but at an opposing angle to the tools 47 on the beam 42. The paths of the tools 47 and 55 cross each other at right angles in the particular machine illustrated, but may have any angulation, according to the particular character of the stock to be operated upon. The crank 8 and eccentric 7 are relatively set upon the shaft 3 to cause the tools to simultaneously move within the profile of the stock during three-quarters of a revolution of the drive-shaft and simultaneously remain entirely without said profile during one-quarter revolution of the drive-shaft. The tools 47 make simultaneous incisions in each of the stock members, while at the same time the tools 55 simultaneously make meeting incisions in each stock member, registering with some previously-made incision of the tools 47, thereby cutting out a chip and forming an ornamental character upon each of the stock members. The cam 12 is set upon the shaft 10 to actuate the feed-rolls 16 during that quarter-revolution of the drive-shaft during which the tools 47 and 55 are entirely without the profile of the stock members. These relative movements are clearly shown in Figs. 6, 7, and 8 taken together, in which the curves of movement of these several parts are illustrated.

It will be observed that the tools are set parallel to one another on a translationally-moving beam mounted transversely of a plurality of parallel stock-guides lying in a single plane parallel to said beam. It will also be observed that the translational movements given the respective beams have convergent directions and that the tools mounted on the respective beams are positioned thereon inclined substantially in said directions, depending below the beams, with their cutting edges lying in the lines of intersection of the planes of their movement at the extreme limit of their downward motion.

The cutter-carrying beams, their supporting connections, and the frame form articulated parallelograms. In practice it should be desired to maintain the parallelism of these parts; but I wish to point out and expressly state that deviation from the exact parallelism of these parts which might arise from incorrect construction or brought about by any particular shop practice which would produce a practically operative machine would not be a departure from the spirit of my invention and that the terms denoting parallelism used in this specification and in the claims are used in a sense broadly covering such deviations from the theoretical parallelism and would not render the machine inoperative.

I have provided a hand-wheel on a projecting portion of the shaft 10, whereby the moving parts of the machine may be operated to facilitate the adjustment of the several parts.

The stock-bed B is bolted to the frame A and is removable and may be substituted by other stock-beds, having stock-guides 2, conforming to differently-configured stock. So, also, may the tool-beds 45 be substituted by others adapted to different work. When differently-configured stock is to be operated upon, the feed-rolls and pressure-rolls should also be substituted by others adapted for the particular class of work. In the claims where I have used the term "crank" I desire that the same may also include that form usually known as an "eccentric."

Having described my invention, I claim—

1. In a carving-machine, the combination of a plurality of parallel carriages, means for moving said carriages to and fro in different directions, corresponding cutting elements mounted upon said carriages, the individual cutting elements upon each carriage depending from and being directed in line with the movement of said carriages, and a plurality of stock-guides placed side by side transversely of and beneath said carriages.

2. In a carving-machine, the combination of a plurality of carriages, means for moving said carriages to and fro in different directions, a plurality of depending carving-tools mounted upon each carriage and directed in line with the path of motion thereof, the tools upon one carriage being directed substantially at right angles to those upon the other carriage, and a plurality of stock-guides placed side by side transversely of and beneath said carriage.

3. In a carving-machine, the combination of stock-feeding means, a plurality of parallel stock-guides, a cutter-carriage mounted transversely of said stock-guides, means for moving said carriage toward and away from said stock-guides, and a plurality of carving-tools depending from said cutter-carriage and directed in line with the path of movement of said carriage, one tool for each stock-guide.

4. In a carving-machine, an articulated parallelogram having a stationary base and a movable upper side, in combination with a plurality of cutting elements mounted on and directed in line with the movement of said upper side, a plurality of stock-guides placed transversely to said parallelogram, stock-feeding means, and means connected to said stock-feeding means for actuating the movable members of said parallelogram.

5. In a carving-machine, a plurality of flanking articulated parallelograms having parallel stationary bases and countermovable upper sides, in combination with cutting elements carried by said upper sides and directed in line with the paths of movement of their respective carriers, a stock-guide placed

transversely to said parallelograms, stock-feeding means, and means connected to said stock-feeding means for actuating the movable members of said parallelograms.

6. In a carving-machine, a plurality of flanking articulated parallelograms having parallel stationary bases and counter-oscillatable upper sides, in combination with corresponding series of cutting elements carried by said upper sides and directed in line with the path of oscillation of their respective carriers, a plurality of stock-guides placed transversely to said parallelogram, stock-feeding means associated with each stock-guide, and means connected to said stock-feeding means for actuating the movable members of said parallelogram.

7. In a carving-machine, a plurality of parallel stock-guides disposed in a common plane, and a plurality of flanking articulated parallelograms surrounding said stock-guides and having parallel bases stationarily mounted in a plane parallel to that of said stock-guides and counter-oscillatable cutter-carrying upper sides.

8. In a carving-machine, the plurality of parallel stock-guides disposed in a common plane; a plurality of flanking articulated parallelograms surrounding said stock-guides, and having parallel bases stationarily mounted in a plane parallel to that of said stock-guides and counter-oscillatable cutter-carrying upper sides; and operating means for imparting an arcal movement to said upper sides alternately toward and away from said stock-guides.

9. In a carving-machine, an articulated parallelogram having a stationary base, a tool-carrying upper side, and an end extending below its point of articulation with the base, in combination with a shaft perpendicularly mounted to said base, a crank upon said shaft, and a connecting-rod connecting said crank and the extended portion of said end with a plurality of stock-guides placed transversely to said parallelogram, stock-feeding means, and means to actuate the same and a connection therewith for actuating the movable members of said parallelogram.

10. In a carving-machine, an articulated parallelogram having a stationary base, a tool-carrying upper side, and an end extended below its point of articulation with the base, in combination with a shaft perpendicularly mounted to said base, an eccentric on said shaft, an eccentric-rod connecting said eccentric and the extended portion of said end, a plurality of stock-guides placed transversely to said parallelogram, and stock-feeding means connected to said shaft.

11. In a carving-machine, a plurality of flanking articulated parallelograms having parallel stationary bases, tool-carrying upper sides and ends extended below their points of articulation with their bases, in combination with a shaft perpendicularly mounted to said bases, crank members on said shaft, rods connecting said extended portions of said ends to said crank members, a plurality of stock-guides placed transversely to said parallelograms, and stock-feeding means connected to said shaft.

12. In a carving-machine, a plurality of flanking articulated parallelograms having parallel stationary bases, tool-carrying upper sides and ends extended below their points of articulation with their respective bases, in combination with a shaft perpendicularly mounted to said bases, crank members on said shaft, rods connecting said extended portions of said ends and said crank members, an intermittent feed mechanism actuated from said shaft, and a plurality of stock-guides placed transversely to said parallelograms.

13. In a carving-machine, a plurality of parallel cutter-carriages movable to and fro in converging directions, corresponding series of cutting members upon said carriages, and directed in line with the movements thereof, a feed mechanism and means for actuating said carriages, and for operating said feed mechanism to effect the feed of the stock during the withdrawal of the cutting members from the stock.

14. In a carving-machine, the combination of a plurality of independent stock-supporters, a plurality of sets of carving-tools each plurality mounted fast upon the same actuating member, one set associated with each of said supporters and the carving-tools in each set being mounted to penetrate the stock from different directions, means for operating said tools, and feeding means.

15. A duplex carving-machine comprising a set of stock supporting and feeding means; carving-tools mounted to penetrate in different directions the stock controlled by said set; a second set of stock supporting and feeding means; carving-tools mounted to penetrate in different directions the stock controlled by said second set; and means for operating said tools; each of said sets of tools being mounted fast one relatively to the other.

16. In a carving-machine, the combination of a plurality of independent supporters having a stepwise relation, a plurality of sets of carving-tools, one set associated with each of said supporters and the carving-tools in each set being mounted to penetrate the stock from different directions, means for operating said tools, and feeding means.

17. In a carving-machine, the combination of a plurality of independent stock-guides having a stepwise relation, a plurality of carving-tools, one at each of said guides, a single member whereby said tools are operated, a second plurality of carving-tools, one

at each of said guides and mounted to penetrate the stock in a different direction from the first plurality, a single member whereby said second plurality is operated, and means associated with each of said stock-guides for feeding the stock.

18. In a carving-machine, the combination with a plurality of independent stock-guides, of a plurality of tool-carriers each extending transversely of said guides, means upon each tool-carrier for carrying a tool at each of said guides, the respective tools of one carrier each having a complemental relation to the respective tools of another carrier, and the cut of one tool being supplemental to that of its complementary tool, means for operating said tool-carriers, and means associated with each of said stock-guides for feeding the stock.

19. In a carving-machine, the combination with a plurality of independent stock-guides, of a plurality of tool-carriers each extending transversely of said guides, means upon each tool-carrier for carrying a tool at each of said guides, means for operating said tool-carriers so that the tools carried by one thereof may penetrate the stock in a different direction from the tools carried by the other thereof, and means associated with each of said stock-guides for feeding the stock.

20. In a carving-machine, the combination with a plurality of independent stock-supporters, of a tool-carrier extending across all of said supporters, means for supporting said tool-carrier at its ends and reciprocatably across said supporters and toward and from the same, tools mounted upon said carrier between its ends, one tool at each stock-supporter, means for reciprocating said carrier crosswise of said supporters to cause the tools to penetrate and leave the stock, and feeding means.

21. In a carving-machine, the combination with a plurality of independent stock-guides having a stepwise relation, of a plurality of tool-carriers extending side by side across the stock-guides, means for supporting each tool-carrier at its ends, tools mounted upon said carriers between their ends, one tool being mounted upon each carrier at each stock-guide, and the tools upon one carrier extending transversely with relation to the tools upon the other carrier, means for moving said carriers to and fro, one in a direction transverse to the other, and stock-feeding means.

22. In a carving-machine, the combination of a plurality of stock-guides placed side by side in a row, the sides of the beds being oblique to the direction of the row, a tool-carrier extending across said guides, obliquely-directed tools upon said carrier, one tool associated with each guide, means for moving said carrier obliquely, coöperating tools mounted to penetrate the stock in a different direction, and means for feeding the stock.

23. In a carving-machine, the combination of a plurality of stock-guides placed side by side in a row, the sides of the guides being oblique to the direction of the row, a plurality of tool-carriers extending side by side across said guides, obliquely-directed tools upon each carrier, one tool upon each carrier being associated with each guide and the tools upon one carrier being directed obliquely with relation to the tools upon the other carrier, means for moving said carriers to and fro substantially in the direction in which their tools are directed, and means for feeding the stock.

24. In a carving-machine, the combination of a plurality of independent stock-guides, a shaft extending transversely of said guides, a plurality of stock-feeding rolls upon said shaft, one roll for each guide, means for rotating said shaft, carving-tools mounted in position to operate in transverse directions upon the stock supported upon said guides, and means reciprocatable transversely of said support and toward and from the same for carrying and operating said carving-tools in unison.

25. In a carving-machine, the combination of a plurality of independent stock-guides, a shaft extending transversely of said guides, a plurality of stock-feeding rolls upon said shaft, one roll for each guide, a roll opposite to each of said rolls, means positively connecting all of said rolls, means for rotating said shaft, positively-connected carving-tools mounted in position to operate upon the stock supported upon the different guides, and means connected to said shaft-rotating means for operating said carving-tools.

26. In a carving-machine, the combination of a plurality of independent stock-guides having stepwise relation, a group of carving-tools mounted in position to operate in different directions upon the stock supported upon the different guides, means for operating said tools, a shaft extending transversely of said guides at each side of said group of tools, a plurality of stock-feeding rolls upon each of said shafts, one roll opposite each guide, and means for rotating said shafts.

27. The combination of a plurality of stock-guides having their supporting-surfaces obliquely disposed relative to their transverse line, stock-feeding rolls, a plurality of tool-carriers each having obliquely-directed tools, the tools upon one carrier being directed angularly with relation to the tools upon the other carrier, and means for moving said carriers obliquely.

28. A carving-machine comprising means of guiding and feeding a plurality of strips of stock, side by side, a number of sets of carving-tools having complemental tools for

each of the several strips, means for rigidly connecting all said tools of a set together and means for actuating the same, for simultaneously carving repeat ornaments upon the several strips the respective tools of one carrier each having a complemental relation to the respective tools of another carrier, and the cut of one tool being supplemental to that of its complementary tool.

29. In a carving-machine, the combination with a plurality of stock-guides, of a beam extending transversely thereof, tools mounted upon said beam, one at each stock-guide, pivoted arms whereon said beam is mounted, means for operating said arms, and stock-feeding means.

30. In a carving-machine, the combination with stock-supporting means of a plurality of beams, a tool mounted upon each beam, said tools being directed angularly with reference to each other, pivoted arms whereon each beam is movable substantially in the direction in which its tool is directed, means for operating said arms and beams, and feeding means.

31. In a carving-machine, the combination with a plurality of stock-guides, of a plurality of beams, a tool mounted upon each beam at each stock-guide, the tools upon one beam being directed angularly with reference to the tools upon the other beam, pivoted arms whereon each beam is movable substantially in the direction in which its tools are directed, means for operating said arms and beams, and stock-feeding means.

32. In a carving-machine, the combination with a plurality of stock-guides, of a plurality of beams, a tool mounted upon each beam at each stock-guide, the tools upon one beam being directed angularly with reference to the tools upon the other beam, pivoted arms upon which each beam is movable substantially in the direction in which its tools are directed, means for operating said arms and beams, a shaft extending transversely of said stock-guides, a plurality of stock-feeding rolls upon said shaft, one roll for each stock-guide, and means for rotating said shaft.

33. In a carving-machine, the combination with a plurality of independent stock-guides, of a plurality of beams, a tool mounted upon each beam at each stock-guide, the tools upon one beam being directed angularly with reference to the tools upon the other beam, pivoted arms upon which each beam is movable substantially in the direction in which its tools are directed, means for operating said arms and beams, a shaft extending transversely of said guides at each side of said plurality of beams, a plurality of stock-feeding rolls upon each of said shafts, one roll opposite each guide, and means for rotating said shafts.

34. In a carving-machine, the combination with a plurality of stock-guides, of a plurality of beams, a tool mounted upon each beam at each stock-guide, the tools upon one beam being directed angularly with reference to the tools upon the other beam, pivoted arms upon which each beam is movable substantially in the direction in which its tools are directed, means for operating said arms and beams, a pair of coupled shafts at each side of said plurality of beams and extending transversely of said guides, one shaft in each pair being above the guides and the other below the guides, rolls upon each of said shafts adapted to engage the upper and lower sides of the stock, and means for rotating said shafts.

35. In a carving-machine, the combination of a plurality of tool-carriers, a number of sets of tools upon each carrier arranged in tandem and secured in rigid relation, one with the other and means for moving each carrier transversely of the stock substantially in the direction in which its tools are directed for carving ornaments in repeat upon each portion of stock in unison the respective tools of one carrier each having a complemental relation to the respective tools of another carrier, and the cut of one tool being supplemental to that of its complementary tool.

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Witnesses:
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