F. H. RICHARDS.

CARVING MACHINE.

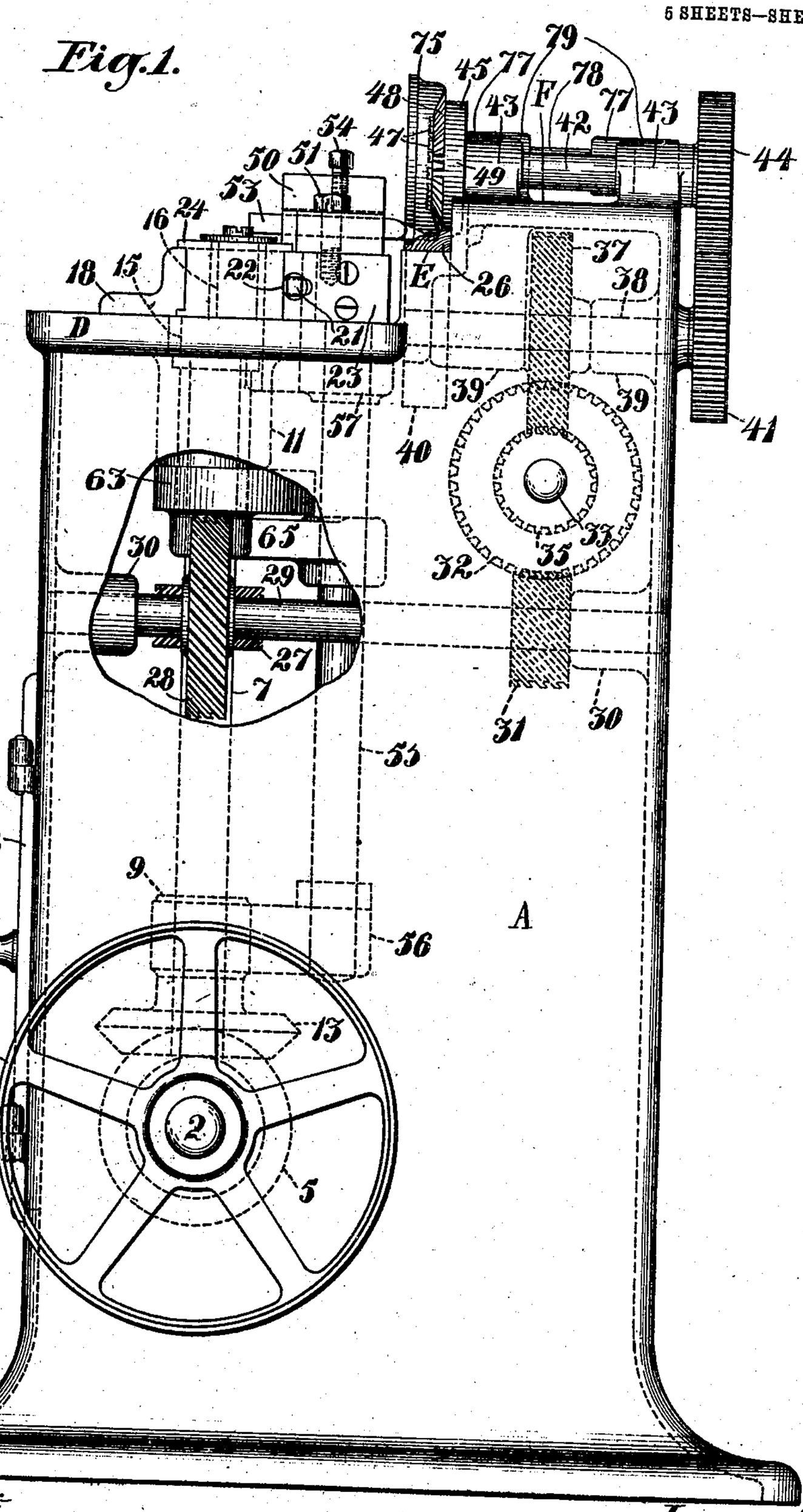
APPLICATION FILED APR. 25, 1902.

919,769.

Patented Apr. 27, 1909.

5 SHEETS—SHEET 1.

Fig. 1.



Witnesses:-

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J. V. Jacob.

Inventor:

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5 SHEETS—SHEET 2.

Fig. 2.

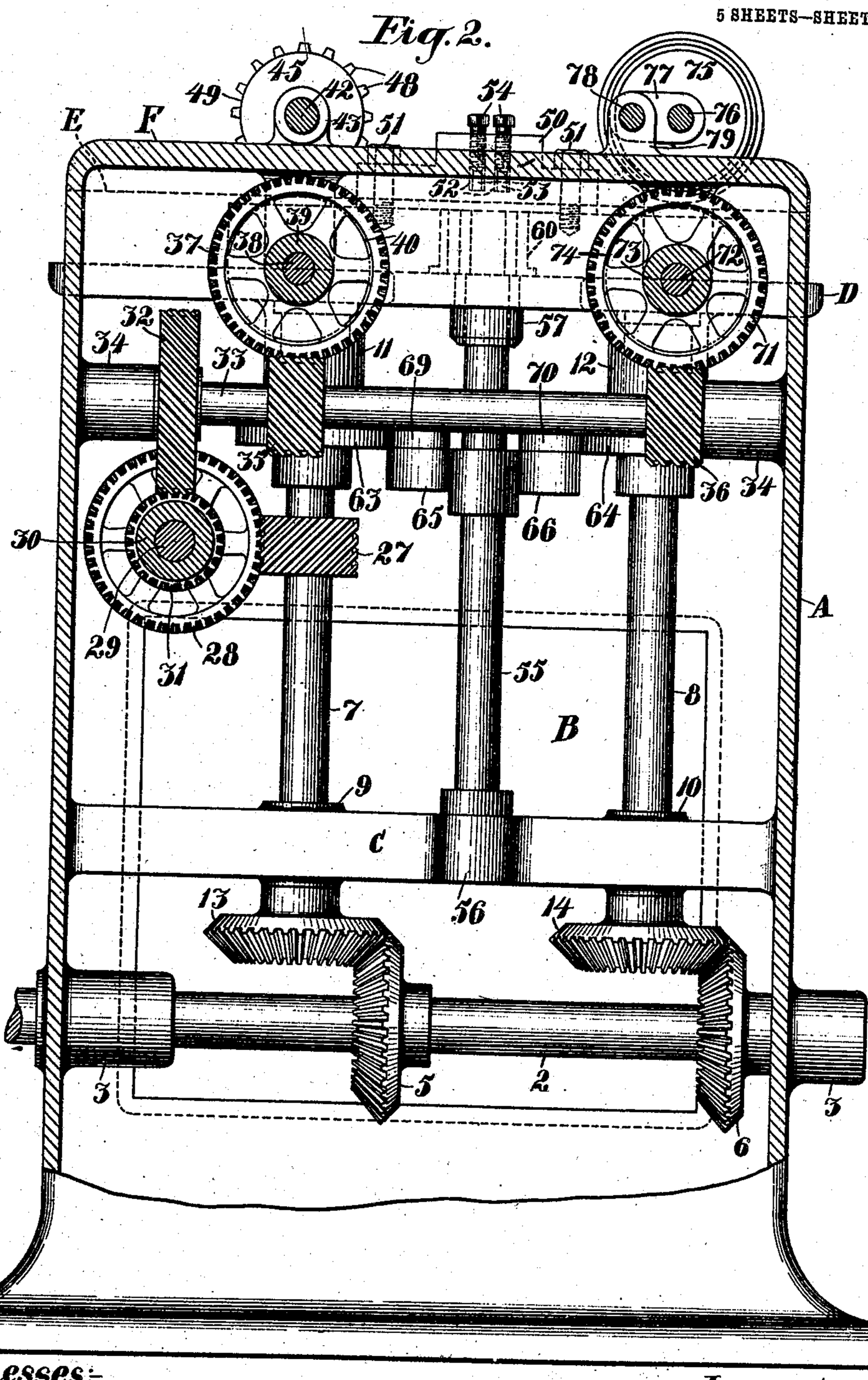

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Fig. 4.

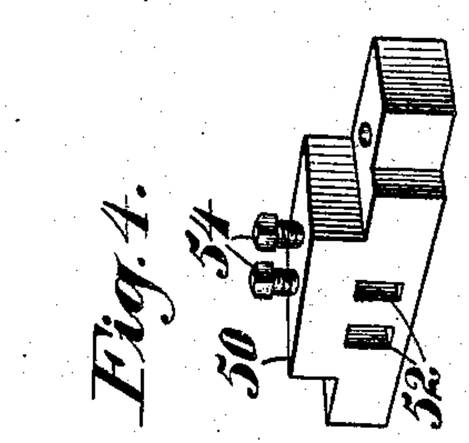


Fig. 5.

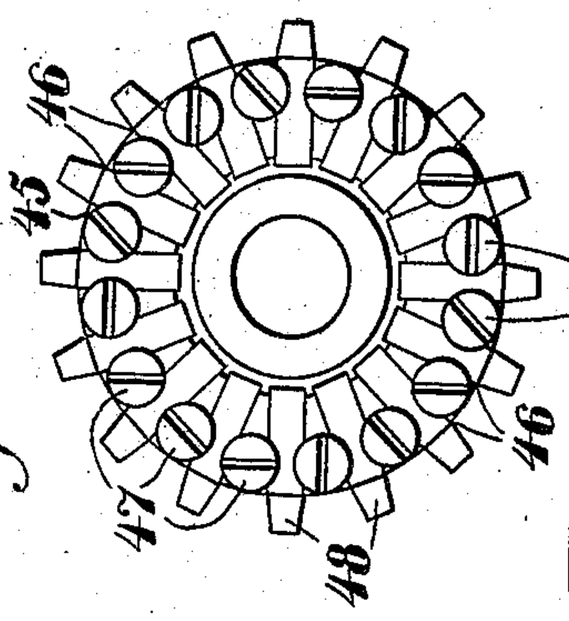


Fig. 6.

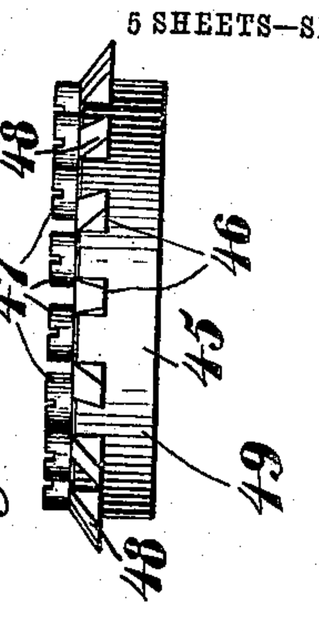
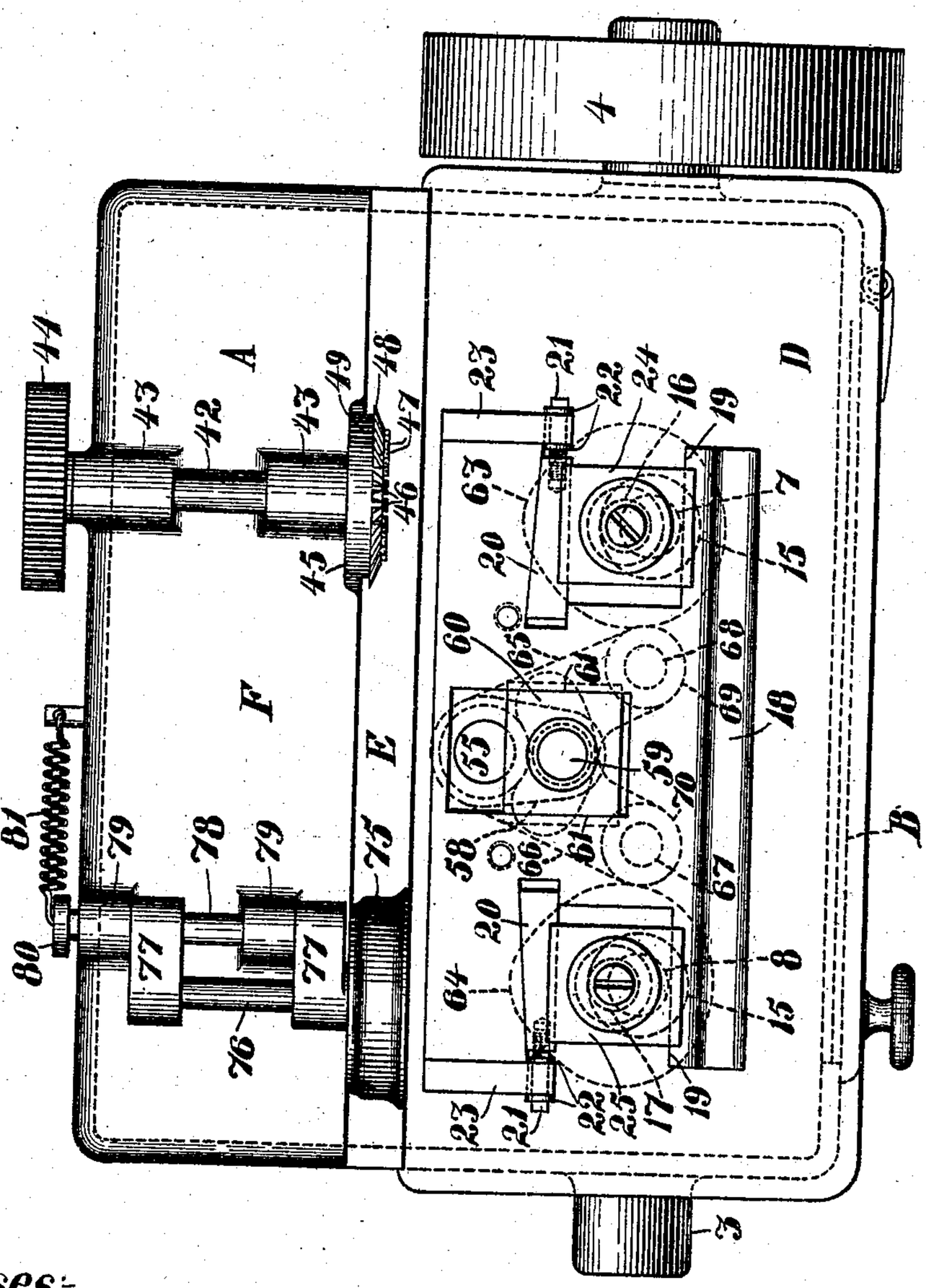


Fig. 3.



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5 SHEETS—SHEET 4.

Fig. 7.

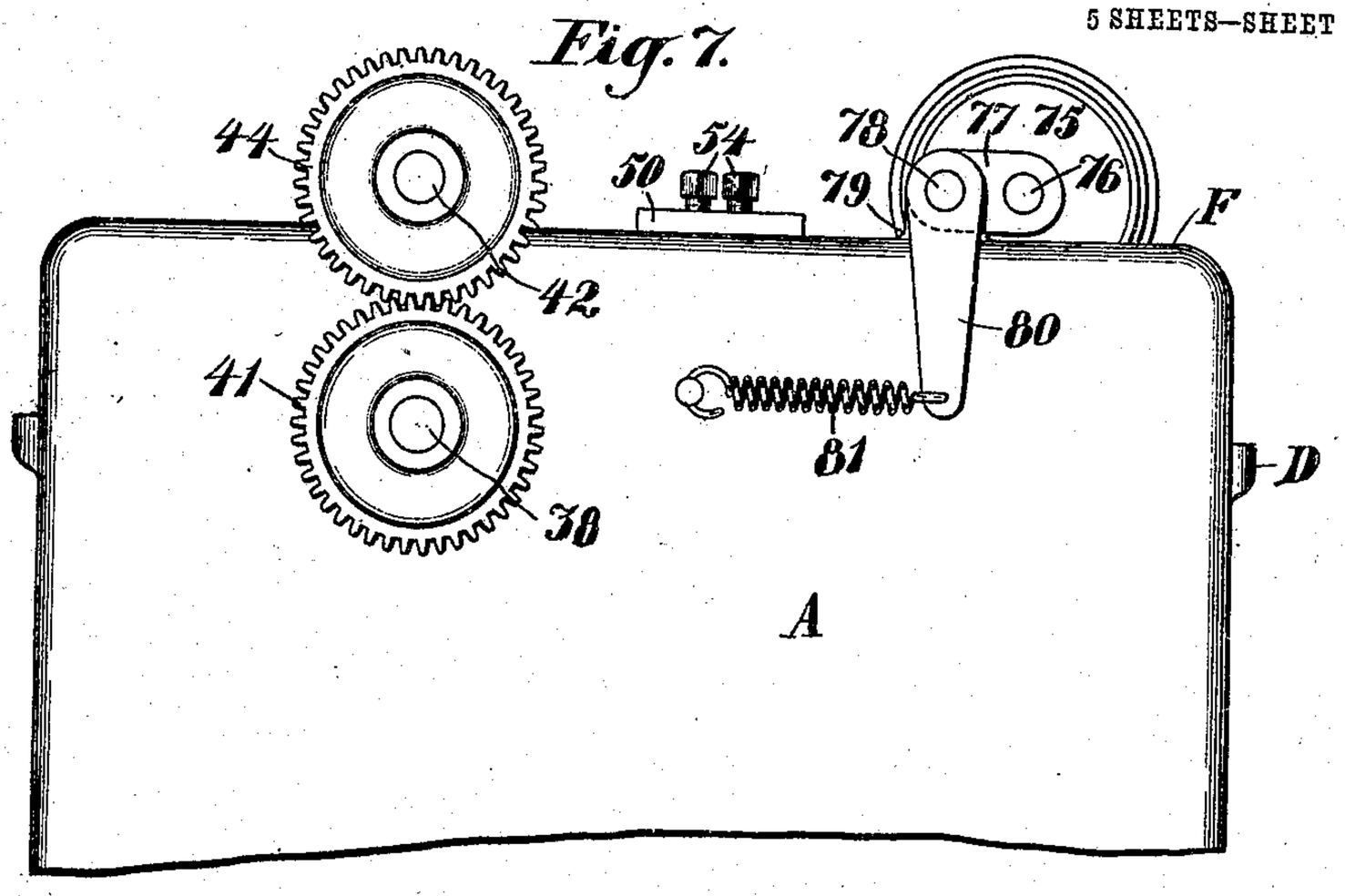
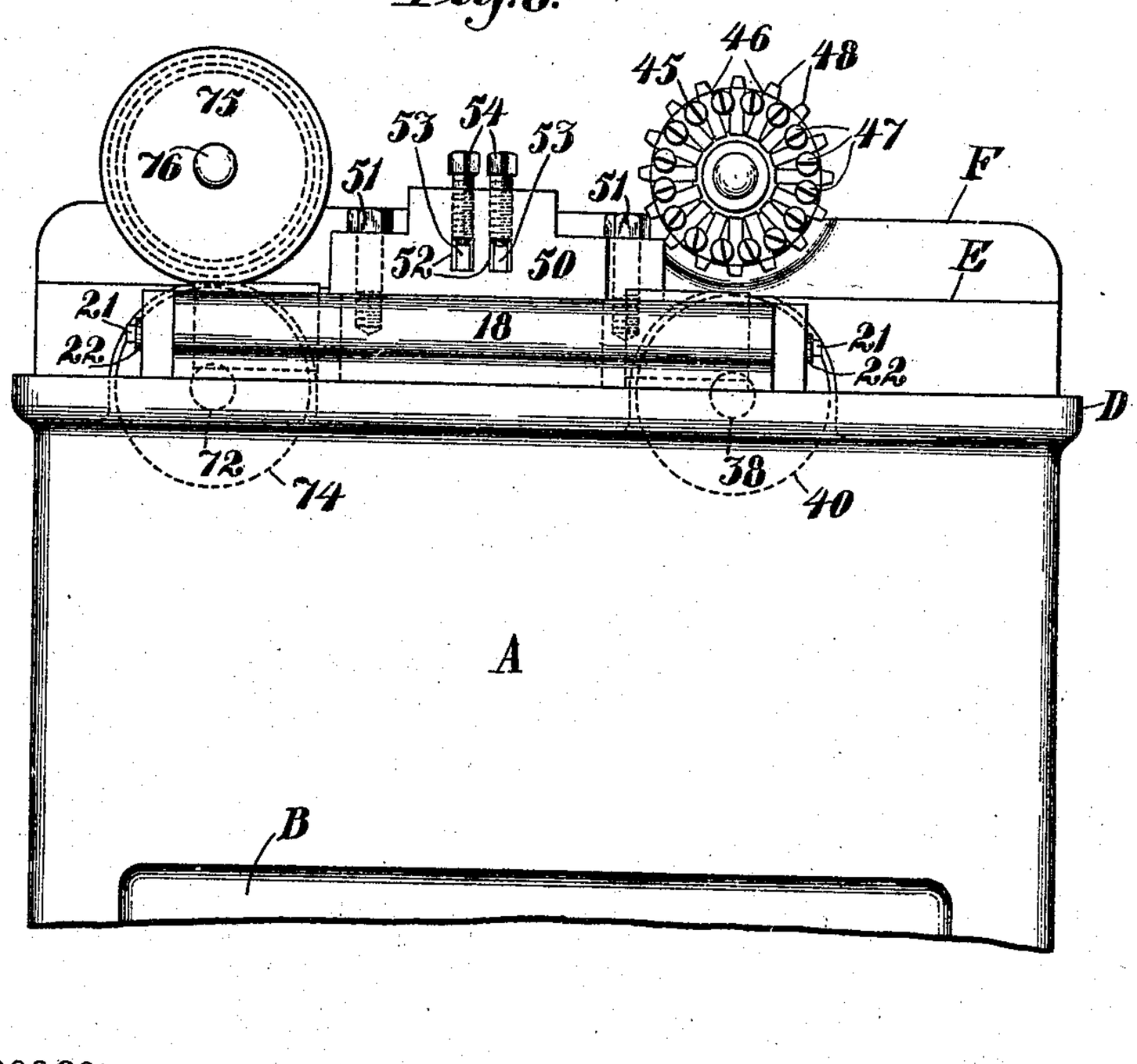


Fig. 8.



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5 SHEETS—SHEET 5.

Fig. 9.

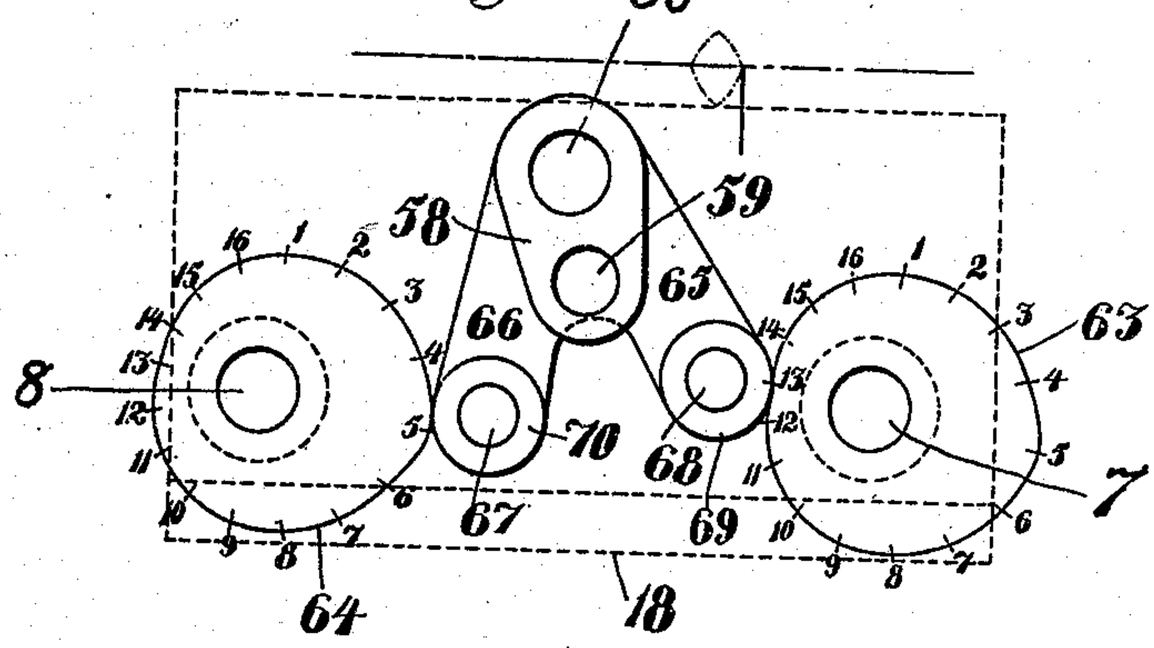


Fig. 10.

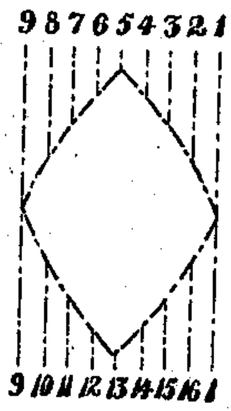


Fig. 11.

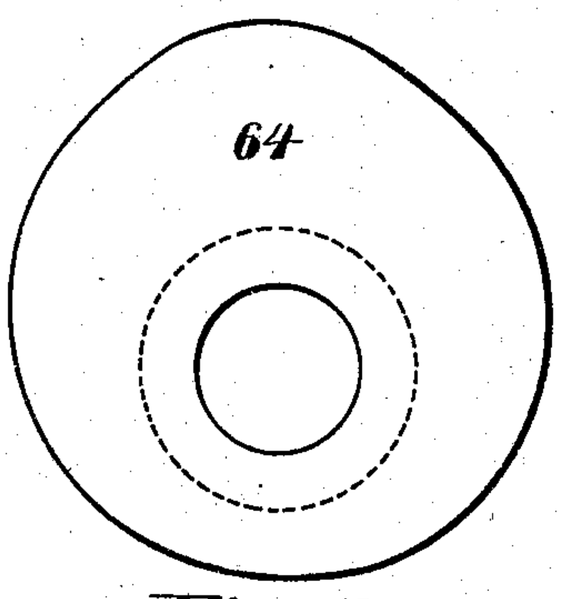


Fig. 12.

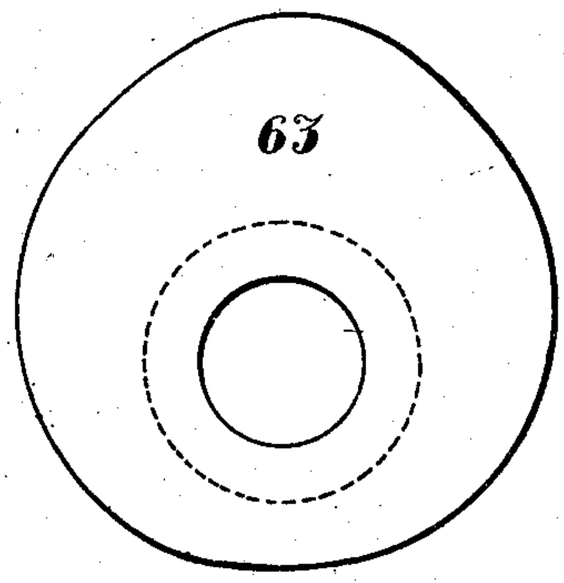


Fig. 13.

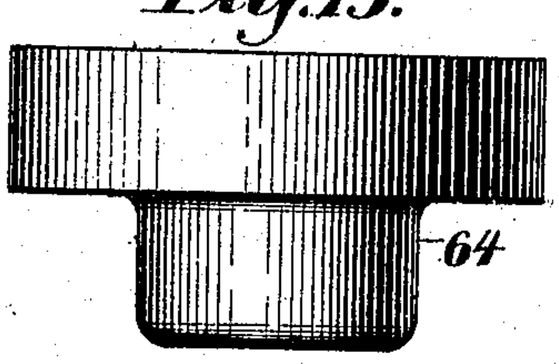
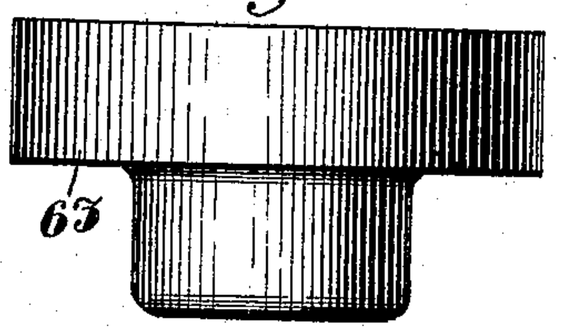


Fig. 14.



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UNITED STATES PATENT OFFICE.

FRANCIS H. RICHARDS, OF HARTFORD, CONNECTICUT.

CARVING-MACHINE.

No. 919,769. Specification of Letters Patent. Patented April 27, 1909.

Application filed April 25, 1902. Serial No. 104,591.

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.

My invention pertains to machines for carving repeat ornaments or a repeating series of ornaments on wood, moldings or the like, and more particularly relates to machines of the above described class in which a plurality of cutting elements are caused to make meeting incisions in the stock to form the desired configuration.

This invention consists in novel and useful mechanical organizations whereby a number of the tools are carried with the uniformly moving stock during their operation upon the stock and in which such a construction is combined with a rotary cutter and feed mechanism in a compact device of practical design and mechanical perfection embodying structural characteristics peculiarly adapted to the ordinary environment of a machine of this class, and further consists in novel and useful elements and combinations of elements as hereinafter set forth and claimed.

Some of the objects of my invention are to provide a uniform continuous-feed carving machine; to provide mechanism whereby the tools may be accurately operated in conjunction with the feed and coöperate to a nicety; to provide a mechanical structure of this class which will be simple, compact and capable of operation at high speeds without deleterious results; and to provide such a machine wherein that portion of the mechanism subject to corruption or destruction or dangerous to operatives, shall be protected and preserved or guarded as the case requires.

I have illustrated one embodiment of my invention in a carving machine in the drawings forming part of this specification, in which like reference characters refer to like parts throughout the several views.

Figure 1 is a front elevation showing a portion of the front wall broken away; Fig. 2, a side elevation with side wall cut out; Fig. 3, a plan view with tool post removed; Fig. 4 a detail in perspective of tool post; Fig. 5, a side elevation of rotary cutter; Fig. 6, an edge view of same; Fig. 7, a right side elevation of upper portion of machine; Fig. 8, a left side elevation of upper portion of machine; Fig. 9, a diagrammatic plan view of the operating mechanism of the tool carriage; Fig. 10 a diagram of the path of the translationally moving tool; Figs. 11 and 12, plan views of the carriage actuating cams and Figs. 13 and 14, details in elevation of said cams.

Referring to the drawings, the machine there illustrated is supported by and assembled upon a box-like frame A, access to the interior of which is had through an opening in one side wall, which opening is closed by a door B hinged upon said frame A. A horizontal driving shaft 2 is mounted longitudinally of the machine in bearings 3, 3, in the walls of frame A projecting without said frame and provided upon its projecting portion with a main driving pulley 4. Miter gears 5 and 6 are shown mounted fast upon shaft 2 and for utilizing the covering advantage of the frame these miter gears are shown upon that portion of the shaft 2 lying entirely within the frame A.

A beam C is cast or otherwise secured in the frame A, parallel with and directly above the shaft 2, said beam being supported by the walls of the frame A at either end in the particular construction illustrated. Vertically disposed shafts 7 and 8 are respectively mounted in bearings 9 and 10 in the beam C, and supported respectively near their upper ends in journal bearings 11 and 12 in the table D forming a portion of the top of frame A. The vertical shafts 7 and 8 are respectively provided at their lower extremities with fast miter gears 13 and 14 respectively meshing with miter gears 5 and 6 on shaft 2, in the present showing driving shafts 7 and 8 at the same speed as that of shaft 2. The vertical shafts 7 and 8 each carry a crank disk 15 which respectively carry wrist pins 16 and 17, having identical throws and similarly set to produce synchronous action.

A tool carriage 18 lies flat upon the table D and is recessed at each end, the said end recesses each being provided on one side, lengthwise of the tool carriage 18, with a guide 19 and upon its opposite side with an inclined surface for engagement of the in-

clined surface of a wedge gib 20 which also serves as a guide, it being provided with a guide surface lying parallel with the guide 19. Adjustment screws 21 provided with flanges 22 grasping brackets 23 on the carriage 18 and threaded in the wedge gibs 20 effect the movement of the gibs upon said inclined surface to increase or decrease the distance between the guide surfaces of the gibs and the guides 19, said guide surfaces and guides 19 the while maintaining their parallelism.

Bearing blocks 24 and 25 are grooved on opposite edges to engage and slide upon the guides 19 and the guide surfaces of the gibs 20 in the end recesses of the tool carriage 18, or more properly speaking the tool carriage 18 may be slid longitudinally upon the table D restricted laterally by the bearing of the guides 19 and gibs 20 against the bearing blocks 24 and 25.

The bearing blocks 24 and 25 are in the present instance provided with central vertical bearings which respectively accommodate the wrist pins 16 and 17.

It will be remembered that the wrist pins 16 and 17 are set at the same angle and carried synchronously by the crank disks 15 on the shafts 7 and 8 and such being the case, the bearing blocks actuated by said wrist pins give the bearing blocks 24 and 25 a lateral translational movement. Owing to the longitudinal play of the bearing blocks 24 and 25 in the end recesses of the tool carriage 18 it need not move longitudinally, and may be moved longitudinally irrespective of the action of the bearing blocks 24 and 25 while shifting it laterally.

Departing for the moment from the mechanism just described, the top of frame A is shown raised along one side of the table D; and in said raised portion is formed a stock-guide E parallel with the table D and the plane of mounting of the shafts 7 and 8. In this stock-guide E in Fig. 1, I have shown in section a piece of molding stock 26. The floor of stock guide E is positioned somewhere near the level of the top face of the carriage 18, depending more or less upon the form of the particular conformation of the stock to be operated upon. The top of the frame A is again raised above the stock guide E partly in forming the side wall of said stock guide and forms what I may call a platform F.

Referring to the construction illustrated in Fig. 2, a spiral gear 27 is mounted fast upon the shaft 7 and meshes with and drives a spiral gear 28, mounted fast on a shaft 29, mounted in bearings 30 in the walls of the frame A, in the relation of one revolution of the shaft 29 to two revolutions of the shaft 7. A spiral gear 31 mounted fast on the shaft 29 meshes with and drives a spiral gear 32, mounted fast on a shaft 33 mounted in bearings 34 in the walls of the frame A, in the relation of one revolution of the shaft 33 to two revolutions of the shaft 29. The shaft 33 is mounted longitudinally of the frame A parallel to the table D and stock guide E. The shaft 33 carries two fast spiral gears 35 and 36. The spiral gear 35 meshes with and drives a spiral gear 37 mounted fast on a shaft 38 mounted in bearings 39 in the frame A. The shaft 38 is mounted perpendicularly of the stock guide E and parallel to the table D and extends without the frame A at its right hand end (see Fig. 1). Upon the projecting portion of shaft 38 is mounted fast a gear 41. A feed roll 40 is mounted on the shaft 38, its periphery extending through the stock guide E, which is cut away for said roll, and slightly above the floor of the stock guide to engage the stock 26. Directly above the shaft 38 and without the frame A, a shaft 42 is mounted in bearings 43 upstanding from the platform F. The shaft 42 projects at its right hand end (see Fig. 1), and is provided upon its projecting portion with a gear 44 meshing with and driven from gear 41 on shaft 38. The shaft 42 also projects at its left hand end (see Fig. 1), over the stock guide E and carries a rotary cutter head 45. The rotary cutter head 45 consists of a solid annulus of metal (see Figs. 5 and 6) having radial tool slots 46 upon one face and flange headed set screws 47 threaded therein between and equidistant from each of said tool slots. Tools 48, here illustrated as knives of suitable formation, are secured in the radial slots 46 by the overlapping flanges of the heads of the screws 47, the head of each set screw bearing upon and clamping a tool upon either side. Therefore each tool is secured by two of the screw heads, and if a tool is desired to be removed for grinding or other reason, the set screws at either side of it are loosened allowing it to be adjusted or removed while the adjacent tools upon either side are not disturbed but still held securely by one set screw each. A portion 49 of the periphery of the solid annulus of the head 45 is conformed to the surface of the stock which it will engage and serves in a measure as a presser roll adjacent the tools 48. The tools 48 make short or shallow vertical incisions in the stock 26. A shaft 42 makes one-eighth of a revolution to one revolution of the driving shaft 2 and sixteen tools 48 being disposed about the periphery of cutter head 45, two of said tools will engage the stock during one revolution of the driving shaft 2.

Upon the tool carriage 18 I mount a tool post 50, (see Figs. 3, 4 and 8) securable to the said carriage by bolts 51 and leaving two tool slots 52 in which two tools 53, here illustrated as knives of a suitable formation are

secured by set screws 54 preferably disalined to give more room for the application of a wrench thereto. This number of tools is employed to harmonize with the other parts of the mechanism herein illustrated.

The action of the tool carriage 18 laterally carries the tools 53 into the stock, making incisions longer than those of tools 48, and withdraws said tools during each revolution of the drive shaft 2.

The feed is continuous and uniform and in order to cause the tools 53 to continuously register with the incisions made or to be made by the tools 48 to make meeting incisions therewith, that is incisions coöperative to complete a single cut, it is necessary to give the carriage 18 a longitudinal uniform movement in the direction of the feed at the same velocity as said feed during the time that the tools 53 are within the profile of the stock. In the machine illustrated I have accomplished a travel of the carriage 18 with the stock equal in duration with the return movement thereof. If the carriage 18 were carried longitudinally as well as laterally by the wrist pins 16 and 17 the tools 53 would travel at varying speeds with relation to the stock guide E and as the stock is fed uniformly it is necessary to give the carriage 18 a uniform movement. This I accomplish in the present illustration by the following mechanism: A shaft 55 is mounted in a bearing 56 in the beam C and a bearing 57 in the table D parallelly of the shafts 7 and 8. The shaft 55 carries at its upper end a crank 58 having a wrist pin 59. The wrist pin 59 is embraced by a bearing block 60 which is grooved to slide laterally of the carriage 18 in guides 61 in the walls of a recess in the central portion of the carriage 18. An oscillating movement in the shaft 55 through the crank 58, wrist pin 59 and block 60 gives the carriage 18 a longitudinal movement and the slidability of the block 60 laterally of the carriage 18 avoids any difficulty arising from the arcal movement of wrist pin 59 and also allows of further lateral movement of the carriage 18 without interference with its longitudinal movement.

An oscillating movement is imparted to the shaft 55 which will give the carriage 18 a uniform longitudinal movement at the velocity of the feed by the following means: Upon shafts 7 and 8 are respectively mounted peripheral cams 63 and 64 which are complementary and of the same size and shape, being, however, reversely mounted upon said shafts. The cams 63 and 64 being of the same size and shape can be made from the same pattern or machine, the only difference being the disposition of the hubs upon opposite sides thereof. Two arms 65 and 66 preferably cast in one are rigidly mounted on the shaft 55 and carry studs 67 and 68 projecting upward from their extremities. Loose rollers 69 and 70 are mounted on the studs 67 and 68 and respectively travel on the faces of cams 63 and 64. The synchronous rotation of shafts 7 and 8 produces a longitudinal reciprocation of the carriage 18 by the cams 63 and 64, the shaft 55, rollers 69 and 70, crank 58, and wrist pin 59 concurrently with a lateral reciprocation of said carriage by crank disks 15 and wrist pins 16 and 17 which give the cutting edges of the tools 53 a path approximating a diamond, shown in Figs. 9 and 10. The vertical lines in Fig. 10 and the points on the cams 63 and 64 diagrammatically indicate equal intervals in the revolution of the shafts 7 and 8 and the uniformity of the travel of the tools along the stock is clearly shown by the occurrence of equal intervals between said lines. The cams 63 and 64 are conformed to give the uniform motion longitudinally to the carriage and also corrected to compensate for the slight discrepancy arising from the arcal movement of the crank 58 and wrist pin 59.

The spiral gear 36 meshes with and drives a spiral gear 71 fast on a shaft 72 mounted in bearings 73 in the frame A. The shaft 72 carries a feed roll 74 mounted in the same manner and in the same position relative to the stock guide E as is the feed roll 40. The feed roll 74 might more properly be termed an ejector roll.

A presser roll 75 having a periphery conforming with the face of the stock and pressing thereon is mounted on a shaft 76 supported on oscillatory arms 77 fast on a rock shaft 78 mounted in bearings 79 on the platform F. A fast arm 80 is mounted on shaft 78 and acts as a bell crank, being drawn to the left (see Fig. 7) by a spring 81 to press the roll 75 upon the stock directly above the feed roll 74.

The operation of the machine is as follows: The stock is fed through the machine at a uniform speed by the feed roll 40, and presser roll portion 49 of the rotary cutter-head and the ejector roll 74 and its presser roll 75, which are all given like active peripheral velocities by the mechanism already described. The tools 48 on the rotary cutter head make a continuous series of vertical incisions in the traveling stock. The translationally moving carriage 18 is moved upon the table D by the cranks and cams and the tools 53 are positioned upon said carriage in such manner that the said tools approaching the stock engage the same in exact registry with two of the incisions made by the tools 48 on the rotary cutter head. As the tools 53 enter and leave the stock they are carried along at the same speed as the stock when they are returned entirely without the stock and engage the stock in registry with the next two incisions made by the tools 48 etc.

I may use a different number of tools on

the carriage 18 than that illustrated, and will then gear the carriage accordingly, and I may also vary the details of construction and arrangement to suit the exigencies of any particular case where the principle of my invention lies, without departing from the spirit of my invention.

Having described my invention, I claim:—

1. In a carving machine, the combination of stock-feeding and guiding means, a knife carriage, means for continuous operative connection with said carriage for imparting a reciprocating motion thereto, means for independently reciprocating said carriage transversely of said reciprocation, a table with which said carriage is in immediate contact, and a coöperative knife carrier mounted for bringing knives carried thereby into action upon the stock in a different direction and coöperative therewith to complete a single cut, and means for actuating the same continuously and in unison with the stock feed movement.

2. In a carving machine, the combination of stock-feeding and guiding means, a knife, carriage, means in continued operative connection with said carriage for imparting thereto a reciprocating motion of uniform velocity longitudinally and transversely of the stock, and a coöperative knife carrier mounted for bringing knives carried thereby into action upon the stock in a different direction and coöperative therewith to complete a single cut, and means for actuating the same continuously and in unison with the stock feed movement.

3. In a carving machine, the combination with stock-feeding and guiding means, of a knife-carriage, means in continued operative connection with said carriage for imparting a reciprocating motion thereto, means in continued operative connection with said carriage for imparting thereto a reciprocating motion transversely of its said line of reciprocation by said means, and a coöperative knife carrier mounted for moving knives toward and from the stock in a plane different from that of the former carriage and coöperative therewith to complete a single cut, and means for actuating the same continuously and in unison with the stock feed movement.

4. In a carving machine, the combination with stock-feeding and guiding means, of a translatory knife carriage, connected reciprocators operative simultaneously upon said carriage and in relatively transverse directions, and a coöperative knife carrier mounted for giving a series of knives working movements toward the stock in a different direction from the working movement of the knives carried by the former carriage and coöperative therewith to complete a single cut, and means for actuating the same continuously and in unison with the stock feed movement.

5. In a carving machine, the combination with uniformly acting stock-feeding means, of a translatory knife-carriage, connected reciprocators operative simultaneously upon said carriage in relatively transverse directions, one of said reciprocators being productive of a reciprocating movement, one stroke whereof is made coincidently with the feeding movement of the stock, and a coöperative knife carrier mounted for giving a series of knives carried thereby a movement toward the stock in a different plane from the working movement of the other carrier and coöperative therewith to complete a single cut and means for actuating the same.

6. In a carving machine, the combination with uniformly-acting stock-feeding means, of a tool-carriage provided with a pair of parallel guides, a pair of equal-throw synchronously acting crank-wrists engaging said guides, said carriage being also provided with a guide transversely disposed of said guides, an oscillatory crank-wrist engaging said latter guide, and cam means for actuating said crank wrist and adapted to impart to said carriage a reciprocating motion longitudinally of the stock, whereof one stroke is made coincidently with the stock-feeding movement, and a coöperative tool carrier mounted for action upon the stock in a different direction.

7. In a carving machine, the combination with uniformly acting stock-feeding means, of a tool-carriage, relatively transverse slots in said carriage, rotatable cranks engaging two of said slots, an oscillatable crank engaging another of said slots, actuating means connected to said oscillatable crank for imparting to said carriage movement parallel with the stock and coincident with the stock-feeding movement, and a coöperative tool carrier mounted for action upon the stock in a different direction.

8. In a carving machine, the combination of a cutter translationally movable in a circuitous path at velocities uniform relative of one diameter of said path, a rotary cutter, and driving mechanism operatively connected with said translationally movable and rotary cutters, the connection between said cutters being such that one makes a cut in a different direction from and complementary of the cut made by the other.

9. In a carving machine, a cutter translationally movable in a circuitous path at velocities uniform relative of one diameter of said path, a rotary cutter rotatable in a plane convergent to the plane of motion of said translationally movable cutter, a continuous stock feed adapted to feed stock continuously to said cutters, and driving mechanism operatively connected with said cutters and

feed, patterned and arranged to invest coincident relative velocities in said cutters and feed, and insure registry of the incisions of the cutters.

10. A carving machine comprising cutting members mounted to penetrate the stock from different directions and coöperative to produce a single design in repeat; one of said cutting members being mounted for a reciprocating movement, and the other thereof being mounted for a revolving movement in a path which is within the contour of the stock; and means for effecting uniform feeding movement of the stock.

11. In a carving machine, the combination with uniformly acting stock-feeding means, of a rotatable tool holder coupled thereto; a set of tools mounted in said holder and revoluble thereon in the path of the stock; a cutting tool coöperative with said set of tools to produce a single design in repeat and mounted to penetrate the stock in a different direction; and means positively connected to stock-feeding means and tool-rotating means for reciprocating said coöperative cutting tool into and out of the stock.

12. In a carving machine, the combination with uniformly acting feeding means, of a set of cutters mounted for rotation within the contour of the stock and connected to said feeding means so that the speed of rotation of the tool equals the speed of the stock-feeding movement, and a cutting member provided with operating means and mounted for penetrating the stock from a different direction and coöperating with said set of cutters to cut the design in the stock.

13. In a carving machine, the combination with uniformly acting stock-feeding means, of cutting members mounted to penetrate the stock from different directions so that the cuts made by one cutting member supplement the cuts made by the other cutting member; at least one of said cutting members being mounted for rotation in the path of the stock and in the direction of the stock-feeding movement, and being provided with means for effecting its rotation at a speed to match the feeding movement of the stock.

14. In a carving machine, the combination of cutting members mounted to penetrate the stock from different directions and coöperative to produce a single design in repeat, means for effecting movement of one of said members to and fro along the stock, uniformly acting feeding means whereby the cuts may be repeated along the stock, and means for rotating the other of said cutting members within the contour of the stock in the direction of the feeding movement and at a speed equal to the feeding speed.

15. In a carving machine, the combination of cutting members mounted to penetrate the stock from different directions and coöperative to produce a single design in repeat, means for feeding the stock at uniform speed, means for reciprocating one of said cutting members into and out of the stock and for moving it to and fro longitudinally of the stock, and means for rotating the other cutting member within the path of the stock and at a speed equal to the stock-feeding movement; said rotating cutting member comprising a circular set of similar cutters.

16. A carving machine comprising a plurality of sets of cutters mounted to penetrate the stock from different directions and coöperative to produce a single design in repeat, uniformly acting stock-feeding means, and means for effecting movement of said sets of cutters coincidently with the stock.

17. In a carving machine, the combination with uniformly acting feeding-means, of a sliding carriage, means for moving said carriage to and fro along the stock coincidently with the feed and also transversely thereto, a cutting tool upon said carriage, a pivoted member, and a cutter mounted upon said pivoted member to complement the cut made by the first-mentioned tool in producing an ornament in repeat.

18. In a carving machine, the combination with stock-feeding means, of a tool-carriage provided with a pair of parallel guides, a pair of parallel shafts, equal-throw synchronously acting crank-wrists carried by said shafts and engaging said guides, said carriage being also provided with a guide transversely disposed of said pair of guides, an oscillatory shaft, a crank-wrist carried by said oscillatory shaft for engaging said latter guide, cam engaging faces carried by said oscillatory shaft, cams carried by said pair of shafts for engaging said faces and actuating said crank-wrist and adapted to impart to said carriage a reciprocating motion longitudinally of the stock, whereof one stroke is made coincidently with the stock-feeding movement, and a coöperative tool carrier mounted for action upon the stock in a different direction.

19. In a carving machine, the combination with stock-feeding means, of a tool-carriage provided with a pair of parallel guideways, bearing blocks mounted on said guideways, a pair of parallel shafts, equal-throw synchronously acting crank-wrists carried by said shafts and engaging said bearing blocks, said carriage being also provided with a guideway transversely disposed of said pair of guideways, a bearing block mounted on said guideway, an oscillatory shaft, a crank arm having a crank-wrist carried by said oscillatory shaft, said wrist engaging said latter bearing block, arms carried by said oscillatory shaft and provided with

cam engaging faces, cams carried by said pair of shafts for engaging said faces and actuating said crank arm wrist and adapted to impart to said carriage a reciprocating motion longitudinally of the stock, whereof one stroke is made coincidently with the stock-feeding movement, and a coöperative tool carrier mounted for action upon the stock in a different direction.

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