

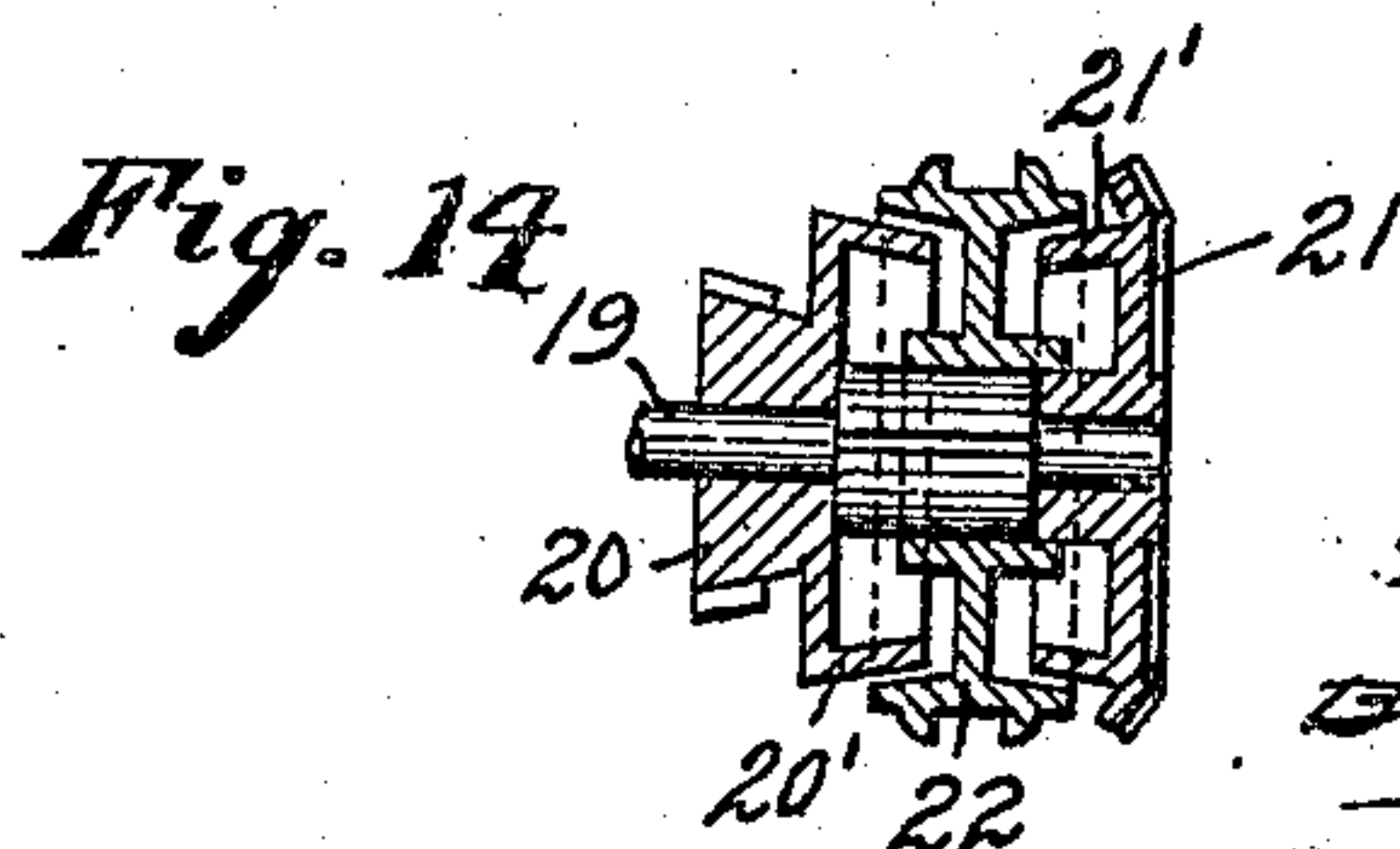
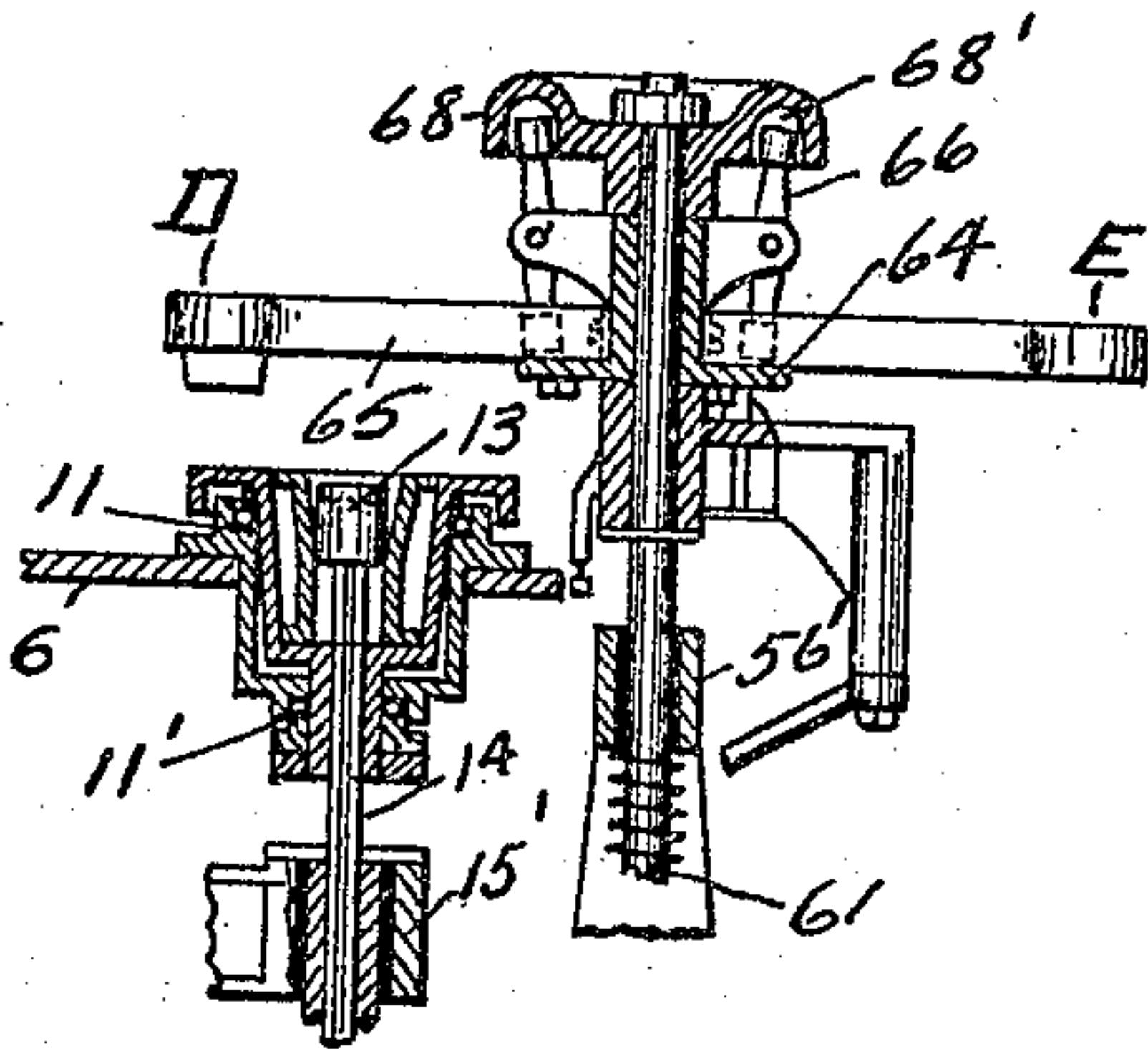
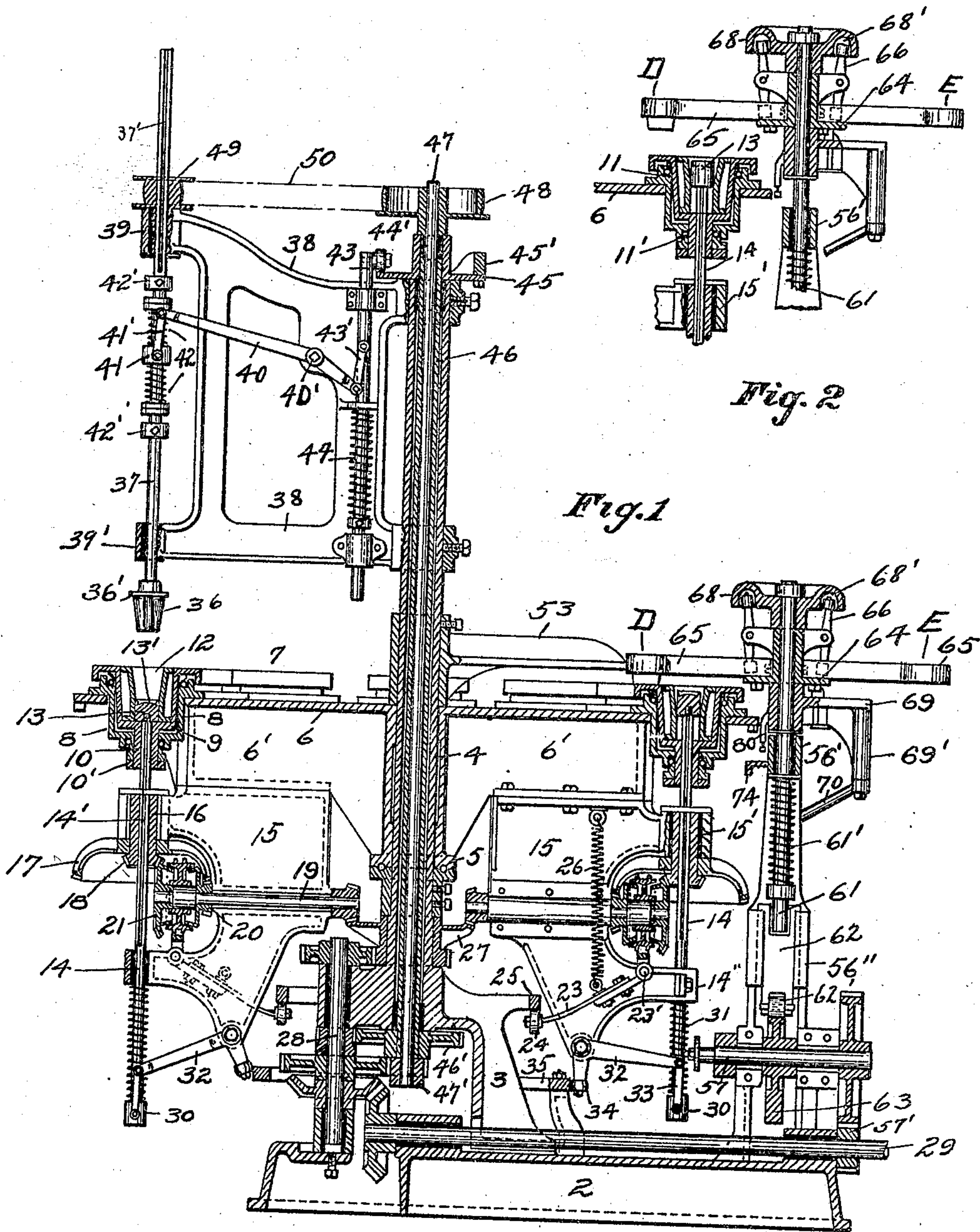
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PATENTED NOV. 28, 1905.

F. O'NEILL.
GLASS FINISHING APPARATUS.

APPLICATION FILED OCT. 21, 1904.

4 SHEETS—SHEET 1.



WITNESSES

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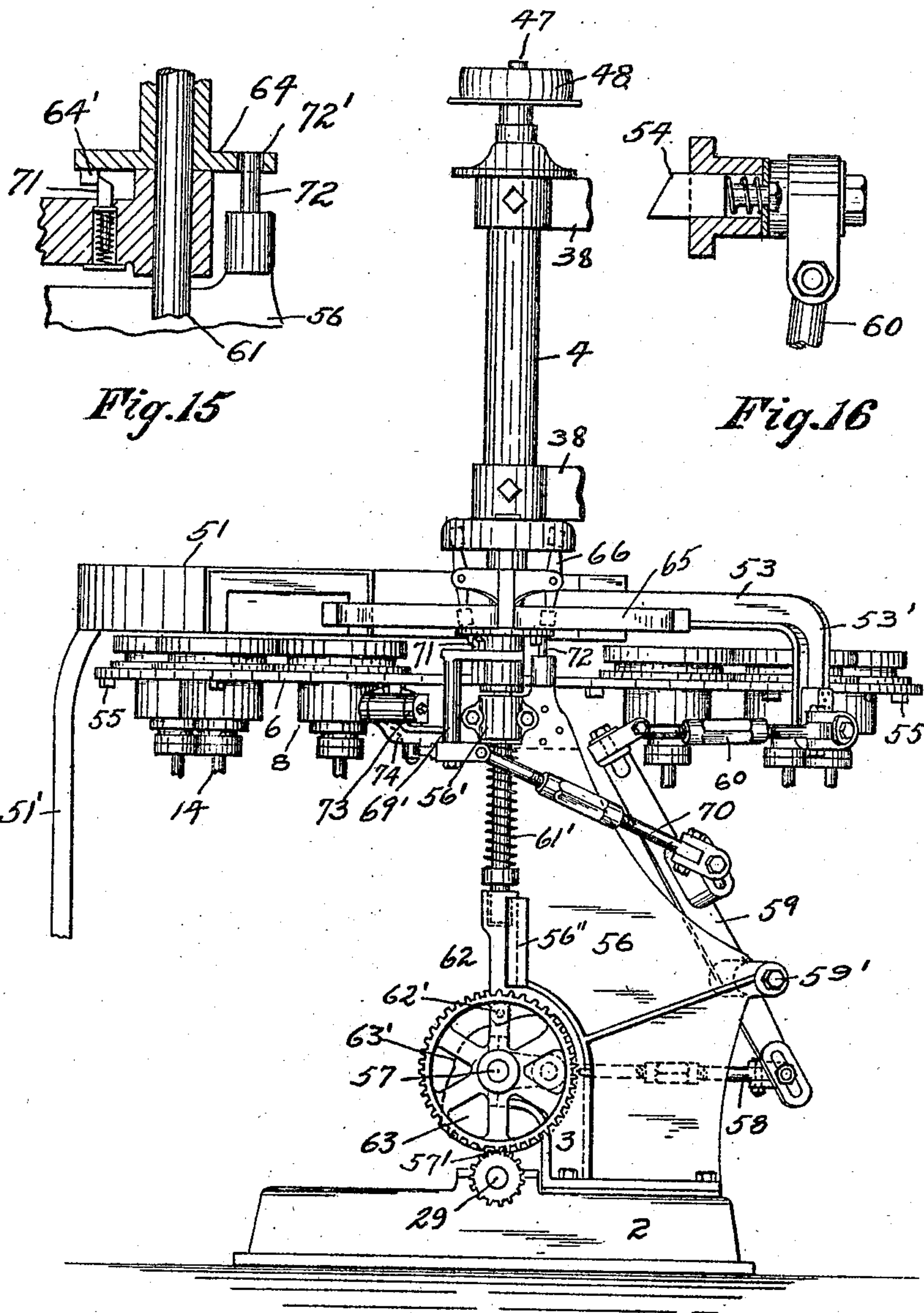
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4 SHEETS—SHEET 2.



WITNESSES

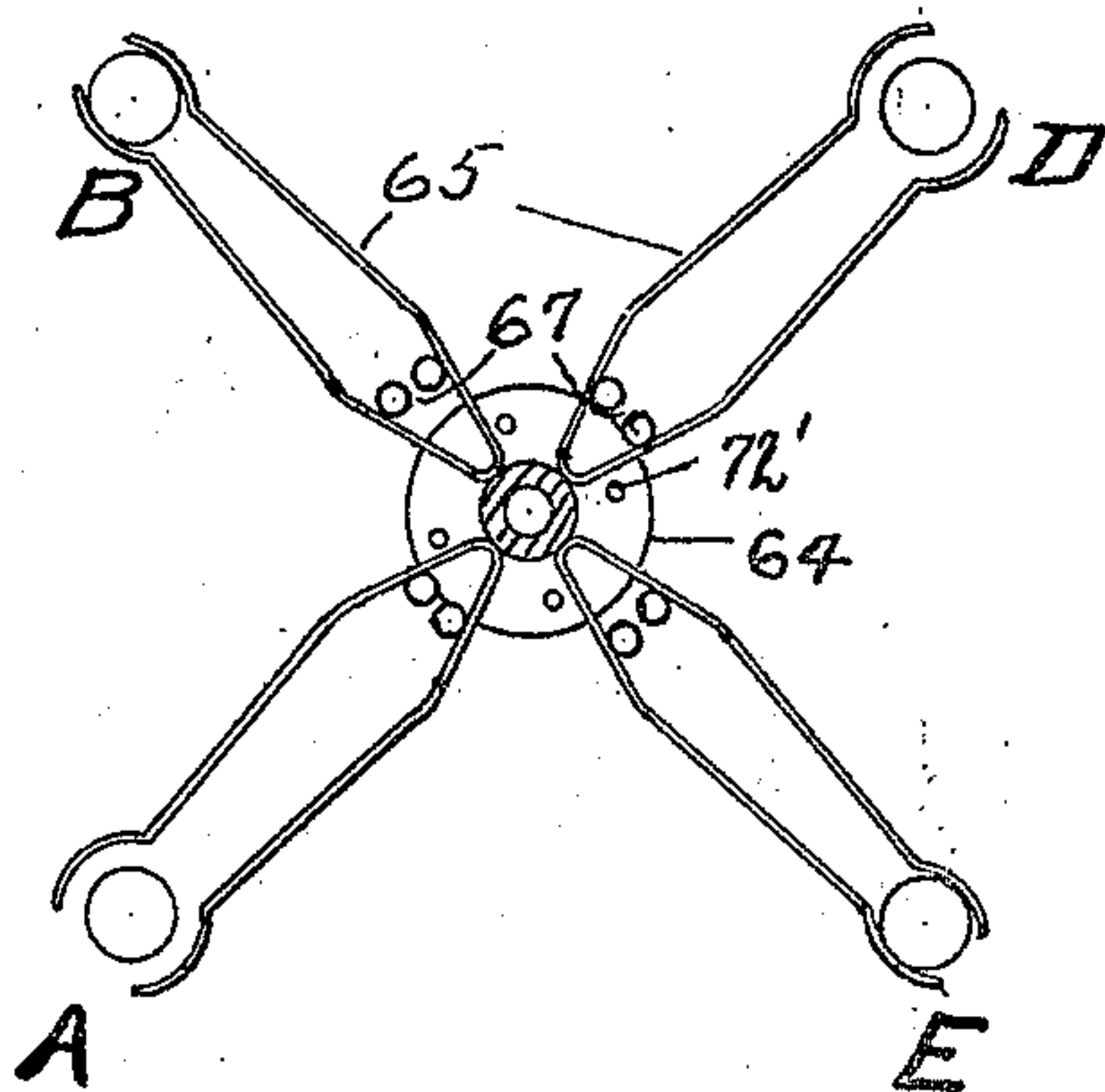
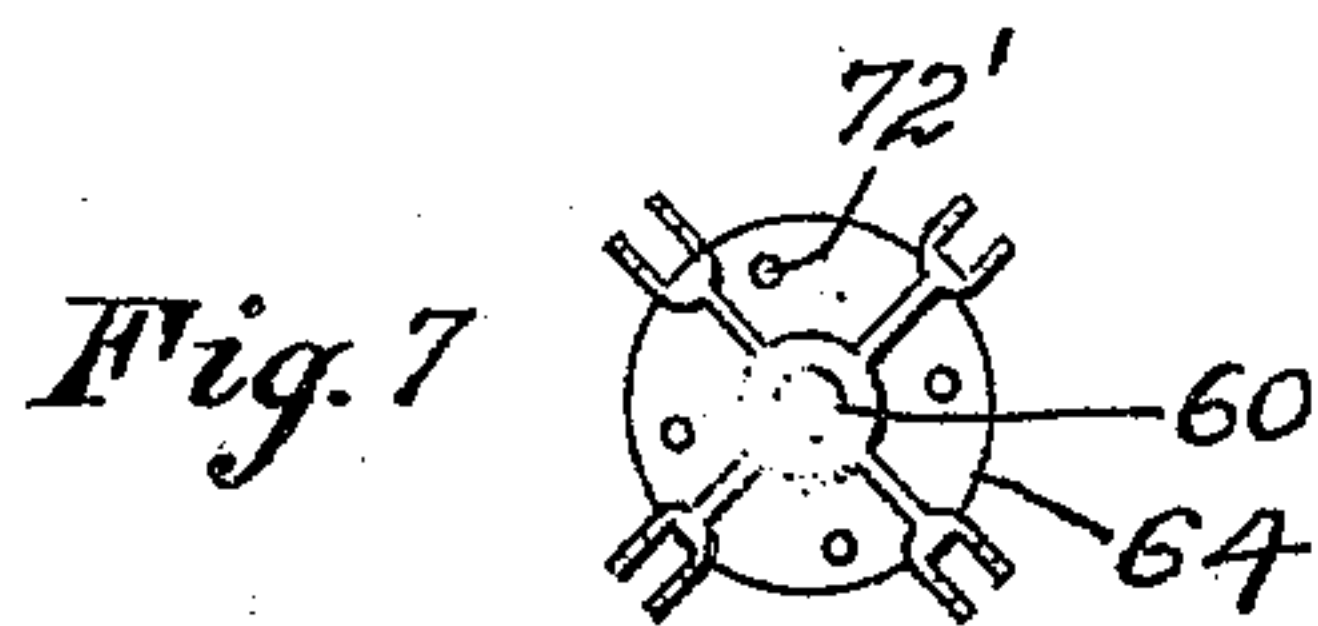
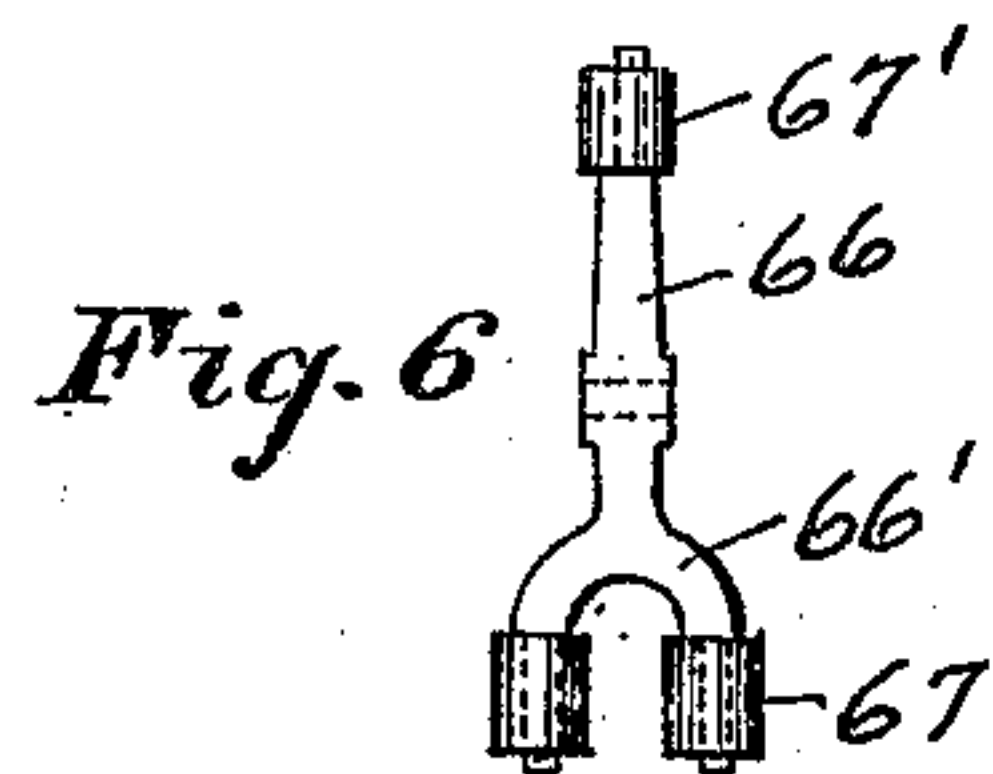
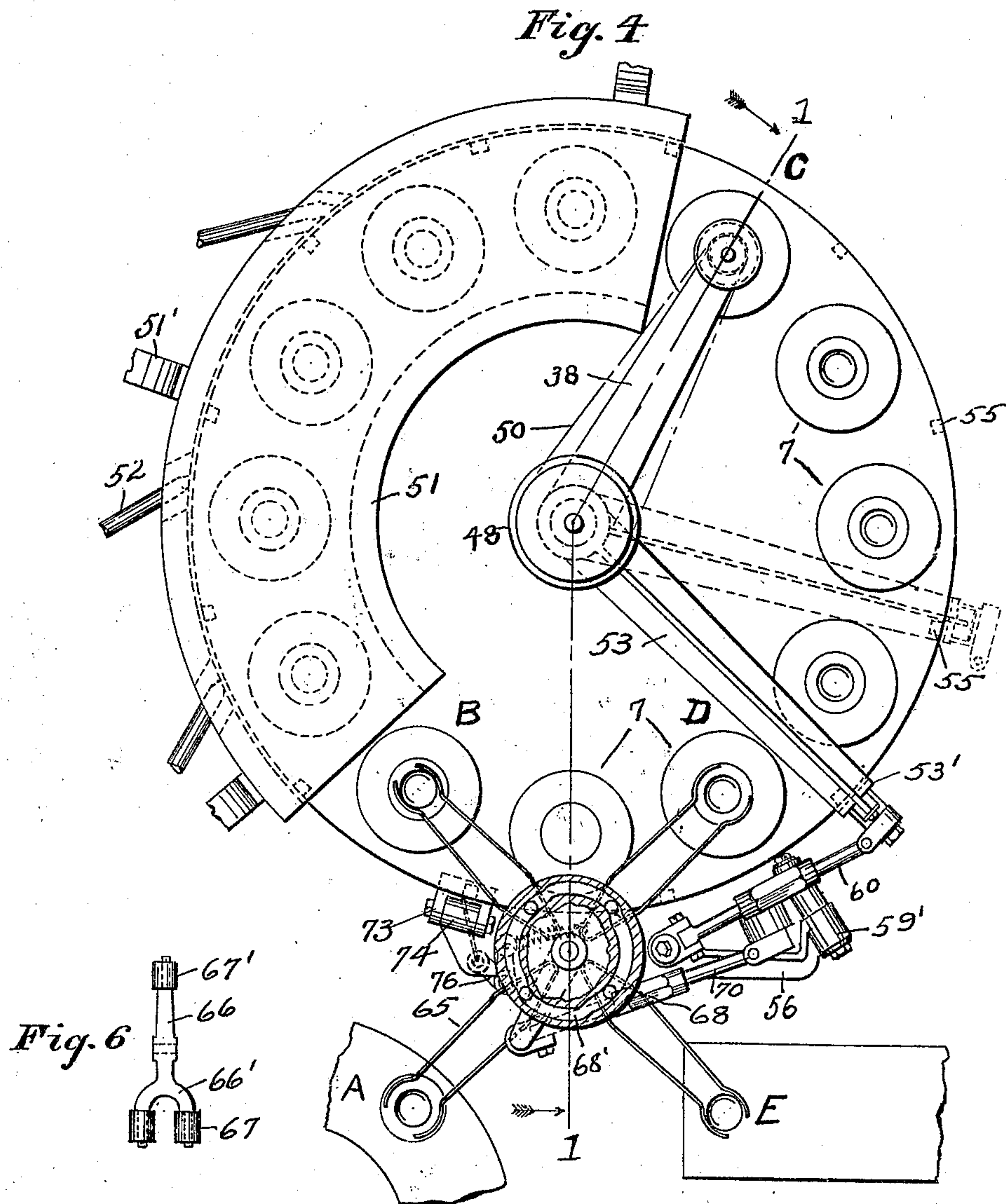
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4 SHEETS—SHEET 3.

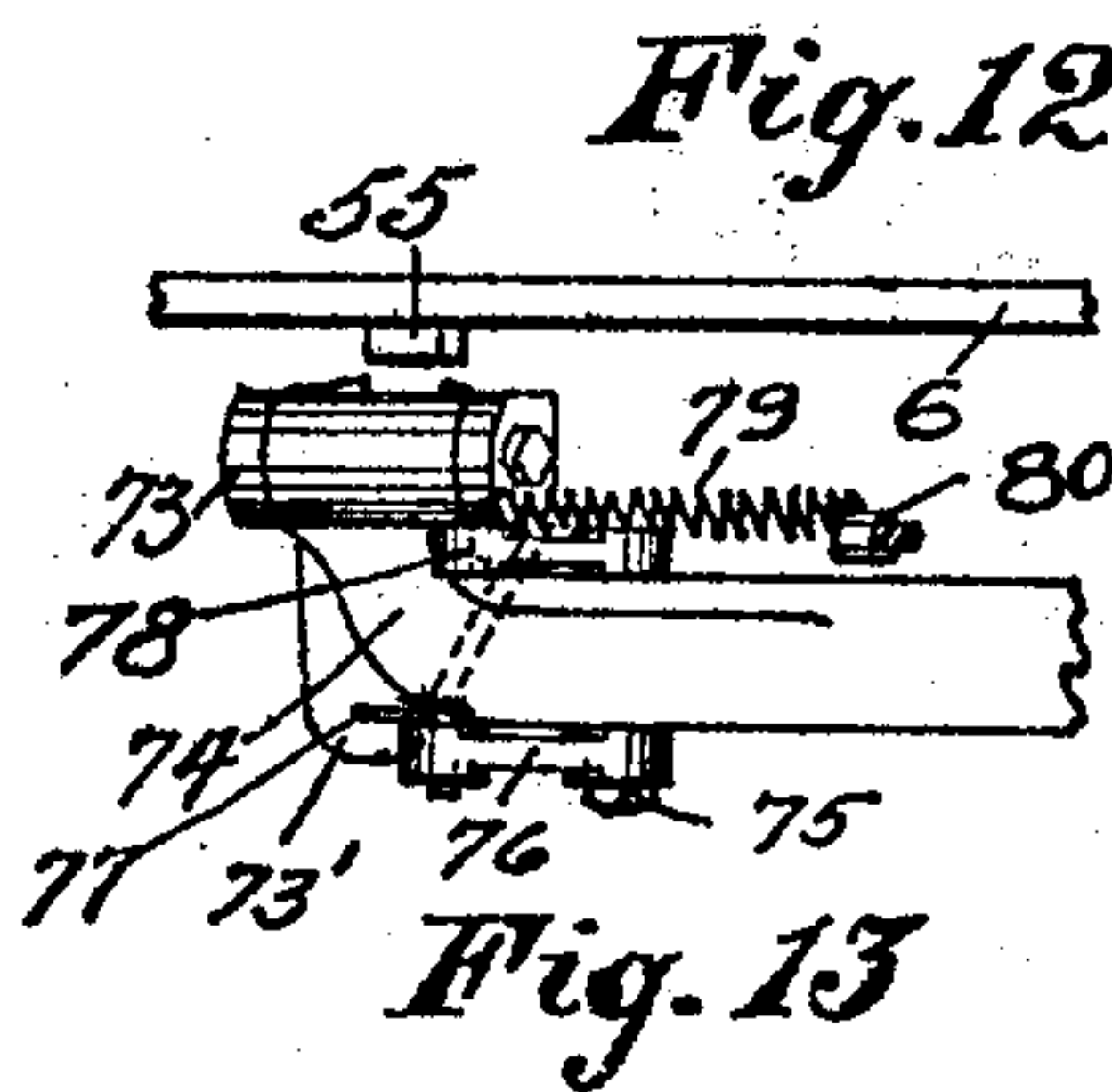
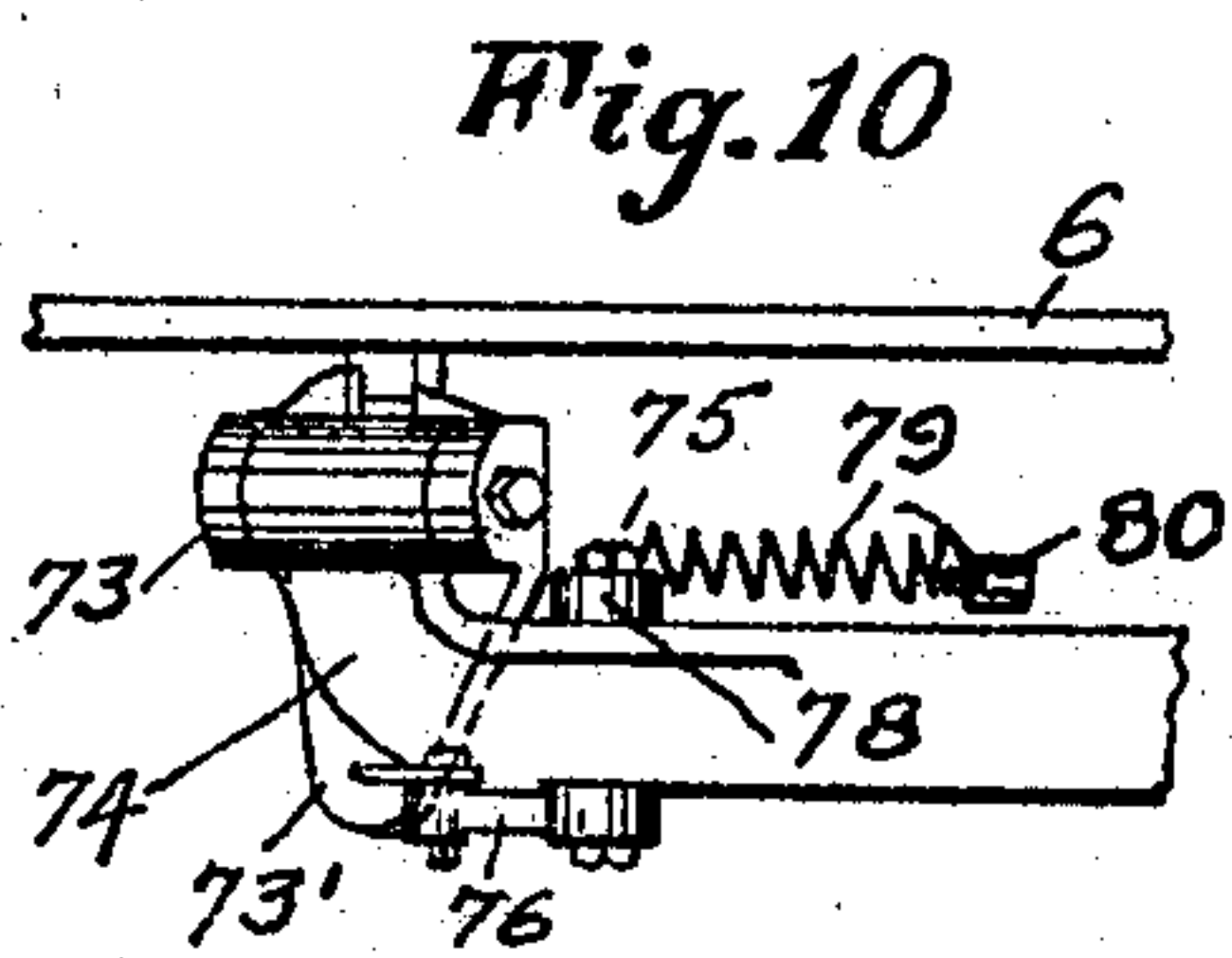
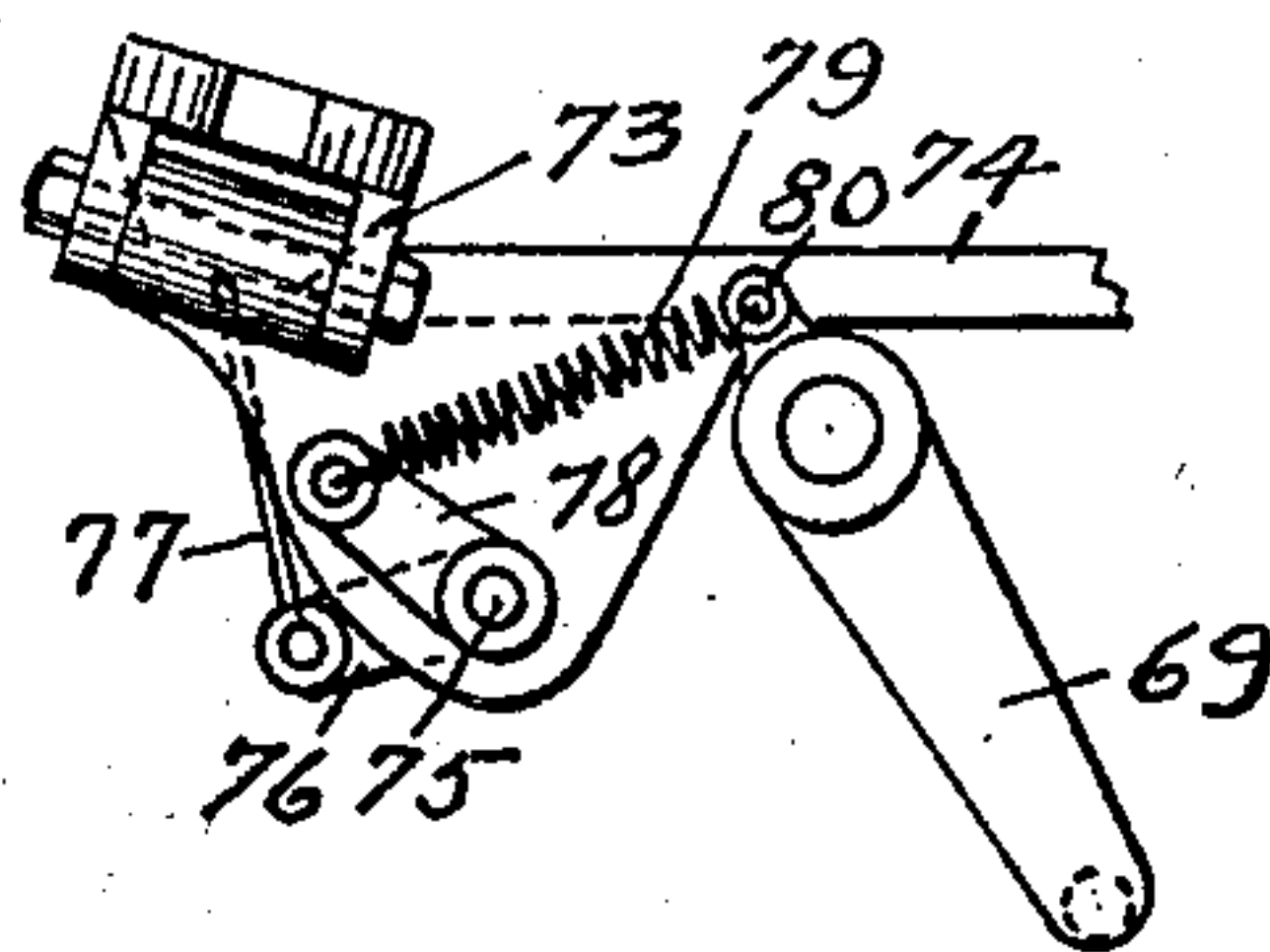
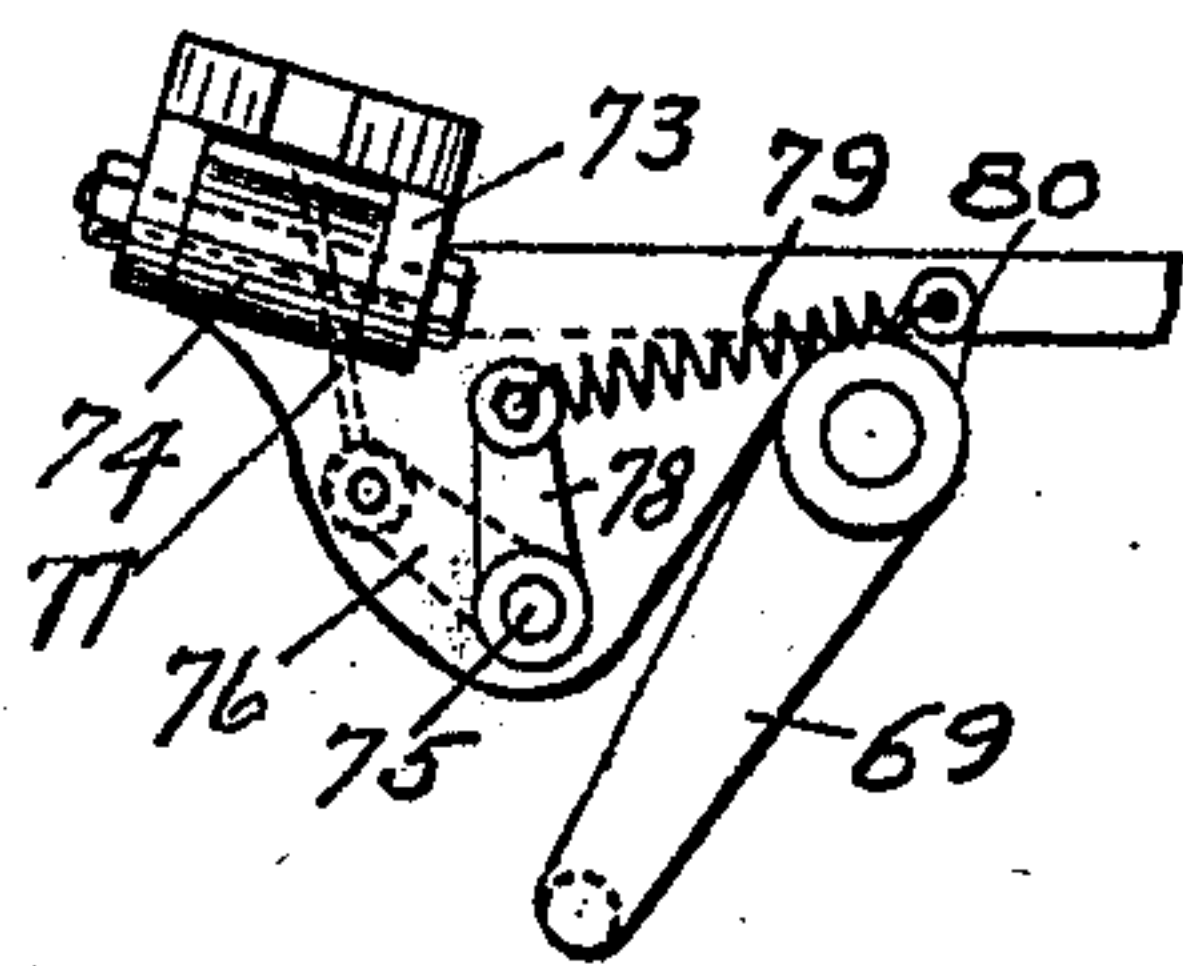
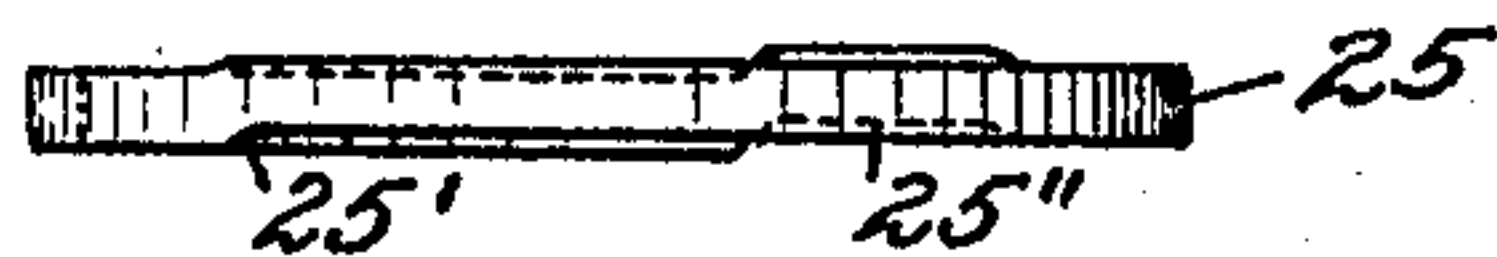
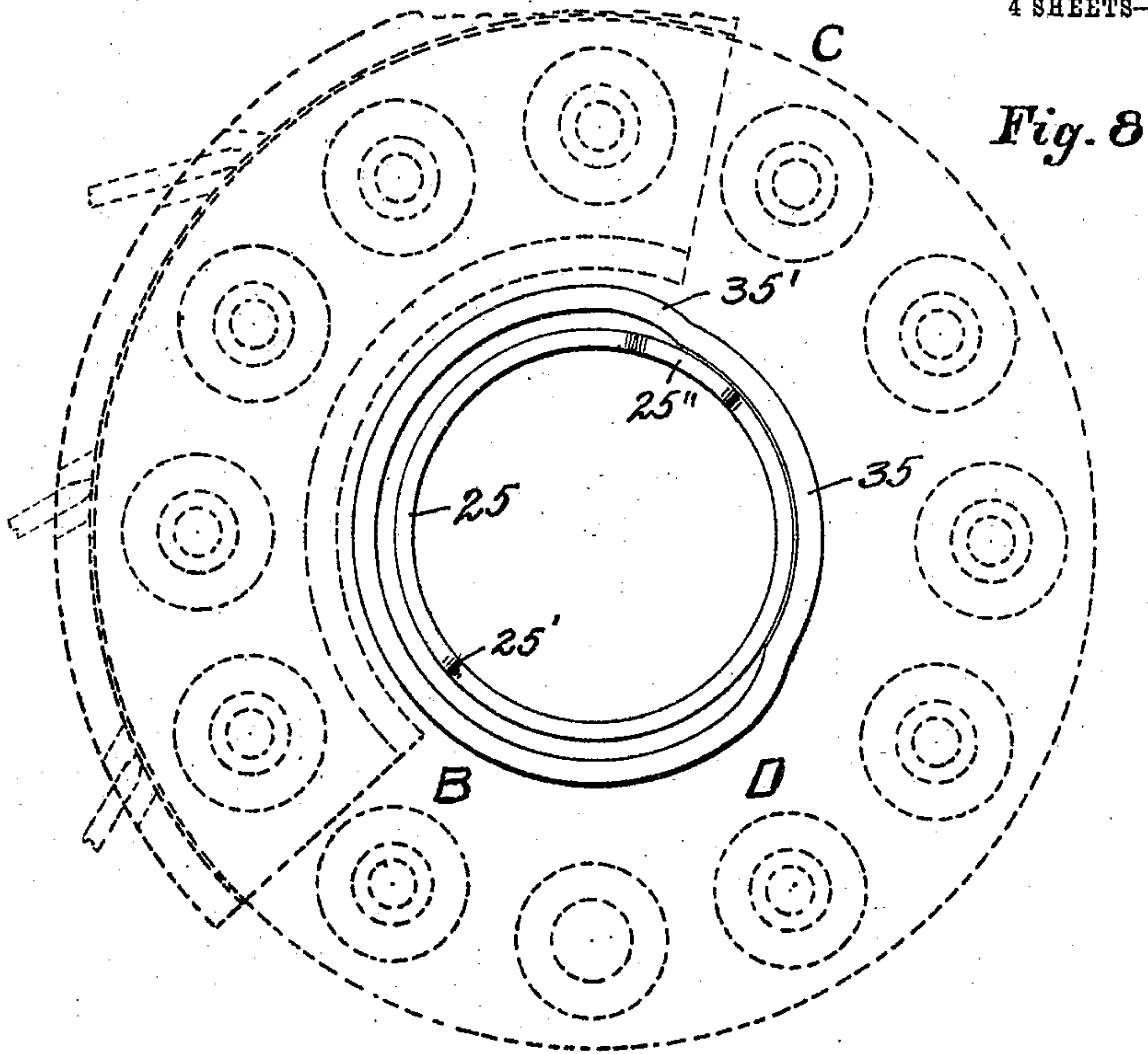


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4 SHEETS—SHEET 4.



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UNITED STATES PATENT OFFICE.

FRANK O'NEILL, OF DETROIT, MICHIGAN.

GLASS-FINISHING APPARATUS.

No. 805,876.

Specification of Letters Patent.

Patented Nov. 28, 1905.

Application filed October 21, 1904. Serial No. 229,473.

To all whom it may concern:

Be it known that I, FRANK O'NEILL, a citizen of the United States, residing at Detroit, in the county of Wayne and State of Michigan, have invented certain new and useful Improvements in Glass-Finishing Apparatus, of which the following is a specification, reference being had therein to the accompanying drawings.

10 This invention relates to the finishing of tumblers and other glass articles, and has particular reference to apparatus which may be used for fire-finishing alone or for fire-finishing and reshaping.

15 The invention is further directed to ware-transferring mechanism, operating in conjunction with the finishing mechanism, and preferably, though not necessarily, so arranged as to both deliver the ware to and remove the same from the finishing mechanism.

20 A further purpose is to so arrange the transfer mechanism that it will receive the ware directly from the pressing, blowing, or other forming mechanism, and thus dispense with the usual and heretofore necessary intermediate handling thereof. With the forming mechanism, finishing mechanism, and leer-receiver in proper relative position the ware is formed, finished, and delivered to the leer without manual manipulation of any sort.

30 In the accompanying drawings, Figure 1 is a vertical sectional view of the improved machine, taken on line 1 1 of Fig. 4. Fig. 2 illustrates a portion of the machine in vertical section, as in Fig. 1, the transfer mechanism being elevated. Fig. 3 is a side elevation of the machine, portions thereof being broken away. Fig. 4 is a top plan view, a portion of the transfer mechanism being shown in section. Figs. 40 5, 6, and 7 are detail views of portions of the transfer mechanism. Fig. 8 is a top plan view of the cam-rings, the ware-carrier and heat-confining hood being shown in dotted lines. Fig. 9 is an edge view of the inner cam. Figs. 45 10, 11, 12, and 13 are detail views of the latch mechanism for locking the ware-carrier. Fig. 14 is a detail view of the changeable-speed mechanism for rotating the ware-holders. Figs. 15 and 16 are detail views of the spring-latch mechanisms.

50 Referring to the drawings, 2 designates the base, and 3 the central upright portion, of the machine-frame, and rising from the latter is hollow post 4. Secured to the post is bearing 5, and rotatable around the post on this bearing is the horizontal ware carrier or table 6.

The table is provided with a circular series of ware-supporting stations 7. In the present embodiment of the invention each of these stations consists of a circular socket 8, secured to and depending through the table, and rotatably mounted in the socket is the cup-shaped receiver 9. The lower portion of the holder is extended to form hollow stem 10, which projects through the bottom of the socket and receives lock-nuts 10' for securing the receiver against vertical movement. The upper and lower portions of the receiver and socket are constructed with raceways for ball-bearings 11 and 11'.

70 Removably secured within the receiver 9 and rotatable therewith is the hollow ware-holder 12, the contour of which corresponds to the exterior shape of the finished ware. The vertically-movable bottom 13 of the holder has its ware-supporting faces depressed at 13', so that when elevated it provides a secure support for the ware. Bottom 13 is removably secured to the upper end of shaft 14, which is movable vertically through stem 10 and which is splined thereto at 14' in order to rotate receiver 9 and holder 12.

80 Secured to under webs 6' of the table are the depending frames or hangers 15, one for each of stations 7. Each of these frames is constructed with a projecting bearing 15', and journaled therein is tubular hub 16, which carries the downwardly-disposed large gear-wheel 17 and the smaller gear 18. Shaft 14 is movable vertically through and is splined to hub 16. Journaled in each of frames 15 is a horizontal shaft 19, and rotatable on the outer portion of this shaft is gear 20, meshing with gear 17, and the larger gear 21, meshing with gear 18. The adjacent sides of gears 20 and 21 are formed, respectively, with friction-faces 20' and 21', and rotatable with the shaft and slidable thereon between said gears is the double friction-drive 22, which is operated by the yoke-lever 23 for engaging either of said gears, whereby the ware-holder may be rotated at different speeds for the purpose presently to be explained. Lever 23 is fulcrumed between its ends at 23', and its lower extremity extends inward and carries roller 24, which rides on the under face of cam-ring 25, being held in engagement therewith by spring 26. The inner ends of shafts 19 are geared to wheel 27, journaled on post 4 beneath bearing 5. Wheel 27 is geared to and driven by the short vertical shaft 28, and the latter is geared to the main horizontal drive-shaft 29.

For moving ware-supports 13 vertically for the purpose of raising and lowering the ware within holders 12 the lower portion of each of shafts 14 extends through guide 14' of frame 15 and carries at its lower end head 30, with a spring 31 confined on the shaft between the guide and head for holding the shaft and support 13 normally depressed. A bell-crank lever 32 is fulcrumed to the lower extremity of frame 13, one arm thereof having link connection 33 with head 30, while the other arm carries roller 34, which rides on the outer face of cam-ring 35, encircling stand 3 in manner similar to ring 25.

Operative above carrier 6 and adapted to cooperate successively with each of ware-stations 7 is a horizontally-rotating and vertically-reciprocating shaping tool or plug 36, here shown detachably secured to the lower end of stem 37, supported by bracket 38, which is adjustably secured to post 4. Stem 37 is operative through bearing 39 at the upper end of the bracket and through guide 39' at the lower end thereof. The shaping-tool is raised and lowered by means of lever 40, fulcrumed between its end at 40' to bracket 38. The outer extremity of the lever has link connection 41' with collar 41, which loosely embraces stem 37, while above and below the collar are spiral springs 42, which are confined by stops 42' secured to the stem. With this cushion connection between the shaping-tool and its actuating means the tool is provided with a sensitive vertical adjustment which prevents such rough or positive engagement with the ware as would tend to injure the same. For oscillating lever 40 the rear end thereof has link connection 43' with rod 43, which is movable vertically through suitable guides on bracket 38 and is held normally depressed by spring 44. The upper end of this rod carries roller 44', which overhangs and rides on the cam-shaped rim 45' of wheel 45, and this cam mechanism is so arranged as to lift rod 43 against the pressure of spring 44 and depress stem 37 for each shaping operation. Wheel 45 is carried by the upper end of tubular shaft 46, extending through post 4, and at its lower end connected by gear 46' with shaft 28. For rotating the shaping-tool a shaft 47 extends throughout tubular shaft 36 and at its lower end is connected by gear 47' with shaft 28 and at its upper end carries band-wheel 48. Journaled in bracket-bearing 39 is the tubular band-wheel 49, to which a belt 50 extends from wheel 48. Stem 37 is movable freely through wheel 49, but is splined thereto at 37', so as to rotate therewith, and this spline is of such length that the shaping-tool rotates constantly.

Before the ware is presented to the shaping-tool it is heated for the purpose of softening the glass. The heating means here shown consists of a bottomless hood or chamber 51 of segmental form positioned on supports 51'

above the path of ware-stations 7 and in such relation to the shaping means that the ware is presented to the latter immediately after passing the heating means. The heat may be generated by any suitable means, that here shown being gas-burners 52, projected through the wall of the hood.

For intermittently moving carrier 6 an arm 53 is mounted to turn on post 4 and extends outward over the carrier with its outer end 53' downwardly disposed and carrying the beveled spring-latch 54 for automatically engaging lugs 55 on the under side of the carrier. Projecting upward from base 2 is frame 56, and journaled therein is short shaft 57, having at one end a crank, which is connected to the lower end of lever 59 by rod 58. This lever is fulcrumed between its ends at 59' to frame 56, and at its upper end is connected by rod 60 with arm 53. Gearing 57' connects shaft 57 with main drive-shaft 29, whereby lever 59 is oscillated, and the throw of the latter is such as to engage latch 54 with the successive lugs 55 and at each operation move the carrier forward, the extent of each movement corresponding to the distance between mold-stations 7.

While the invention includes mechanism for transferring the unfinished and finished ware to and from the ware-carrier, I will explain the operation of the mechanism thus far described before entering into a detailed description of the transfer mechanism. As each of the ware-holding stations and attending mechanisms are exactly the same and as each goes through exactly the same operations while carrier 6 is making a complete rotation, a description of one will suffice for all. The freshly pressed or blown tumbler or other article is placed in holder 12 of station 7 when the latter is in position B, this position being preferably slightly in advance of the approach to hood 51. At this time support 13 is elevated within holder 12, as shown at the right-hand side of Fig. 1, and the shape of cam 35 is such as to hold the support thus elevated and the ware projected above holder 12 until after it passes the heating means. The projected ware is thus brought in direct contact with the flames, and the glass is given a fire finish and is so softened that it may be given its final perfect shape. Cam 25 is so arranged that clutch 22 is held in neutral position while the ware-holder approaches and is at position B, with the result that the holder-rotating mechanism is inactive and the holder at rest. After passing from position B a downward deflection 25' of cam-ring 25 operates to so throw the clutch mechanism that the ware-holder is rotated through the medium of large gear 17, and the upwardly-projected article resting on raised support 13 is thus rotated at a relatively slow speed while passing the heating means. As the article emerges from the heating means, deflection 35' of cam 35

permits support 13 to lower within holder 12, and the latter and said support are of such contour as to exactly fit the exterior shape of the finished article. As the ware-support is lowered in manner just described an upward deflection 25" of cam 25 operates to throw clutch 22 in engagement with gear 21, thus rotating the ware-holder at a much more rapid speed than while passing the heating means. As the movement of carrier 6 is intermittent, this more rapid rotation of holder 12 continues while the carrier is at rest at shipping position C. At this juncture shaping-tool 36 is lowered and enters the article, the tool rotating rapidly and in direction reverse to that of the rapidly-rotating holder 12. While the tool is preferably corrugated vertically, its general contour corresponds to the interior shape of the article being finished and coöperates with the interior of holder 12 in perfectly shaping the article, while rim 36' of the tool smooths the edge of the same. The arrangement is preferably such that after passing position C clutch 22 is moved to neutral position and the ware-holder ceases to rotate, and as the mechanism approaches discharge position D cam 35 operates to again raise support 13 and elevate the finished ware, so that it may be readily removed.

As the transfer mechanism to which I have referred picks up ware to be delivered to and from the ware support or carrier of the finishing apparatus, the latter is preferably so located that the transfer mechanism receives the ware at the discharge or delivery position A of the glass-forming apparatus, such as a pressing-machine or a combined pressing and blowing machine, so that the ware passes directly from the forming to the finishing apparatus without intermediate handling. The discharge position E of the transfer apparatus may comprise a table or support (not shown) within convenient reach of the leers, or the ware may be deposited directly upon a leer-conveying apparatus, as may be arranged.

In constructing the present embodiment of the transfer mechanism a vertical shaft 61 is mounted in bearing 56' at the upper end of frame 56, and the lower end of this shaft is held rotatably seated in vertical slide 62 by spring 61'. The slide is confined in a guide 56" on frame 56 and at its lower end carries roller 62', which rides on the periphery of cam-wheel 63, secured to shaft 57. Loose on the upper portion of shaft 61 is head 64, and secured to and radiating horizontally from this head are the four equidistant spring-tongs 65, the arms of which are normally contracted or in ware grasping or holding relation. For spreading or opening the tongs head 64 carries the four vertical levers 66, fulcrumed between their ends, as shown. The lower end of each lever extends between the arms of one of the tongs and is forked at 66',

and carried by said forks are rollers 67, which engage the inner faces of the tong-arms. At the upper end of each lever 66 is a roller 67', which moves in cam-grooves 68' in plate 68, the latter being secured to the upper extremity of shaft 61. For intermittently rotating shaft 61 an arm 69 is secured thereto beneath head 64, and at the outer end of this arm is downward extension 69', which is connected by rod 70 with lever 59. A beveled spring-latch 71, projecting from arm 69, engages successively lugs 64', depending from head 64. Projecting vertically from the upper end of frame 56 is pin 72, and adapted to register therewith are the four openings 72' in head 64.

In the position shown in the drawings, and referring particularly to Figs. 1, 3, and 4, carrier 6 is at rest, having been moved forward, and the carrier-advancing mechanism is about to move backward for a fresh hold. At this time shaft 61 and the mechanisms carried thereby, including the tongs, have been lowered by cam 63 and spring 61', with pin 72 entered in one of openings 72', thus holding tong-carrying head 64 against rotation. With said head thus positioned and held fixed one of the tongs are open and projected over the delivery position A of the glass-forming mechanism, the next tongs are closed and projected over receiving position B of the finishing mechanism, the next tongs are open and projected over the ware-discharging position D of the finishing mechanism, and the next tongs are closed and projected over the finished-ware-receiving position E. The tongs at position B are grasping the ware which has been carried forward from position A, and the tongs at position E are grasping the ware which they have carried forward from position D. The open tongs at positions A and D have been lowered over the articles at those positions and are ready to grasp the same. At this juncture shaft 61 is oscillated by means of lever 59, rod 70, and arm 69 and caused to turn within head 64, which is held fixed by pin 72, as before explained. Cam-plate 68 turning with the shaft operates the several levers 66 in such manner that the lower ends of the levers for the tongs at positions A and D are moved toward the outer ends of the spring-tongs, thus permitting the latter to contract and grasp the articles at those positions. At the same time the levers for the tongs at positions B and E are so moved as to throw their lower ends inward toward the contracted inner ends of the tongs, and thus open or spring apart the tong-arms and release the ware at said positions. During this tong opening and closing operation the shallow portion 63' of cam 63 is turning beneath roller 62', and at the completion of said operation the deep portion of cam 63 operates to raise slide 62, together with shaft 61 and all of the mechanisms carried thereby. The ware is thus lifted at positions A and D, and the

open tongs are lifted clear of the ware at positions B and E. Upon the completion of this raising operation lever 59 has completed its backward oscillation and obtained a new hold
 5 for the carrier-oscillating arm 53 and at the same time has engaged latch 71 with one of lugs 64'. The forward oscillation of lever 59 then begins, thus advancing carrier 6 and at the same time imparting a quarter-turn to
 10 the raised tong mechanism, the latter being held raised by the deep portion of cam 63 turning beneath roller 62'. This one-quarter turn of the tong mechanism carries the unfinished article from above position A to above
 15 position B and the finished article from above position D to above position E. At the completion of the one-quarter turn of head 64 cam-depression 63' reaches roller 62', thus permitting head 64 to lower and embrace pin 72.
 20 The several tongs lower with the head, thus depositing the unfinished article at position B within holder 12 and resting the same on support 13, which at that time is in raised position, as heretofore explained. Simultane-
 25 ously the finished article is lowered at position E and there deposited. The ware is then released at positions B and E, and simultaneously other articles are engaged at positions A and D, and the above-described operation
 30 is repeated.

For holding carrier 6 fixed and in exact position between the intermittent movements thereof a vertically-swinging latch 73 is pivoted to an arm 74, extended from frame 56,
 35 the latch being formed with a downward projection 73'. Mounted on arm 74 is the vertical spindle 75, having arm 76 at its lower end connected by rod 77, with latch projection 73' and arm 78 at its upper end connected by
 40 spring 79 with arm 80, projecting from the hub of arm 69. The turning of arm 69 during the advancing movement of carrier 6 operates to expand spring 79 and to so turn spindle 75 as to hold the latch in raised po-
 45 sition by the pressure of rod 77. Latch 73 is in the path of carrier-lugs 55, and the upper face of the latch is inclined, so that as a lug approaches the same it rides up over and depresses the latch against the pull of spring
 50 79 until the latch-notch is reached, when the latch springs upward and positively engages the lug and provides a firm hold for the carrier. When the mechanism is moving back-
 55 ward to give arm 53 a fresh hold on the carrier, spring 79 contracts and pushes against arm 78 in such manner as to turn spindle 75 and draw or turn the latch outward and re-
 60 lease the carrier, so that it may be free for the next advancing movement.

While the transfer apparatus herein shown and described is adapted to both deliver the unfinished ware to the finishing mechanism and to remove the finished ware therefrom, I do not confine myself to mechanism which
 65 will perform both operations, as transfer

mechanism may be used alone for either of said operations as may be preferred.

While in the economic operation of the apparatus I prefer to have as position A the discharge-station of a pressing or forming
 70 mechanism, said position A may be differently constituted, and in like manner position E may be formed by the inlet end of a leer or any other convenient or desirable point for depositing the finished ware. It will be
 75 further understood that the finishing apparatus may be used irrespective of the transfer mechanism, the ware in such instance being placed upon and removed from carrier 6 by hand. Conversely, the transfer mechanism
 80 may be used in connection with any desired form of ware-finishing means that will cooperate therewith.

It will be noted that holder 12 and shaping-tool 36 are removable, so that corresponding
 85 elements of various forms may be substituted therefor for finishing articles of different shapes. While the holder 12 and tool 36 each have a reshaping function, as herein shown and described, such function may be restrict-
 90 ed to the tool alone, as will be apparent to those skilled in the art.

In the finishing of such ware as requires only a fire finish or polish the reshaping mechanism may be dispensed with or simply ren-
 95 dered inoperative so long as such ware is being operated upon. The ware-heating means may be variously embodied, the means here shown consisting of gas-burners and a bot-
 100 tomless hood, being well known in the art.

The expressions "ware-finishing means" and "ware-finishing mechanism" occurring in some of the claims are used in a broad sense, being designed to include any and all means that may be employed for finishing
 105 the ware, whether by heating alone or by heating and reshaping, or by other means.

I claim—

1. Glass-finishing apparatus comprising a ware-carrier, ware-shaping mechanism, ware-
 110 heating means above the carrier and operative in advance of the shaping mechanism, and ware raising and lowering mechanism constructed and arranged to hold the ware ele-
 115 vated while passing the heating means and to hold the same in lowered position when operated upon by the shaping mechanism.

2. In apparatus for finishing formed glass articles, the combination of a hollow holder adapted to receive the formed article and cor-
 120 responding to the exterior shape thereof, and a finishing-tool corresponding to the contour of the interior of the formed article, the tool and holder cooperating to finish the interior and exterior of the article.
 125

3. In apparatus for finishing formed glass articles, the combination of a hollow holder open at one end to receive and discharge a
 130 formed article and corresponding to the exterior shape of the latter, and a finishing-tool

adapted to enter the open end of the holder and corresponding to the interior contour of the formed article, the tool and holder cooperating to finish the interior and exterior of the article.

4. In apparatus for finishing formed glass articles, the combination of a hollow holder adapted to receive a formed article and corresponding in shape to the exterior of the article, and a finishing-tool corresponding to the interior contour of the article and having a projection which overhangs and operates on the edge of the formed article, the finishing-tool and holder cooperating to finish the interior and exterior of the article and the edge thereof.

5. In apparatus for finishing formed glass articles, the combination of a hollow holder conforming to the shape of the exterior of the article, a finishing-tool operative on the interior of the article and adapted to cooperate with the holder for finishing the interior and exterior thereof, heating means, and means for projecting the article from the holder while being heated.

6. Glass-finishing apparatus comprising a carrier, a hollow ware-holder thereon conforming to the shape of the exterior of the ware, a shaping-tool operative on the interior of the ware, ware-heating means in advance of the shaping-tool, and ware raising and lowering mechanism operating to elevate the ware within the holder while passing the heating means.

7. Glass-finishing apparatus comprising a carrier, a vertically-movable ware-holder rotatively mounted on the carrier, ware-shaping means, ware-heating means above the carrier and in advance of the shaping means, means for rotating the holder for the heating and shaping operations, and mechanism for moving the holder vertically while the same is rotating.

8. Glass-finishing apparatus comprising ware-transferring mechanism, heating means, a shaping means, a carrier movable past the transfer mechanism heating means and shaping means successively, a ware-holder rotatably mounted on the carrier, and holder-rotating mechanism operative while the holder is passing the heating means and shaping means.

9. In glass-finishing apparatus, a hollow receiver adapted to rotate on a vertical axis, a hollow-ware holder removably fitting within and rotatable with the receiver, and a shaping-tool.

10. Glass-finishing apparatus comprising a horizontally-movable ware-carrier, a vertically reciprocating and rotating shaping-tool, and actuating means common to the carrier and tool for moving the former and for reciprocating and rotating the latter.

11. Glass-finishing apparatus comprising a horizontally-rotatable ware-holder, ware-heating means, a vertically reciprocating and

rotating shaping-tool, and means for rotating the holder at different speeds for the heating and shaping operations.

12. Glass-finishing apparatus comprising a carrier, a series of vertically-movable ware-supports on the carrier, support-elevating means, a shaping-tool, and ware-heating means to which the ware is presented while elevated before reaching the shaping-tool.

13. Glass-finishing apparatus comprising a rotatable ware-carrier, a circular series of vertically-movable ware-supports on the carrier, a cam around which the supports are adapted to be moved by the carrier, support-lifting means in engagement with the cam, and finishing mechanism.

14. Glass-finishing apparatus comprising a rotatable ware-carrier, a circular series of vertically-movable ware-supports on the carrier, support-lifting levers rotatable with the carrier, a cam which the levers are adapted to engage for actuating the same, and ware-finishing means.

15. Glass-finishing apparatus comprising a rotatable ware-carrier, a circular series of ware-supports revolubly mounted on the carrier, support-rotating mechanism common to all of the supports, and ware-finishing means.

16. Glass-finishing apparatus, comprising a rotatable carrier, a circular series of ware-holders rotatably mounted on the carrier, a gear-wheel concentric with the carrier, gearing operatively connecting all of the holders with said gear-wheel, and finishing mechanism.

17. Glass-finishing apparatus comprising a rotatable carrier, a circular series of vertically-movable ware-supports revolubly mounted on the carrier, a gear-wheel concentric with the carrier, gearing interposed between each of said supports and said gear-wheel, a cam around which the supports are moved by the carrier, support-lifting means actuated by said cam, and ware-finishing mechanism.

18. Glass-finishing apparatus comprising a ware-carrier, ware-finishing means, and automatically-operating finished-ware-transferring mechanism which the carrier passes after leaving the finishing means, the transfer mechanism being constructed and arranged to remove the finished ware from the carrier.

19. Glass-finishing apparatus comprising a ware-carrier, ware-finishing means, and an automatically-operating ware-transferring mechanism cooperating with the carrier and constructed and arranged to move the ware to and from the latter.

20. Ware-finishing apparatus comprising a rotatable ware-carrier having a circular series of ware-stations, ware-heating means and ware-shaping mechanism to which the several ware-stations of the carrier are successively presented, and ware-transferring mechanism.

21. Glass-finishing apparatus comprising a

carrier having depressed ware-stations, ware-supports movable vertically in said stations, ware - heating means, ware - shaping mechanism, means for raising the supports after passing the shaping mechanism for the purpose of elevating the ware, and ware - transferring mechanism.

22. Glass-finishing apparatus comprising a carrier having depressed ware-stations, vertically-movable ware-supports in said stations, ware - heating means, ware - shaping mechanism, means for raising the supports before and after passing the shaping mechanism, and ware-transferring mechanism.

23. The combination of two horizontally-separated ware-holding positions or stations, finishing mechanism which includes one of said stations, and vertically and horizontally movable ware-transfer mechanism constructed and arranged to lift ware from one position or station and move it horizontally to and lower it at the other position or station.

24. The combination of glass-finishing mechanism having a ware-support, an unfinished-ware-delivery station, and ware-transfer mechanism constructed and arranged to transfer the unfinished ware from said station to the support of the finishing mechanism.

25. The combination of glass-finishing mechanism, an unfinished-ware-delivery station at one side of the finishing mechanism, and vertically and horizontally movable transfer mechanism constructed and arranged to lift the unfinished ware from said delivery-station and transfer the same to the finishing mechanism.

26. The combination of glass-finishing mechanism, a finished-ware-receiving station apart from the finishing mechanism, and transfer mechanism constructed and arranged to lift the ware from the finishing mechanism and transfer the same to the finished-ware station.

27. The combination of finishing mechanism having an intermittently-movable ware-support, a ware-delivering station, and intermittently-movable ware-transfer mechanism constructed and arranged to transfer the ware from the delivery-station to the ware-support, the movement of the transfer mechanism alternating with the movement of said holder.

28. The combination of finishing mechanism having an intermittently-movable ware-support, a receiving-station, and intermittently-movable ware-transfer mechanism constructed and arranged to transfer the ware from the ware-support to the receiving-station, the movement of the transfer mechanism alternating with the movement of the ware-support.

29. The combination of finishing mechanism having a ware-support, a ware-delivering station, a ware-receiving station, and ware-transferring mechanism interposed between the support and said stations and constructed and arranged to transfer ware from the de-

livery-station to said support and to transfer the ware from the support to the receiving-station.

30. The combination of finishing mechanism having a ware-carrier, a ware-delivering station, a ware-receiving station, and rotatable transfer mechanism positioned between the finishing mechanism and said stations, said mechanism having four outwardly-projecting ware-supports adapted to turn above the carrier and said stations.

31. The combination of finishing mechanism having a ware-support, a ware-station adjacent said support, and vertically and horizontally-movable ware-grasping mechanism adapted to grasp the ware and move the same between the support and said station.

32. The combination of finishing mechanism having a ware-support, ware delivering and receiving stations, and transfer mechanism rotatable between the finishing mechanism and said stations, the transfer mechanism having outwardly-projecting automatically-operating ware-grasping devices adapted to move the ware between the support and said stations.

33. The combination of finishing mechanism having a ware-support, ware delivering and receiving stations, and vertically-movable and horizontally-rotatable transfer mechanism adapted to overhang the support and said stations, said transfer mechanism having automatically-operating ware-grasping devices adapted to move the ware between the support and said stations.

34. The combination of finishing mechanism having a ware-support, ware delivering and receiving stations, and vertically-movable and horizontally-rotatable transfer mechanism overhanging the finishing mechanism and said stations, the transfer mechanism having projecting ware-grasping tongs adapted to grasp the ware and move it between the support and said station, and means for operating said tongs.

35. The combination of ware-finishing mechanism which includes a carrier having ware-stations, ware delivering and receiving stations adjacent the carrier, and rotatable transfer mechanism having four outwardly-projecting ware-sustaining devices movable over all of said stations, and operating means for said devices constructed and arranged to cause the diametrically opposite devices to sustain the ware and the other diametrically opposite devices to release the ware.

36. The combination of ware-finishing mechanism which includes a carrier having ware-stations, ware delivering and receiving stations adjacent the carrier, and rotatable transfer mechanism having outwardly-projecting ware-sustaining devices movable over all of said stations, and operating means for said devices whereby two of said devices simultaneously engage articles on the carrier

and the delivery-table and two other of said devices release ware on the carrier and at the said receiving-station, and vice versa.

37. The combination of finishing mechanism having a ware-support, ware delivering and receiving stations adjacent the support, and transferring mechanism having ware-grasping devices adapted to move over the support and said stations, means for causing two of said devices to simultaneously grasp ware on the support and at one of said stations, and operating means for the transfer mechanism constructed and arranged to elevate, turn, and lower the transfer mechanism while thus grasping the ware.

38. The combination of a ware-support, ware delivering and receiving stations, transfer mechanism having outwardly-projecting devices adapted to overhang the support and said stations, each of said devices being adapted to close and open for the purpose of grasping and releasing the ware, operating means adapted to cause two of said devices to grasp ware on the support and one of said stations, and means for elevating, turning, and lowering the transfer mechanism while the ware is thus held.

39. The combination of ware-finishing mechanism, and vertically and horizontally movable ware-transferring mechanism adapted to move the ware with relation to the finishing mechanism.

40. The combination of finishing mechanism having depressed ware-holding stations, and vertically and horizontally movable ware-transferring mechanism adapted to move the ware vertically and horizontally with relation to the finishing mechanism.

41. The combination of separated ware-stations, finishing mechanism which includes one of said stations, transfer mechanism adapted to turn on a vertical axis, the transfer mechanism having projecting ware-sustaining devices adapted to move the ware from one station to another, and means for raising and lowering the transfer mechanism.

42. The combination of ware-stations, finishing mechanism which includes one of said stations, transfer mechanism having outwardly-projecting ware-clasping devices adapted to close and open for engaging and disengaging the ware, operating means for moving the supports vertically and horizontally with relation to the stations, and means operating to open and close the ware-clasping devices while the latter are in lowered position.

43. The combination with ware-finishing mechanism, of ware-transferring mechanism comprising a movable support, ware-clasping devices carried by and projecting from the support, and operating means for said devices.

44. The combination with ware-finishing mechanism, of ware-transferring mechanism

comprising a movable support, ware-grasping tongs carried by and movable with the support, and means operating to engage and disengage the tongs from the ware.

45. The combination with ware-finishing mechanism, of ware-transferring mechanism comprising a movable support, and ware-grasping devices carried by and projecting from the support, each of said devices consisting of cooperating spring-arms adapted normally to spring toward each other for grasping the ware, and means for springing the said arms apart for releasing the ware.

46. The combination of ware-finishing mechanism, a carrier therefor having depressed ware-stations, vertically-movable ware-sustaining bottoms for said stations, and ware-transferring mechanism.

47. The combination of finishing mechanism, a horizontally-movable ware-carrier therefor, transfer mechanism, means for moving the transfer mechanism horizontally simultaneously with the movement of the carrier, and mechanism for moving the transfer mechanism vertically while the carrier is at rest.

48. The combination of ware-finishing mechanism, a carrier therefor, transfer mechanism, actuating mechanism for imparting intermittent horizontal movement to the carrier and transfer mechanism simultaneously, and means for raising and lowering the transfer mechanism while the carrier is at rest.

49. The combination of ware-finishing mechanism, a carrier therefor, transfer mechanism including a plurality of outwardly-projecting ware-gripping devices adapted to close and open for engaging and releasing the ware, mechanism for imparting intermittent movement simultaneously to the carrier and transfer mechanism in a horizontal direction, means for moving the transfer mechanism vertically while the carrier is at rest, and means operative when the transfer mechanism is in lowered position for closing certain of said ware-gripping devices and for opening other of said devices.

50. The combination of finishing mechanism, a horizontally-rotatable ware-carrier therefor, a horizontally-rotatable transfer mechanism having radially-projecting ware-gripping devices movable over the carrier and adapted to close and open for engaging and disengaging the ware, means for intermittently and simultaneously rotating the carrier and transfer mechanism, means for raising and lowering the transfer mechanism while the carrier is at rest, and means for closing and opening the ware-gripping devices of the transfer mechanism while the latter is in lowered position.

51. The combination of ware-finishing mechanism, a carrier therefor having ware-receiving depressions, ware-supports movable

vertically in the carrier depressions, and transfer mechanism constructed and arranged to deposit ware on said supports while they are in raised position.

5 52. The combination of ware - finishing mechanism, a carrier therefor having ware-receiving depressions, ware-supports movable vertically in the carrier depressions, and transfer mechanism constructed and arranged
10 to engage and remove ware from said supports while they are in raised position.

53. The combination of ware - finishing mechanism, a carrier therefor having ware-receiving depressions, ware-supports movable
15 vertically in the carrier depressions, transfer mechanism having a plurality of ware-carrying devices, and operating means for the carrying devices constructed and arranged to release an article positioned over one of said

supports and to simultaneously engage an article positioned on another support. 20

54. The combination of ware - finishing mechanism, a carrier therefor having ware-receiving depressions, ware-supports movable vertically in the depressions, a series of horizontally-rotatable ware-gripping devices movable over the depressions, and operating means for said devices constructed and arranged to release an article positioned over one of said supports and to engage for subsequent removal an article on another of said supports. 25 30

In testimony whereof I affix my signature in presence of two witnesses.

FRANK O'NEILL.

Witnesses:

EDWARD F. STEEN,
HENRY WIESHMANN.