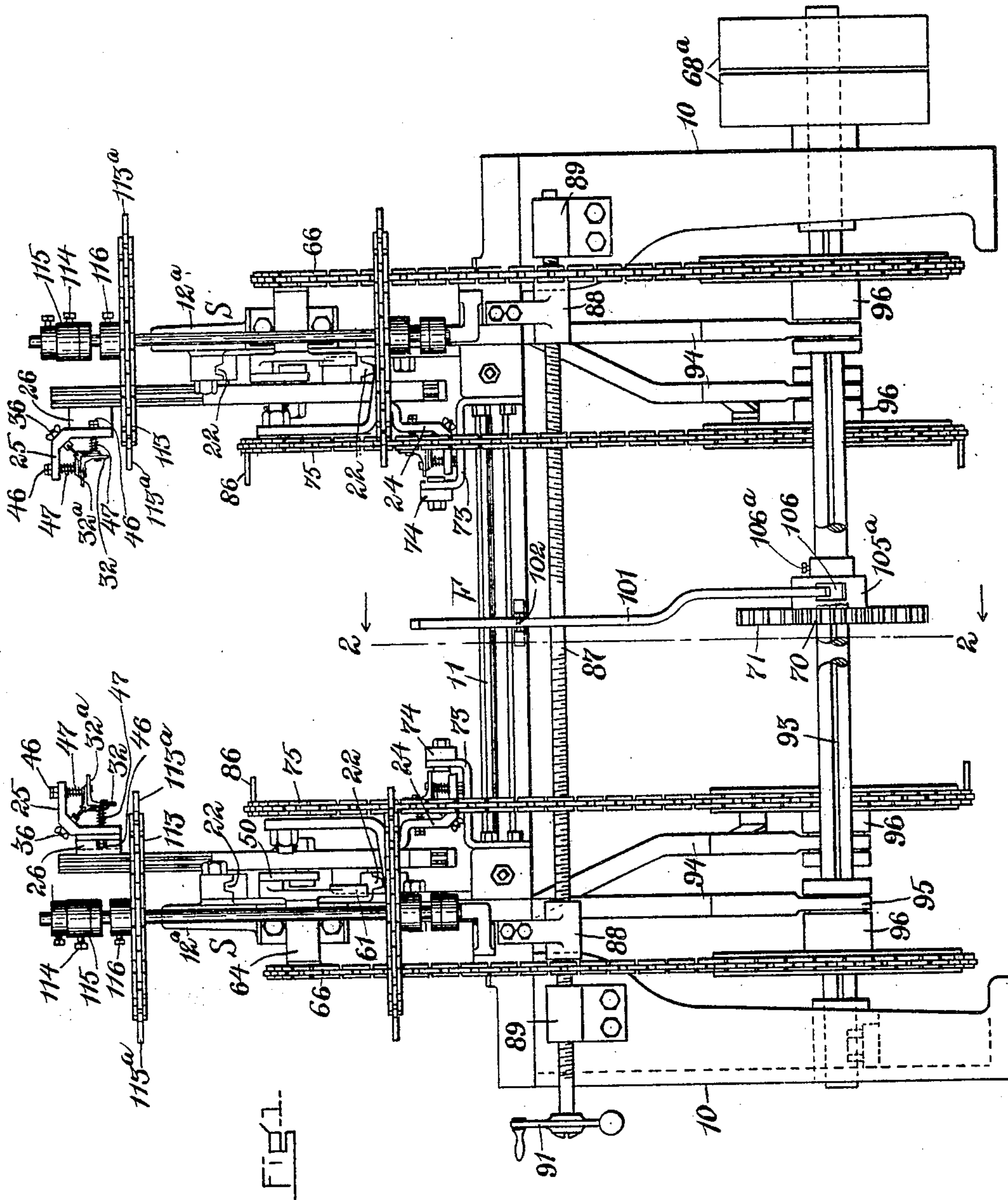


No. 800,836.

PATENTED OCT. 3, 1905.

W. S. SMITH.
SMOOTHING MACHINE.
APPLICATION FILED APR. 11, 1904.

4 SHEETS—SHEET 1.



Witnesses.

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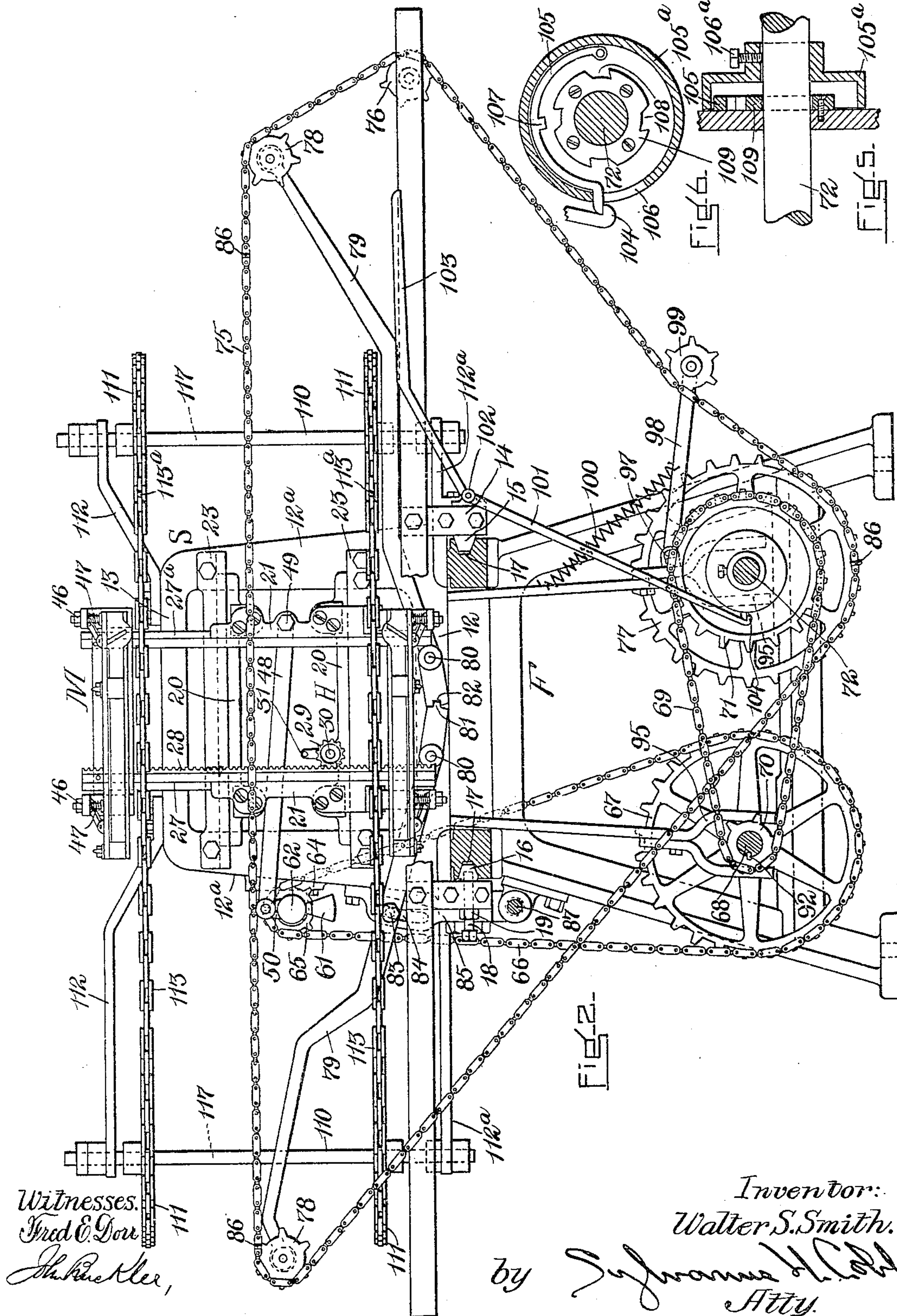
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APPLICATION FILED APR. 11, 1904.

4 SHEETS—SHEET 2.



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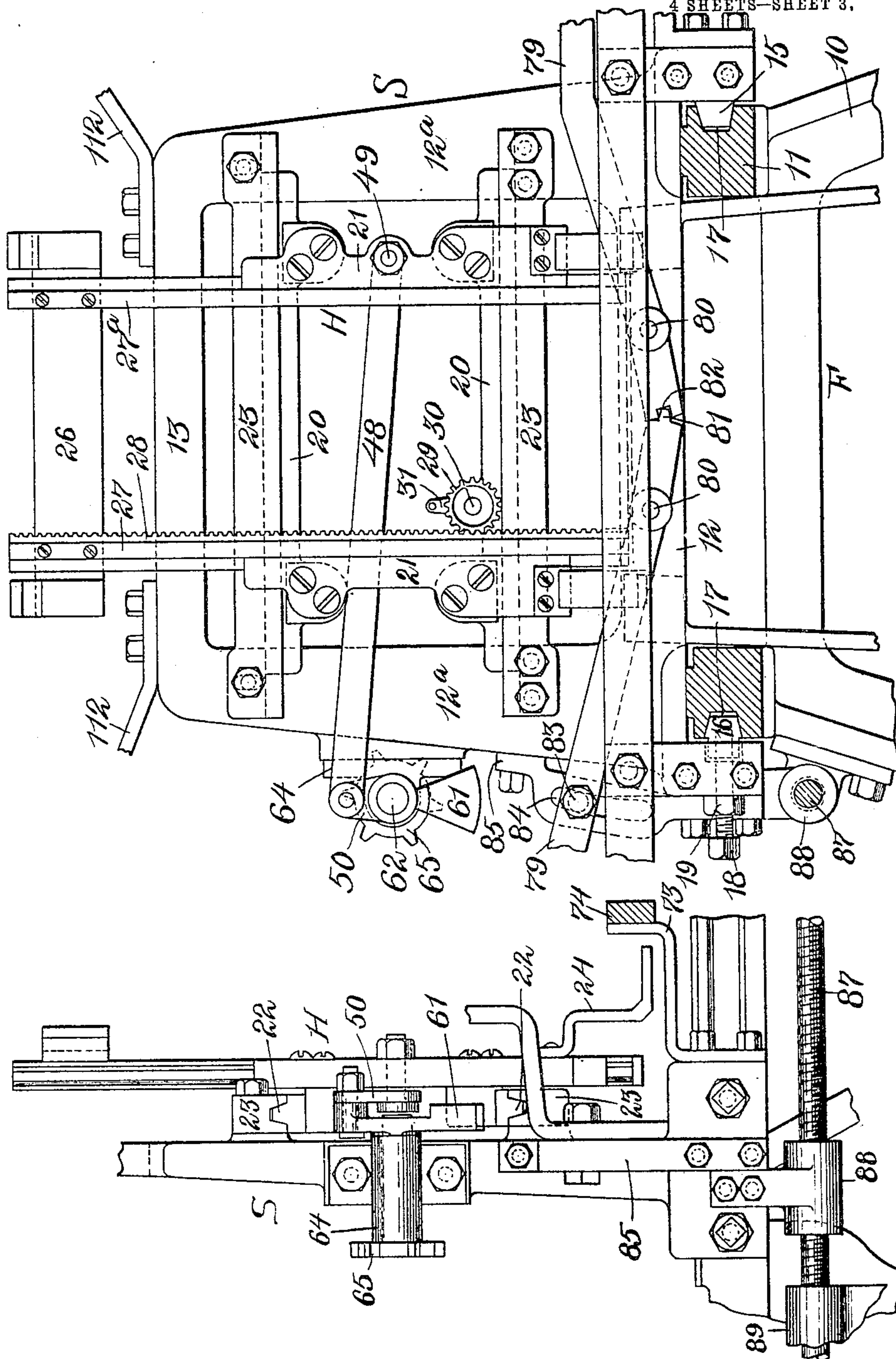
PATENTED OCT. 3, 1905.

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APPLICATION FILED APR. 11, 1904.

4 SHEETS—SHEET 3.

Fig. 3

Fig. 4.



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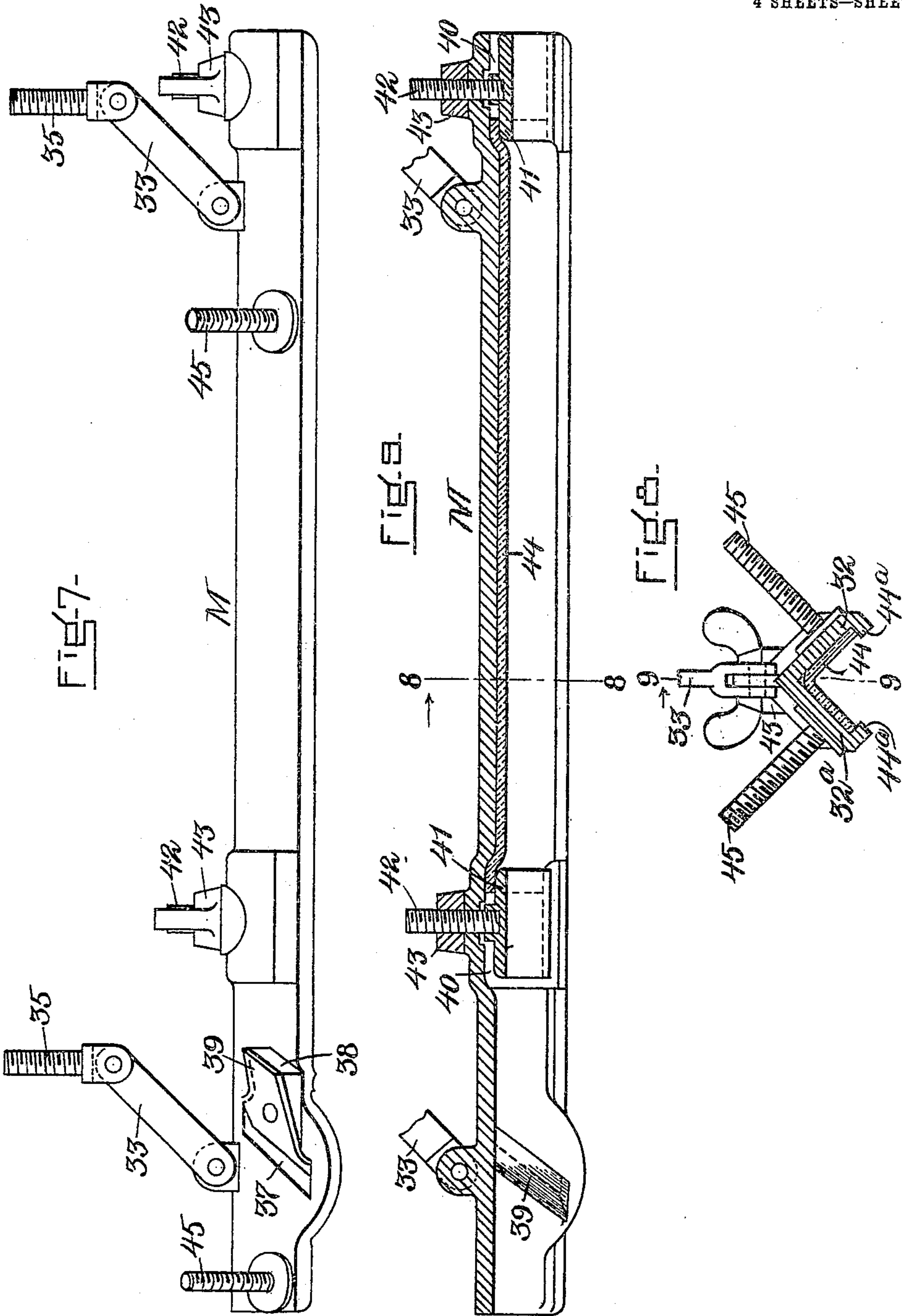
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UNITED STATES PATENT OFFICE.

WALTER S. SMITH, OF BOSTON, MASSACHUSETTS.

SMOOTHING-MACHINE.

No. 800,836.

Specification of Letters Patent.

Patented Oct. 3, 1905.

Application filed April 11, 1904. Serial No. 202,663.

To all whom it may concern:

Be it known that I, WALTER S. SMITH, a citizen of the United States, residing at Boston, in the county of Suffolk and State of Massachusetts, have invented a new and useful Improvement in Smoothing-Machines, of which the following is a specification.

My invention relates to machines for smoothing the surfaces of various objects, being particularly adapted for use in finishing the corners of such prismatic articles as boxes, and has for its object the provision of an efficient machine of this class.

It consists in the various features and combinations hereinafter described and more particularly claimed.

In the accompanying drawings, Figure 1 is an end elevation of one embodiment of my invention. Fig. 2 is a longitudinal vertical section therethrough on the line 2 2 of Fig. 1. Fig. 3 is an enlarged side elevation of the reciprocating head and more closely associated supporting and actuating parts. Fig. 4 is an end elevation thereof. Figs. 5 and 6 are respectively transverse and longitudinal sections through a driving-clutch. Fig. 7 is a side elevation of one of the smoothing members. Fig. 8 is a transverse section there-through at the line 8 8 of Fig. 9, and Fig. 9 is a full longitudinal section on the line 9 9 of Fig. 8.

Similar characters indicate like parts throughout the several figures of the drawings.

The letter F designates a frame composed of opposite side pieces 10 10, connected by cross-bars 11 11. Upon this frame are supported standards S S, conveniently made up of bases 12, from each end of which rise uprights 12^a, connected by a top bar 13, the whole being of generally rectangular form. From each end of the standards depends a portion 14, from which wedges or generally V-shaped bearing-blocks 15 16 project inwardly. These bearing-blocks coact with grooves 17 of similar form situated in the outer side of each cross-bar, forming ways to allow a transverse movement of the standards. The block 15 may be rigidly secured to the portion 14, while the companion block 16 is preferably carried upon the end of a screw 18, threaded through the member 14 and retained in position by a lock-nut 19. This permits a relative adjustment of the blocks and the taking up of any wear which may occur in the ways.

Each of the standards S carries a head H, conveniently formed of longitudinal bars 20 fastened together by opposite connecting-bars 21. The bars 20 are shown as provided at their outer sides with generally V-shaped projections 22, which operate in grooves or ways in adjacent faces of bars 23 23, bolted or otherwise secured near the top and bottom of the standard, the arrangement being such that the head is allowed to slide freely in said ways. Each head has mounted upon it pairs of oppositely-situated angular brackets 24 25, the first of which are located at the lower portion and may be screwed or otherwise secured thereto, while the second are preferably mounted upon a tie-bar 26, uniting the upper portion of vertical carrying-bars 27 27^a, which conveniently slide in the ways formed in the connecting-bars 21. The bar 27 is here shown as provided with a rack 28, with which meshes a pinion 29, fast upon a shaft 30, journaled in the lower bar 20 of the head and provided with a crank 31. Upon turning this crank the carrying-bars may be raised or lowered together, thus varying the extent of separation of the upper and lower brackets.

Upon each pair of brackets are carried smoothing members M, situated substantially at the corners of a quadrangle and each of which preferably consists of an elongated holder made up of diverging arms 32 32^a, which permit the members to operate upon a plurality of adjacent sides of an object. These arms form with one another an angle of preferably somewhat greater extent than ninety degrees and carry the element or elements which are to directly perform the smoothing operation. The first of these arms extends along the head substantially parallel thereto, and the other, 32^a, projects toward the opposite head and smoothing member. Each of the holders is supported upon pairs of links 33 33, which are pivoted to said holders at the intersection of the arms and to studs 35, which may take through holes at the corners of the brackets and be retained in place by thumb-nuts 36 upon the outer side. These links lie at an angle of substantially forty-five degrees with the plane of the head and the sides of the brackets and are preferably of equal length, so that when the holders are moved inwardly or outwardly a condition of parallelism with the axis of the machine and the edges of work moving therethrough will be maintained. Near the forward end

of each arm of the holders is situated an inclined opening 37, to the rear of which is a support or table 38, upon which may be secured blades 39, having their cutting edges projecting through the opening at the inner or operating face of the holder-arm. Beyond and to the rear of these blades are depressions 40, preferably two in number, in which are seated V-shaped clamps 41, preferably corresponding in angle to that of the arms of the holders and maintained in place by threaded studs 42, projecting through the apex of the angle of the holder and having at the outside retaining-nuts 43. Beneath these clamps may be held a section of abrasive material 44, which may be of sandpaper, roughened metal, or in any other convenient form. Along the outer edge of each arm of the holder may extend a stop-flange 44^a, projecting to such a distance therefrom that while it allows the abrasive surface to properly act upon the corner of the object it prevents by its contact the removal of an excessive amount of material. From each arm of the holder near the opposite ends project threaded studs 45, preferably passing through openings in the bracket-arms and having at the outside of said brackets nuts 46 to limit their movement. Between the holder-arms and the bracket encircling the studs are shown springs 47, the upper pair of which normally forces the smoothing member downward and the lower of which forces it inward, so that the resultant movement under the control of the pivoted links is toward the central axis along which the work passes.

Each head and its attached smoothing members are given reciprocatory movement at an angle to the direction of extension of the holder-arms by means of connecting-rods 48, pivoted at one extremity to one of the bars 21 at 49 and at the other end articulated to a crank 50, preferably provided with a counterweight 61 to balance it and fixed upon a shaft 62, journaled in a bearing 64, screwed to one of the vertical members of the standard. Fast upon the shaft 62 is a sprocket 65, from which a chain 66 passes over a larger sprocket 67 upon a shaft 68, journaled in the side frames of the machine. Upon this shaft 68 are fast and loose pulleys 68^a, by which it is rotated at the desired speed from some suitable source of power. On the shaft 68 is a small sprocket 70, from which a chain 69 passes over a large sprocket 71, fixed upon a shaft 72, also journaled in the side frames, and actuating the carrier mechanism, which will now be described.

Upon the depending portions of each standard are mounted brackets 73, to which are secured longitudinally-extending work supports or bars 74, which form a track upon which the work may be placed and moved from one end of the machine to the other. To effect this movement, a carrier is provided at each side of the track, preferably consisting of an endless chain 75, passing over a sprocket 76,

rotatably mounted upon the forward end of the track-bar, then beneath a large sprocket 77 upon the shaft 72, and over small sprockets or supports 78 78, rotatably mounted upon the ends of arms 79 79, each of which is pivoted at 80 upon the under side of the standard. These arms are connected to move together to simultaneously adjust different portions of the chains by a projection 81 upon the end of one of them, which enters a recess 82 in the end of the other. The arms are retained in the desired position by a bolt 83, passing through a hole in one of the arms and through a slot 84 in a retaining member or bracket 85, fastened to the side of the standard. By adjusting these arms in one direction or the other the upper run of the chain, which is substantially horizontal and parallel to the tracks, may be raised or lowered to provide for its proper engagement with objects of various heights. Upon the carrier-chains are projections 86, extending toward the opposite chain and separated upon one another by such a distance that when one of them is starting an object in its movement through the machine the next rearward projection will be delivering the work which has been operated on at the other end.

To adjust the heads and their attached smoothing members to provide for their proper operation upon objects of different widths, the standards are movable in their supporting-ways by a shaft 87, oppositely threaded at its ends, said threaded portions being engaged by correspondingly-threaded nuts 88, which are secured to the lower portion of the standards. This threaded shaft is journaled in bearings 89, fixed to the side frames, and may be rotated by a hand-wheel 91, attached to one end. This effects a simultaneous movement of the standards and maintains constant their relative positions with regard to the bars 74. To prevent this transverse movement of adjustment from disturbing the relation of the gearing, the sprockets 67 and 77 are mounted to slide upon their shafts, being provided with keys 92, which engage keyways 93, extending longitudinally of said shafts. The sprockets may conveniently be moved along the shafts with the standards by arms 94, which are provided with forked ends 95, conveniently engaging annular grooves in hubs 96 of the sprockets. Upon each of the forward pairs of these arms 94 is preferably pivoted at 97 an arm 98, carrying rotatably mounted upon its outer end a sprocket 99, which may be yieldably forced into engagement with the carrier-chain at that side of the machine to take up the slack by a suitable spring 100, secured to said pivoted arm and the arm 94.

It may be desirable to automatically control the movement of the work through the machine by an intermittent advance of the carriers, and for this purpose a controlling-lever 101 may be provided fulcrumed at 102

and lying with its upper end extending horizontally at 103 in substantially the central line of machine at the feed end. Its opposite end is shown as provided with a hook 104, which is in a position to coact with an arm 105, pivotally mounted upon the interior of a casing 105^a and extending through a slot 106 in the peripheral wall thereof. This casing is fixed upon the shaft 72 by some such means as a set-screw 106^a. The arm 105 is shown as provided with a projection 107, which may coact with one of a series of notches 108, arranged about the periphery of a disk 109, which is secured to the face of the sprocket 71. The outer end of the lever 101 normally projects far enough above the tracks so that it lies in the path of the work and is depressed by the weight thereof, and when this occurs the hook is disengaged from the end of the arm 105, allowing it to drop and enter one of the notches in the disk 109, which is being constantly rotated by the chain 69, which passes over its sprocket. This engagement compels the rotation of the shaft 72 and starts both the carriers in operation, this continuing until a complete rotation of the clutch has been made, when the end of the arm will be again engaged by the hook, this in the meantime having returned to its normal position when the weight of the box has been removed from it. The single rotation of the driving-shaft is sufficient to carry the object through the machine and complete one smoothing operation.

At each side of the path of the work and near each extremity of the machine are located supports which in the present instance consist of vertical shafts 110, carrying sprockets 111 near their upper and lower ends and journaled in generally horizontally extending arms 112 112^a, secured at the upper and lower portion of the standards, respectively. Over these sprockets pass endless members or chains 113, provided with inwardly-extending separated projections 113^a, so situated that they will press against the opposite side of the object operated upon from that with which the carrier projections coact. The movement of each chain, which is independent of the positively-driven portions of the machine, is resisted by a brake mechanism which, as shown, consists of a set-screw 114, threaded through a bearing-sleeve 115, formed with or secured to the arm 112 and having its inner end contacting with the shaft. The extent to which these set-screws are pressed against the shafts will vary the resistance of the supports to rotation, and therefore the resistance of the chains, and this may be so adjusted that the work will be retained against movement upon the tracks under the reciprocation of the smoothing member. It will be seen that the lower of these retaining-chains on account of their relation to the tracks will be at the same distance from the

under side of the work whatever its size. To permit the upper chains to be similarly situated with regard to the upper side, their supporting-sprockets are made adjustable along their shafts by means of set-screws 116, threaded through the sprocket-hubs and engaging said shaft. The ends of the set-screws preferably enter longitudinally-extending splines 117 in the shafts, thus maintaining a constant relation between the projections on the chains 75 and 113 to provide for their proper coöperation with the work.

In the operation of the machine the attendant places the box or other object which is to be smoothed upon the tracks and presses it forward until the actuating-lever is displaced by its weight. This releases the clutch, as has been previously described, and starts the movement of the carrier and the box in its travel through the machine. As it enters between the smoothing members, which have been previously adjusted so that they will bear substantially the same relation to each corner, the operating-faces of the holders are permitted by the springs to yield outwardly and will thus adapt themselves to the box and still be firmly pressed against it. Then under the rapid reciprocation of the members the knives will first remove the more prominent projections, such as the ends of tenons or particles of exuded glue, and cut them off. Then as the box advances the surface will be subjected to the action of the abrasive material which completes the smoothing operation. This movement will continue until the discharge end of the machine is reached, when it stops automatically through the reengagement of the controlling-lever and clutch-arm, and the box may be removed by the attendant.

I wish it distinctly understood that in employing in the description and claims such terms as "smoothing member" I in no sense limit myself to the use of cutting-blades or any particular form of abrading or reducing member, but that I intend them to comprehend any element adapted to properly remove material and effect the desired result. Moreover, my invention is applicable to many objects and is by no means confined in its operation to boxes or to working upon wood.

Having thus described my invention, I claim—

1. The combination with a work-support, of a plurality of reciprocatory smoothing members situated at each side of and at different distances above said support, and opposite endless carriers operating between the smoothing members.

2. The combination with a work-support, of a plurality of reciprocatory smoothing members situated at each side of and at different distances above said support, opposite endless carriers operating between the smoothing members, and means for adjusting the

smoothing members with relation to the support.

3. In a smoothing-machine, the combination with a plurality of reciprocatory holders having arms lying at an angle with one another and extending upon opposite sides of the objects to be operated upon, said arms being provided with abrasive surfaces, of means for moving said objects in coaction with the abrasive surfaces.

4. In a smoothing-machine, the combination with a reciprocatory holder having arms lying at an angle with one another and being provided with abrasive surfaces, of knives carried by the arms, and means for moving objects in coaction with the abrasive surfaces and knives.

5. In a smoothing-machine, the combination with a reciprocatory holder having arms lying at an angle with one another and provided with depressions, of angular clamps seated in the depressions, said depressions and clamps being adapted to retain a smoothing element, and means for moving objects in proximity to the holders.

6. In a smoothing-machine, the combination with a reciprocatory holder having arms lying at an angle with one another, abrasive material covering the adjacent faces of the arms, stop-flanges situated at the outer edge of each arm and extending beyond the abrasive material toward the work, and means for moving said work in coaction with the abrasive material.

7. The combination with oppositely-situated pairs of smoothing members, each member of said pair being adapted to operate upon a plurality of adjacent sides of an object, of means for simultaneously moving each of said pairs with relation to the companion pair.

8. The combination with a reciprocatory smoothing member, of a carrier for moving objects in coaction with the smoothing member and operating between opposite faces of said objects, and means for varying the position of the carrier with relation to the adjacent edges of the objects.

9. The combination with separated reciprocatory smoothing members, of a carrier located between the smoothing members and traveling in the direction of reciprocation of the smoothing members, means for moving the smoothing members toward and from one another, and means for adjusting the position of the carrier toward either smoothing member.

10. In a smoothing-machine, the combination with a reciprocatory head, of a holder adapted to receive a smoothing member carried thereby and having arms extending along said head and at an angle thereto, and yieldable means for permitting the holder to move both from and along the head.

11. In a smoothing-machine, the combination with a reciprocatory head, of a holder

adapted to receive a smoothing member carried thereby and having arms extending along said head and at an angle thereto, means for permitting the holder to move both from and along the head, and yieldable means for forcing the holder in both directions.

12. In a smoothing-machine, the combination with a reciprocatory head, of means for feeding work in proximity thereto, a holder elongated in the direction of reciprocation and feed and adapted to receive a smoothing element, and links pivoted to the head and to the holder near opposite ends.

13. In a smoothing-machine, the combination with a reciprocatory head, of means for feeding work in proximity thereto, a holder elongated in the direction of reciprocation and feed and adapted to receive a smoothing element, and links of equal length pivoted to the head and to the holder near opposite ends and maintaining parallelism between the holder and moving work.

14. In a smoothing-machine, the combination with a reciprocatory head, of an elongated holder having angular arms, each adapted to receive a smoothing element, and links pivoted to the head and to the holder near opposite ends and at the juncture of the arms thereof.

15. In a smoothing-machine, the combination with a reciprocatory head, of an elongated holder adapted to receive a smoothing element, links pivoted to the head and to the holder near opposite ends and permitting a longitudinal movement of the latter, and springs situated between the head and holder.

16. In a smoothing-machine, the combination with a reciprocatory head, of an elongated holder having angular arms, each adapted to receive a smoothing element, links pivoted to the head and to the holder near opposite ends and at the juncture of the arms thereof, and springs situated between the head and each side of the holder.

17. In a smoothing-machine, the combination with a reciprocatory head, of a holder fixed thereto, a rack sliding in the head, a holder mounted upon said rack, and a pinion engaging the rack, each of the holders being adapted to receive a smoothing element.

18. In a smoothing-machine, the combination with a support, of opposite standards mounted thereon, means for moving the standards toward and from one another, a head movable upon each standard, a smoothing member carried upon each head and adapted to operate upon a plurality of adjacent sides of an object, and means for reciprocating the heads to perform the smoothing operation.

19. In a smoothing-machine, the combination with a support, of opposite standards mounted thereon, means for simultaneously moving the standards toward and from one another, a head movable upon each standard, a holder carried upon each head and having

angular arms adapted to receive smoothing elements, and means for reciprocating the heads to perform the smoothing operation.

20. In a smoothing-machine, the combination with a support, of opposite standards mounted thereon, means for moving the standards toward and from one another, a head movable upon each standard, pairs of separated smoothing members carried by each standard and having portions extending toward one another and toward the opposite standard, and means for reciprocating the heads.

21. In a smoothing-machine, the combination with a support, of opposite standards mounted thereon, means for moving the standards toward and from one another, a head movable upon each standard, pairs of separated smoothing members carried by each standard and each having faces extending at an angle to one another, and means for reciprocating the heads.

22. In a smoothing-machine, the combination with a support, of opposite standards mounted thereon, means for moving the standards toward and from one another, a head movable upon each standard, pairs of separated smoothing members carried by each standard, means for reciprocating the heads, and means for adjusting the smoothing members upon the heads.

23. In a smoothing-machine, the combination with a support, of opposite standards mounted thereon, means for moving the standards toward and from one another, a head movable upon each standard, smoothing members fixed to the heads, carrier-bars mounted upon the heads, smoothing members supported upon the carrier-bars, and means for reciprocating the heads.

24. In a smoothing-machine, the combination with a support, of opposite standards mounted thereon, means for moving the standards toward and from one another, a head movable upon each standard, smoothing members fixed to the heads, carrier-bars mounted upon the heads, smoothing members supported upon the carrier-bars, means for reciprocating the heads, and means for reciprocating the carrier-bars.

25. In a smoothing-machine, the combination with a support, of opposite standards mounted thereon, means for moving the standards toward and from one another, a head movable upon each standard, a smoothing member fixed to each head, a plurality of carrier-bars mounted upon each head, tie-bars connecting the carrier-bars, smoothing members mounted upon the tie-bars, and means for reciprocating the heads.

26. In a smoothing-machine, the combination with a support, of opposite standards mounted thereon, means for moving the standards toward and from one another, a head movable upon each standard, smoothing mem-

bers fixed to the heads, carrier-bars mounted upon the heads and having racks, pinions meshing with the racks, smoothing members supported upon the carrier-bars, and means for reciprocating the heads.

27. In a smoothing-machine, the combination with a frame, of a standard mounted to slide thereon, a reciprocatory head carried by the standard, a bracket fixed to the head, and a second bracket adjustable with relation to its companion, each of the brackets having means for supporting a smoothing member.

28. In a smoothing-machine, the combination with a frame, of oppositely-situated standards mounted to slide thereon, oppositely-threaded nuts fixed to the standards, a screw journaled in the frame and cooperating with the nuts, a reciprocatory head carried by each standard, a bracket fixed to each head, and a second bracket adjustable with relation to its companion, each of the brackets having means for supporting a smoothing member.

29. The combination with reciprocatory smoothing mechanism, of a carrier for the work, rotatable supports at each side of said work, and an endless resisting member carried by the supports and adapted to press against the work and being movable thereby.

30. The combination with reciprocatory smoothing mechanism, of a carrier for the work, rotatable supports at each side of said work, an endless member carried by the supports and adapted to press against the work, and means operating upon the supports for resisting their rotation.

31. A smoothing member comprising a holder having an opening through which extends a cutting-blade and having clamps for an abrasive member.

32. The combination with a work-support, of a pair of reciprocatory smoothing members situated at each side of and at different distances above said support, opposite endless carriers operating between the smoothing members, and means for moving the pairs of smoothing members toward and from one another.

33. The combination with a work-support, of a pair of reciprocatory smoothing members situated at each side of and at different distances above said support, opposite endless carriers operating between the smoothing members, and means for moving one of each pair of smoothing members toward its companion.

34. In a smoothing-machine, the combination with a reciprocatory head, of a holder having elongated diverging arms, and links pivoted to the head and at the intersection of the arms.

35. In a smoothing-machine, the combination with a work-support, of a reciprocatory head, a holder having elongated diverging arms, and links of equal length pivoted to the head and at the intersection of the arms and

maintaining the holder in parallelism with the work-support.

36. In a smoothing-machine, the combination with a work-support, of a reciprocatory head, an elongated holder, and links pivoted to the head and holder and lying at an acute angle to the head and to the work-support.

37. In a smoothing-machine, the combination with a support, of opposite standards mounted thereon, means for simultaneously moving the standards toward and from one another and maintaining their relative positions with regard to the support, a head movable upon each standard, a holder carried upon each head, and means for reciprocating the heads.

38. In a smoothing-machine, the combination with a support, of opposite standards mounted thereon, means for moving the standards toward and from one another, a head movable upon each standard, an elongated

smoothing member carried upon each head, and means for reciprocating the heads in the direction of elongation of the smoothing members.

39. In a smoothing-machine, the combination with a support, of opposite standards mounted thereon, means for simultaneously moving the standards toward and from one another, a head movable upon each standard, a holder carried upon each head and having elongated angular arms upon which smoothing elements may be fixed, and means for reciprocating the heads.

Signed at Boston, in the county of Suffolk and State of Massachusetts, this 30th day of January, 1904.

WALTER S. SMITH.

Witnesses:

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