

W. E. NICKERSON.
STACKING MACHINE.

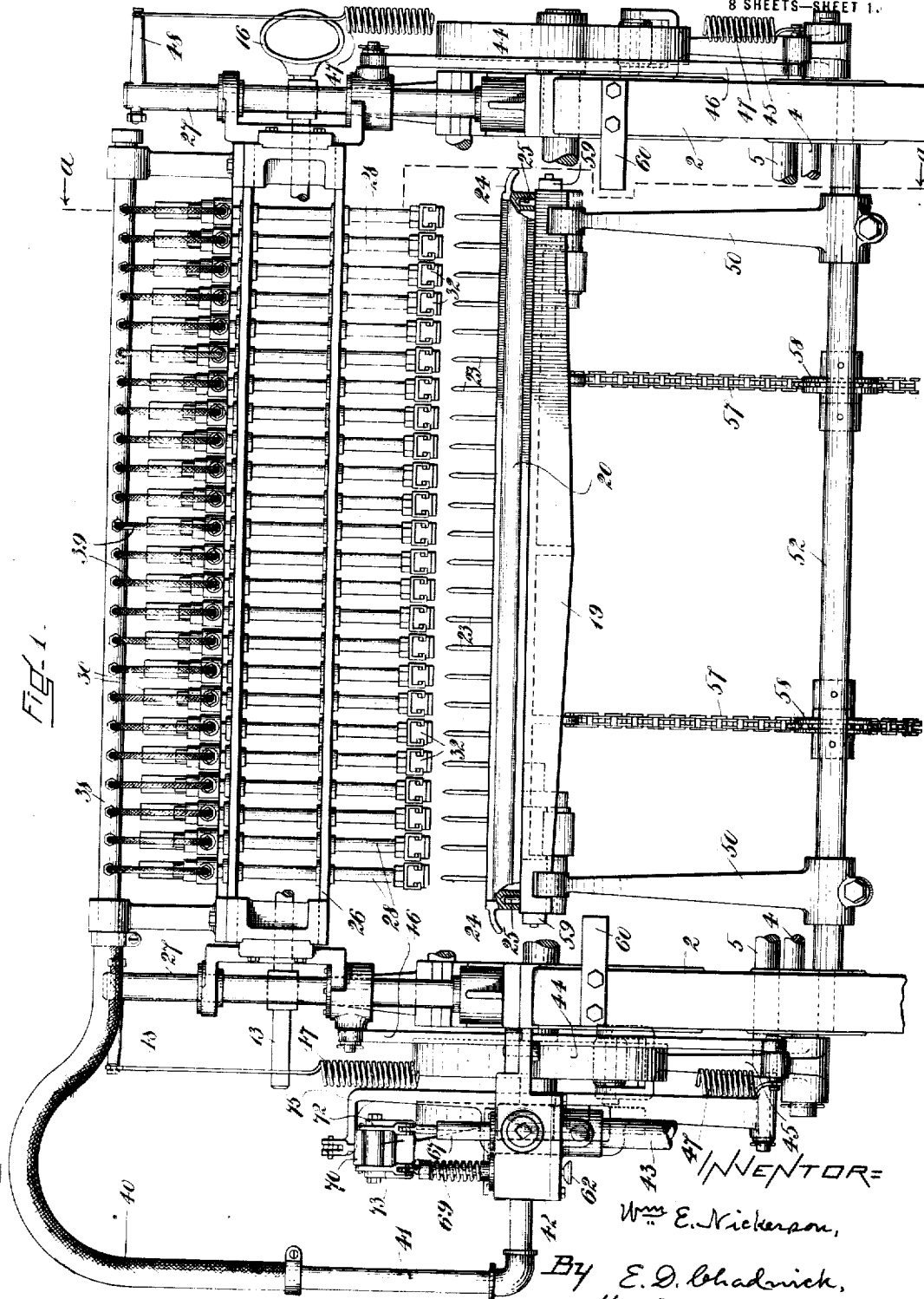
APPLICATION FILED DEC. 31, 1917

Patented Nov. 5, 1918.

1,283,873.

8 SHEETS—SHEET 1.

Fig. 1.



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 8 SHEETS—SHEET 2.

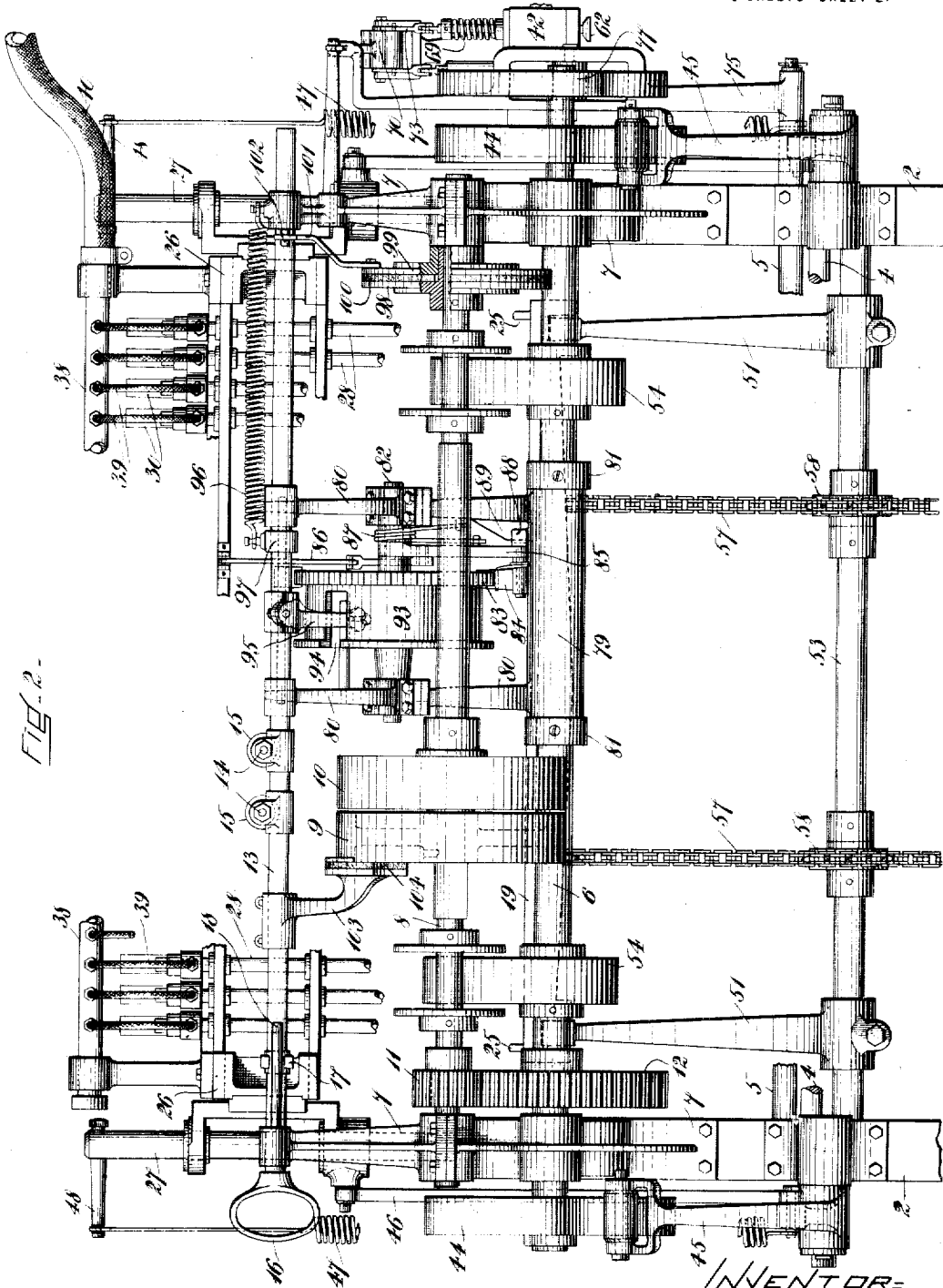


FIG. 2.

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 BY E. D. Chadwick,
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8 SHEETS—SHEET 3.

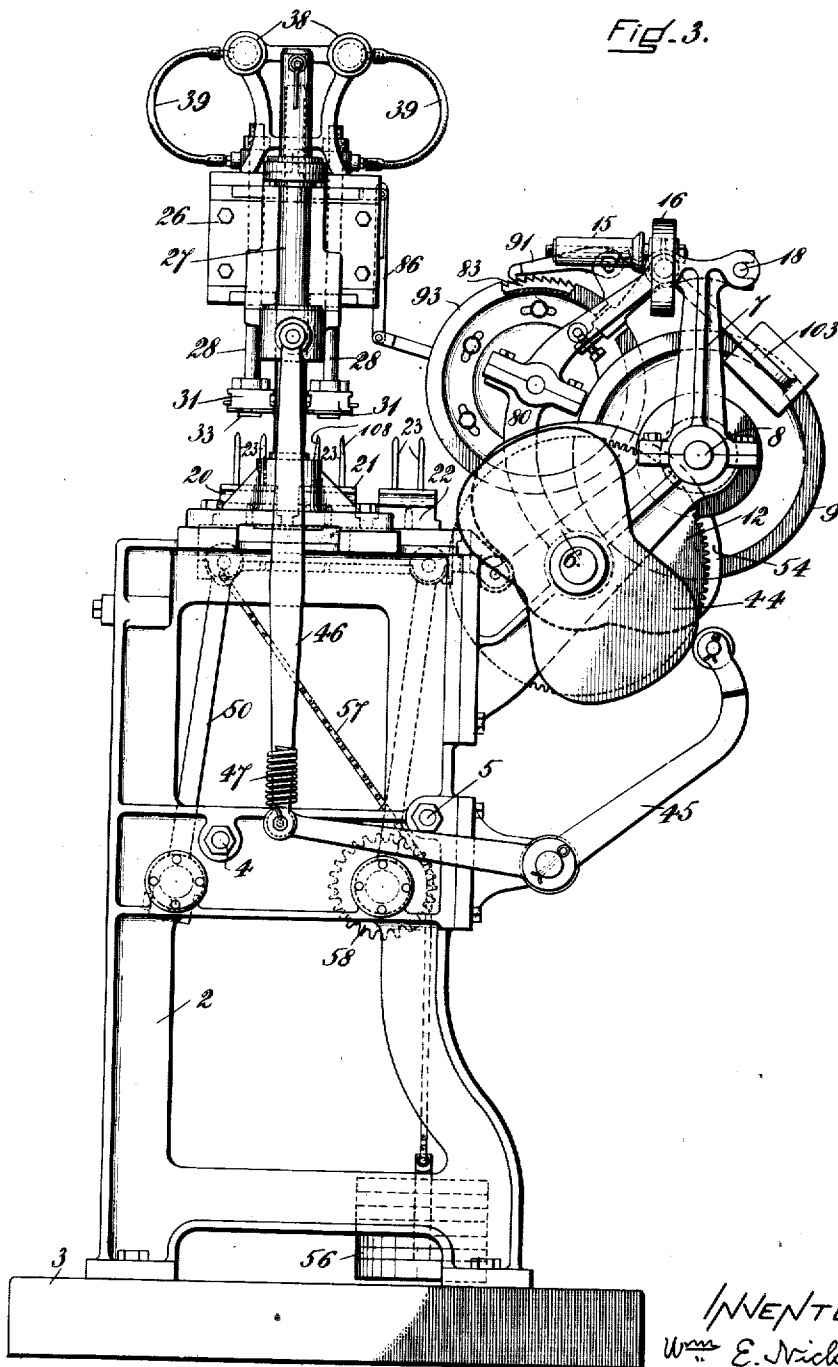


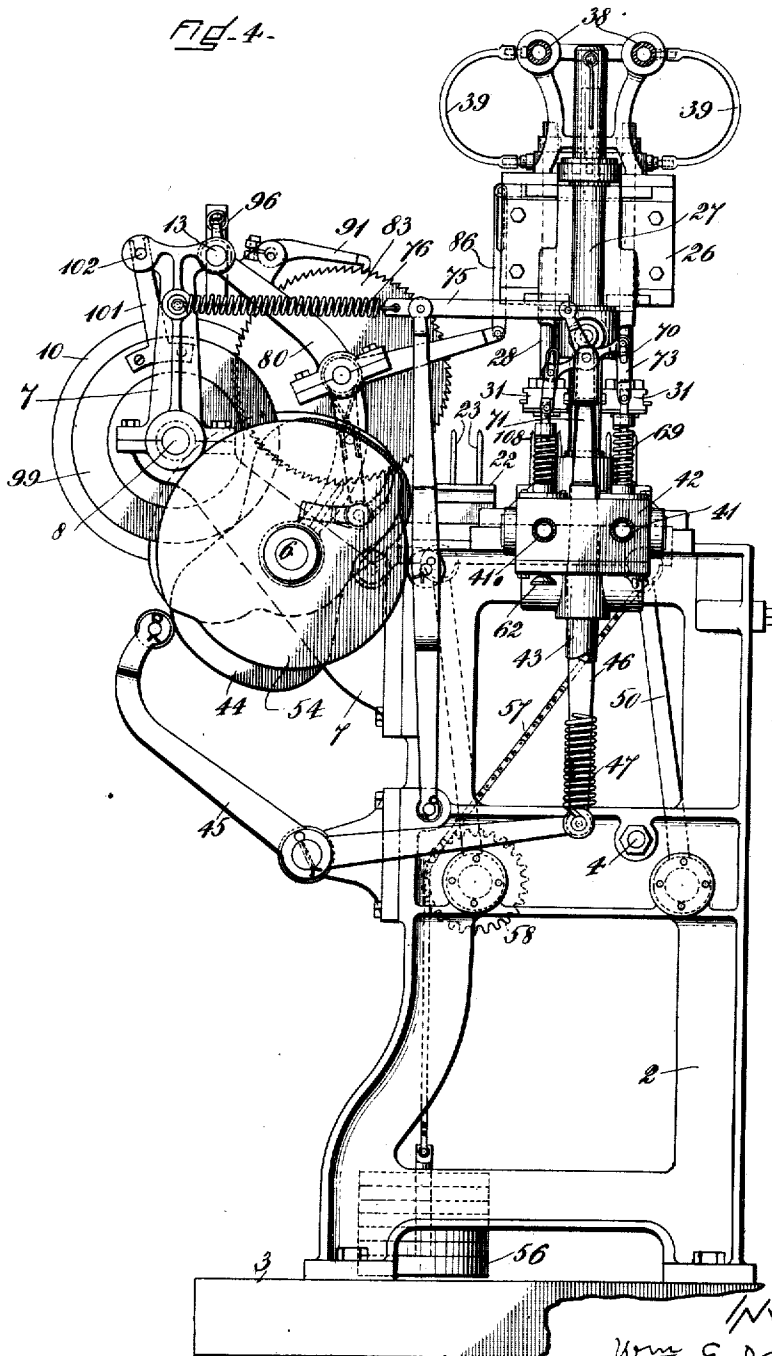
Fig. 3.

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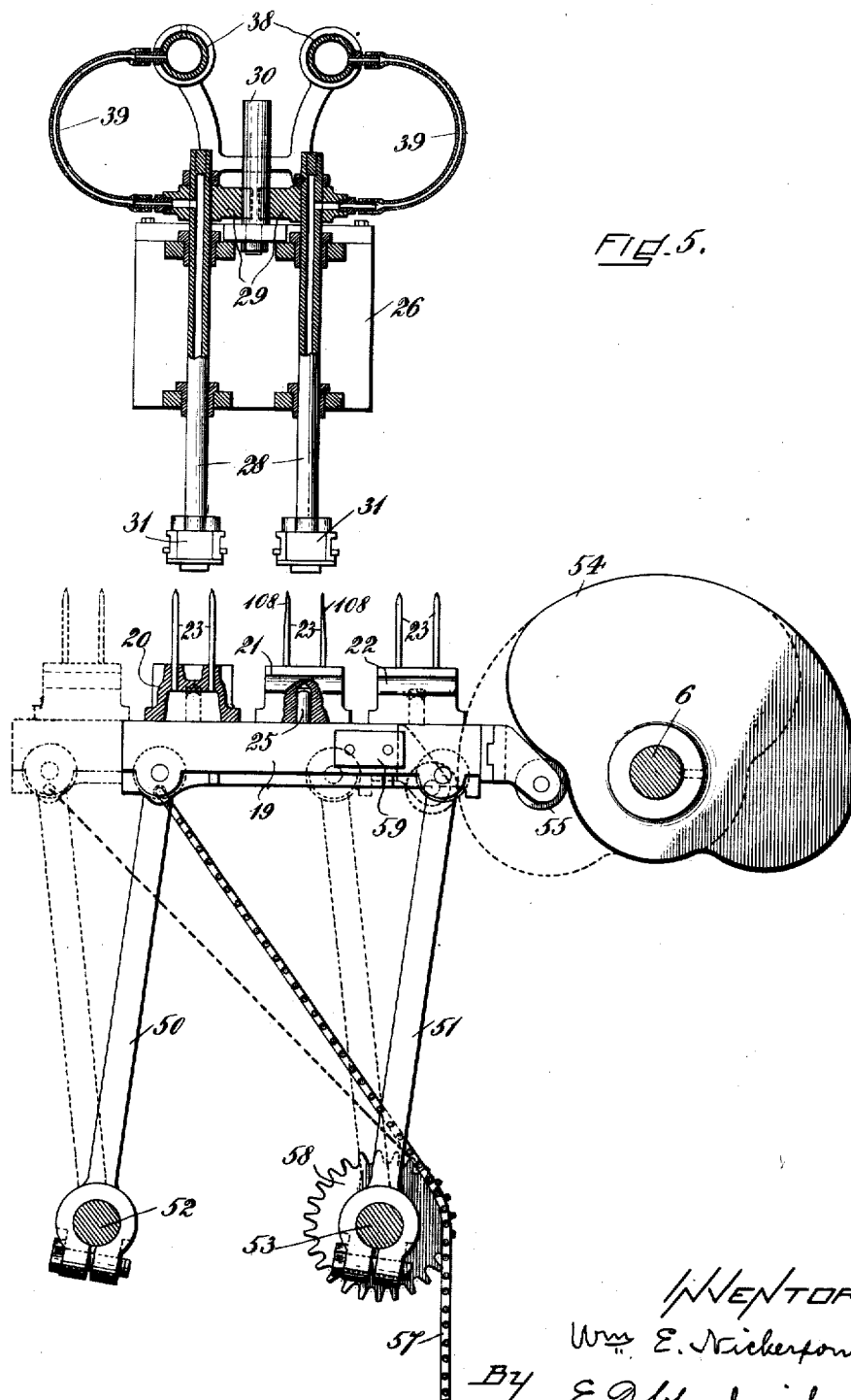


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8 SHEETS—SHEET 5.

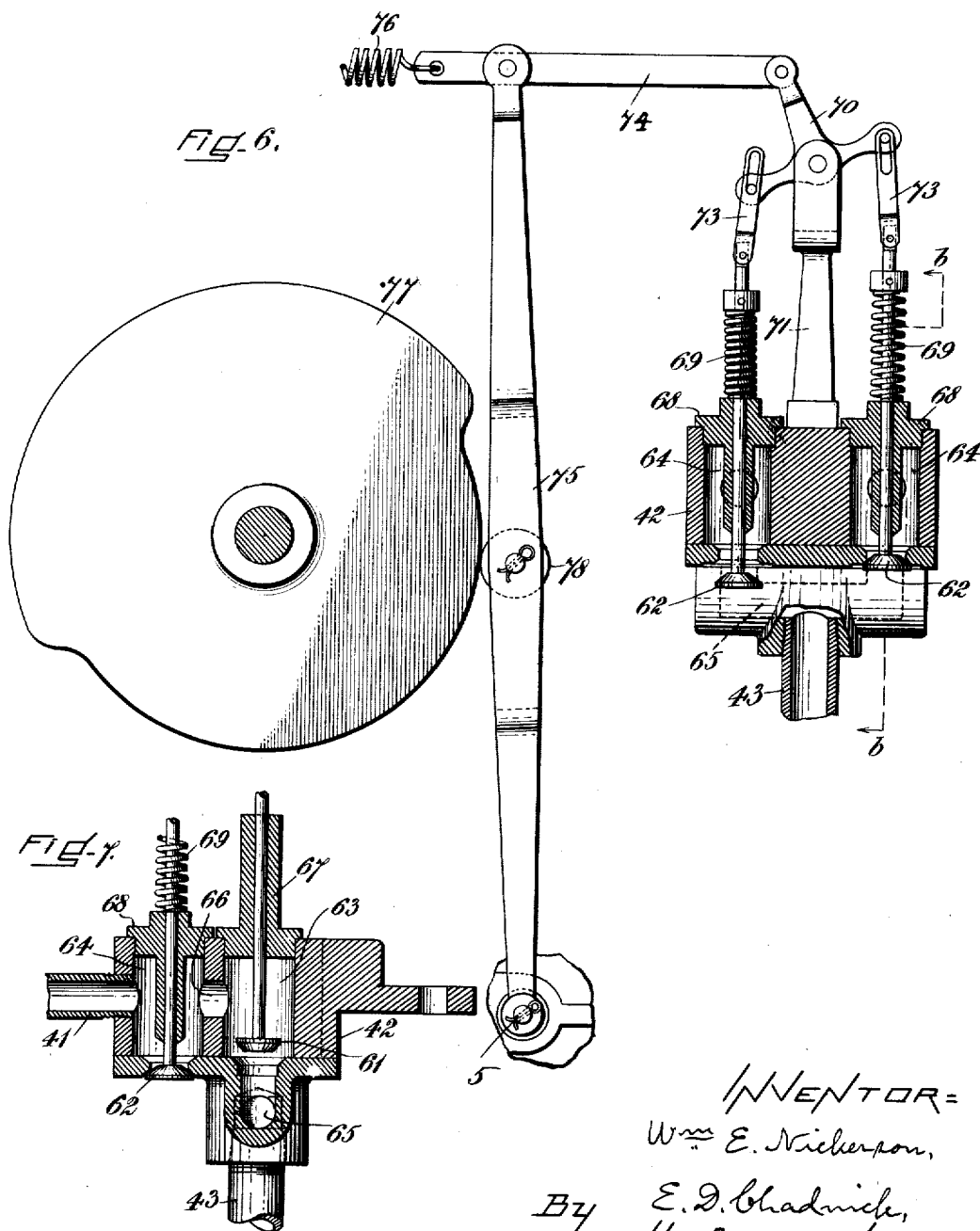


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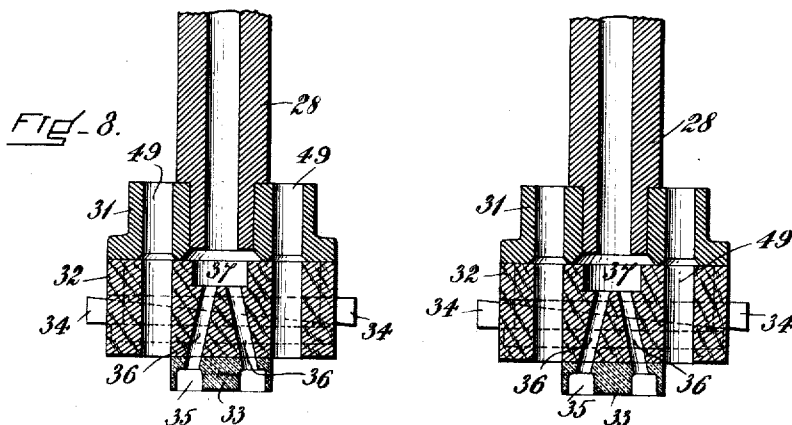
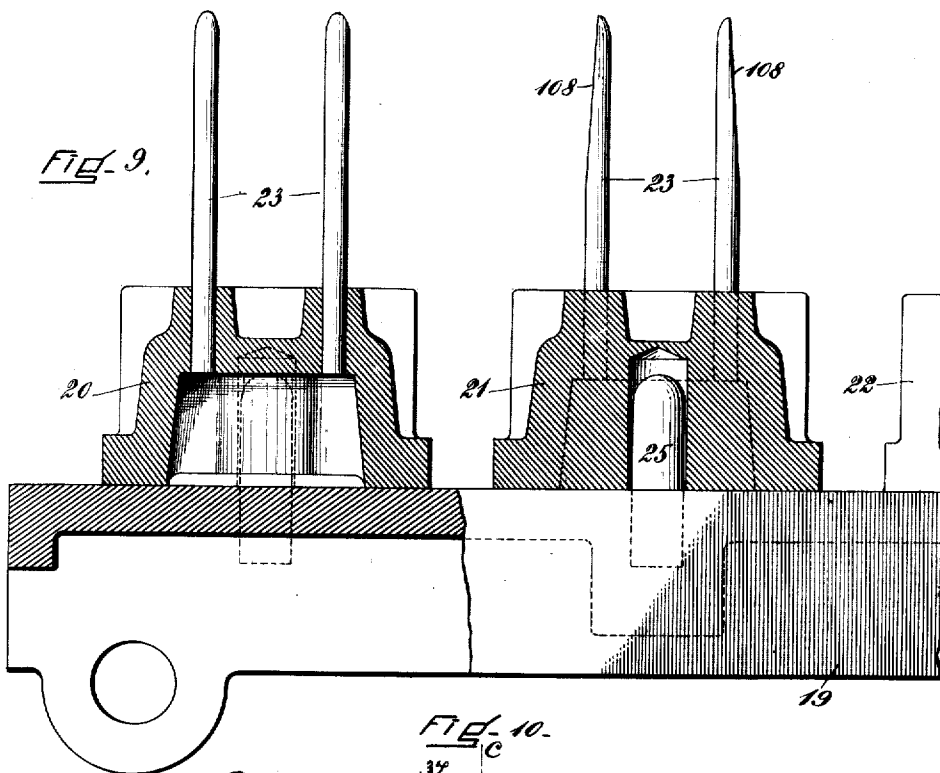
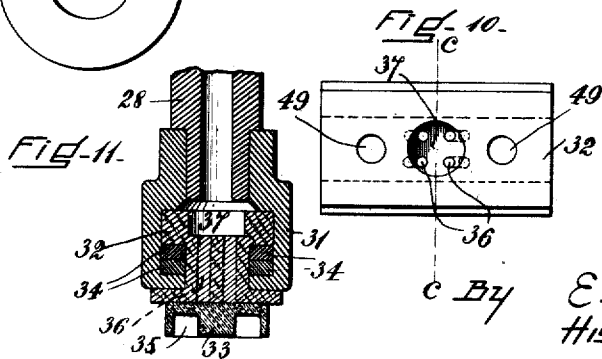
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8 SHEETS—SHEET 7.



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8 SHEETS—SHEET 8.

Fig. 12.

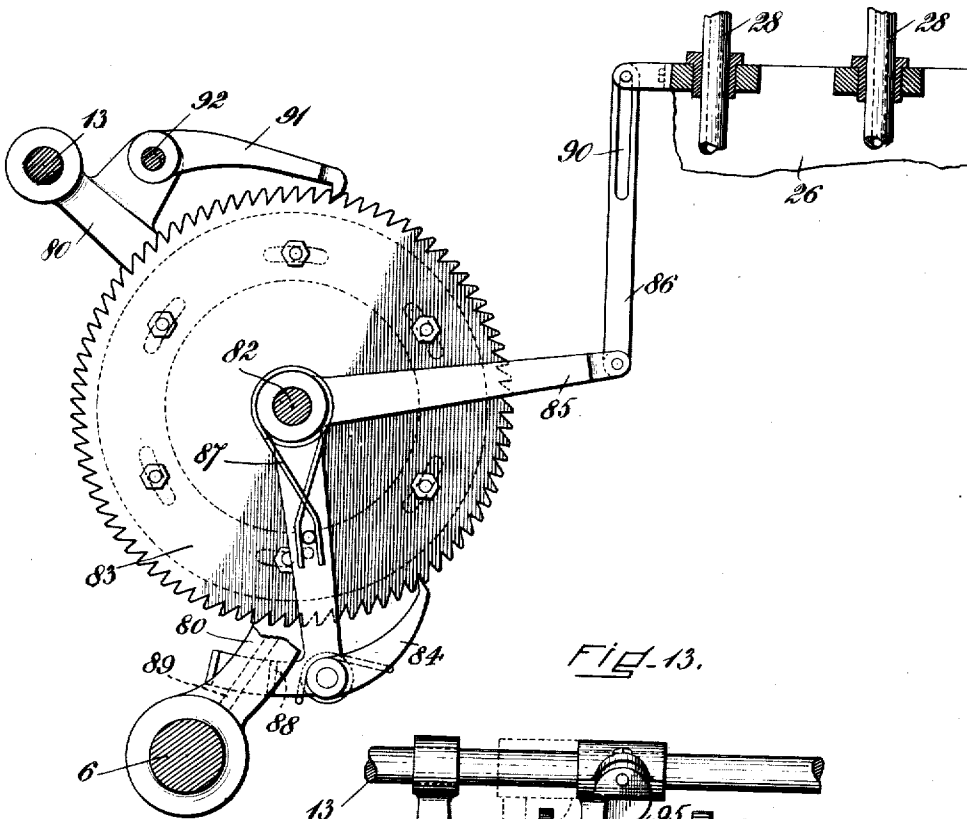
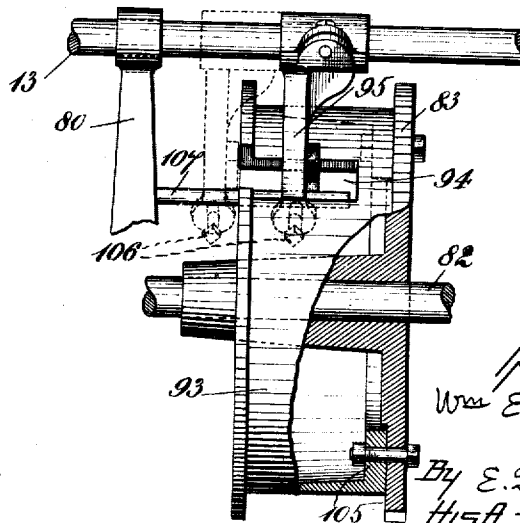


Fig. 13.



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UNITED STATES PATENT OFFICE.

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STACKING-MACHINE.

1,283,873.

Specification of Letters Patent.

Patented Nov. 5, 1918.

Application filed December 31, 1917. Serial No. 209,672.

To all whom it may concern:

Be it known that I, WILLIAM E. NICKERSON, a citizen of the United States, residing at Cambridge, in the county of Middlesex and State of Massachusetts, have invented certain new and useful Improvements in Stacking-Machines, of which the following is a specification.

This invention, which relates in general to sheet-stacking apparatus, is particularly intended to provide an automatic machine by means of which flat metal sheets of small size may be piled in stacks each containing a predetermined number of sheets. One of the features of the invention resides in the employment of three stacks of sheets, of which two are supply stacks and one is a receiving stack, in combination with two transferring devices which take the sheets one by one from the supply stacks in alternation and each of which deposits a sheet upon the receiving stack while the other is taking a sheet from its supply stack. This results in rapid stacking, since both transferring devices operate simultaneously in the building up of a single stack. Other features of the invention relate more particularly to details of construction and arrangement of the parts above mentioned, to the means employed for operating them and to the mechanism for counting the number of sheets delivered to the receiving stack.

The specific embodiment of my invention hereinafter described is a machine adapted to be used for the purpose of stacking and counting Gillette safety razor blades, or the blanks from which they are made, the machine as preferably constructed being illustrated in the accompanying drawings, in which—

Figure 1 is a front elevation of the machine with certain parts broken away;

Fig. 2 is a rear elevation of the machine with certain parts broken away;

Figs. 3 and 4 are elevations of the right and left ends of the machine, respectively;

Fig. 5 is mainly a vertical section on the line *a-a* in Fig. 1;

Fig. 6 is in part an elevation and in part a vertical section showing a valve mechanism hereinafter described;

Fig. 7 is a section on the line *b-b* in Fig. 6;

Fig. 8 shows in vertical section the two

transferring devices included in a single stacking unit;

Fig. 9 is a sectional elevation showing a portion of the stack supporting and positioning devices;

Fig. 10 is a top plan view of a portion of a suction device hereinafter described;

Fig. 11 shows the suction device in vertical section on the line *c-c* in Fig. 10;

Fig. 12 is an elevation showing a portion of the counting mechanism; and

Fig. 13 is a detail view showing a portion of the counting mechanism as viewed from the left in Fig. 12.

Figs. 5 to 13 inclusive are drawn to a larger scale than the remaining figures.

The machine illustrated is a gang machine comprising a series of blade-handling units, each of which includes means for supporting and positioning three stacks of blades in combination with two transferring devices operating in the manner above referred to. The three stacks of blades in each unit are located in line with one another from front to back of the machine and at equal distances apart, the front and rear stacks being supply stacks and the middle stack being a receiving stack, and the corresponding stacks in the collective units are located side by side, thus forming three transversely extending lines of stacks. The machine may contain any desired number of the units, which are all alike and are operated simultaneously by mechanism which is automatically stopped at the end of a predetermined number of blade-transferring operations, so that all of the receiving stacks are built up at the same rate and contain the same number of blades when the machine stops.

The working parts of the machine are carried by a main frame comprising end uprights 2-2 bolted to a base plate 3 and connected by tie-rods 4 and 5, and are operated for the most part by cams on a main shaft 6 journaled in a pair of two-part brackets 7-7 bolted to the rear faces of the uprights 2-2. In the brackets 7 is also journaled a driving shaft 8 provided with fast and loose pulleys 9 and 10 and connected to the main shaft 6 by intermeshing gears 11 and 12 secured respectively to the two shafts. A belt (not shown) extends from the pulleys to a suitable source of power and is shifted from one pulley to the other by

means of a rod 13 mounted to slide longitudinally in the upper ends of the brackets 7 and provided with a pair of pins 14—14 carrying rollers 15—15 between which the belt passes. The rod 13 has at one end a handle 16 by which it may be slid longitudinally to shift the belt and is prevented from rotating by a rearwardly-extending arm 17 rigidly connected to it and having a forked end which embraces and slides on a fixed horizontal pin 18 carried by the upper end of one of the brackets 7.

The blades on which the machine operates are supported by a horizontal table 19, and in order to facilitate the introduction and removal of the blade stacks the latter are carried by three bars 20, 21 and 22, which in turn are carried by the table and are removable therefrom. Each bar carries one of the transversely-extending lines of stacks and each stack is positioned on its bar by means of a pair of vertical pins 23 secured to the bar at their lower ends and spaced to enter the end perforations in a Gillette blade. Each bar is provided at its ends with handles 24, Fig. 1, by which it may be lifted and transported and is positioned on the table by a pair of pins 25 extending vertically upward from the ends of the table and adapted to enter corresponding recesses formed in the under side of the bar, as shown in Figs. 1, 5 and 9.

The blade-transferring devices are located above the blade stacks and form two transversely-extending lines, with the two transferring devices in each stacking unit located one behind the other at a distance corresponding to the distance between two adjacent lines of blade stacks. All the transferring devices are carried by a cross-head 26 which slides vertically on guides 27—27 secured to and extending upward from the end uprights 2—2, whereby the transferring devices are collectively moved upward and downward with relation to the blade stacks beneath them. Each transferring device is also movable upward and downward independently of the others and comprises an upright tube 28 adapted to slide vertically in the cross-head 26, in which it is prevented from turning by means of a horizontal guide arm 29 secured to the tube near its upper end and having a half-round end face which embraces and slides on a vertical pin 30 secured to the cross-head, one pin 30 being sufficient for a pair of tubes. Each tube 28 is closed at its upper end and carries at its lower end a suction device consisting of a head 31 rigidly secured to the tube and having a recess extending through it from front to back, a block 32 held in said recess and a suction-pad 33 secured to the bottom face of the block 32. The details of these parts are shown in Figs. 8, 10 and 11, from which it will be seen that the block 32 is laterally

recessed on both sides between its top and bottom to receive two pairs of wedges 34 driven in from opposite ends of the block and bearing on the overhanging top portion of the latter and on the inwardly-turned lower edges of the head 31, so that while the block is normally held firmly in place it can be removed by first drawing out the wedges and then sliding the block out of the head in an endwise direction. The suction pad 33, which is made of soft rubber, has on its bottom face an annular groove 35 adapted to surround the central perforation in a Gillette blade, and from this groove passages 36 extend upwardly through the pad and the block 32 to a recess 37 formed in the top of the latter and located below and in communication with the open lower end of the tube 28.

Provision is made for establishing suction at the bottom faces of the pads 33 by means of a system of valve-controlled passages communicating with the interior of the tubes 28 and comprising a pair of horizontal pipes 38 each closed at one end and carried by the cross-head 26 above the tubes 28, one pipe for each line of tubes, flexible tubes 39 each connecting the interior of one of the pipes 38 with the interior of one of the tubes 28 in the corresponding series, a pair of flexible tubes 40 each connecting the open end of one of the pipes 38 with one of two fixed pipes 41 leading to the interior of a valve casing 42 hereinafter described, and a pipe 43 connecting the valve casing to a vacuum chamber, suction pump or the like (not shown.) The flexibility of the tubes 40 enables the cross head 26 to be moved upward and downward without interfering with the continuity of the suction passages above described, and such movements are effected by means of a pair of cams 44 secured to the main shaft 6 and operating on a pair of rock arms 45 which are pivotally supported on the end uprights 2—2 and connected to the ends of the cross-head 26 by links 46. The springs 47 which connect the lifting ends of the rock arms 45 with fixed posts 48 carried by the upper ends of the guides 27 are for the purpose of partially balancing the weight of the cross-head and thereby diminishing the wear and tear on the machine and the power required to operate it. When the cross-head is lowered, the blade positioning pins 23 which are located at that time beneath the blade-transferring devices are received within perforations 49 extending upward through each head 31 and its block 32 on opposite sides of and at equal distances from the annular groove 35, and after each suction pad 33 comes in contact with the topmost blade in the stack beneath it, whatever the height of the latter may be, the corresponding blade-transferring device remains at rest while the cross-head com-

pletes its determinate downward movement, the independent movements of the transferring devices with respect to the cross head being provided for by the flexibility of the tubes 39.

The relation of the blade-transferring devices to the several lines of blade stacks is changed by shifting the stacks beneath the transferring devices in a forward and backward direction, and this is provided for by supporting the table 19 on a parallel-motion linkage comprising two pairs of equal arms 50 and 51 pivoted at their upper ends to the under side of the table and secured at their lower ends to parallel rock shafts 52 and 53. These rock shafts are located one behind the other at the same level and extend laterally between the end uprights 2—2 at a distance from each other equal to the distance between the pivoted upper ends of the arms which they carry, so that the table is kept horizontal in all positions. The table is moved forward by means of a pair of cams 54 secured to the main shaft 6 and operating on rollers 55 mounted on the table near its ends, as shown in Figs. 1 and 5, and is moved backward by a pair of weights 56 each secured to the lower end of a sprocket chain 57 attached at its upper end to the under side of the table near its front edge and passing over a sprocket wheel 58 mounted on the rear rock shaft 53. When the table is at the limit of its backward movement the front and middle lines of blade stacks are located respectively beneath the front and rear lines of blade-transferring devices, with the pins 23 in position to enter the perforations 49 in the corresponding suction devices, and when the table is at the limit of its forward movement the middle and rear lines of blade stacks are located respectively beneath the front and rear lines of transferring devices in like relation to the suction devices carried thereby.

The above described arrangement for supporting and operating the table 19 has the advantage that it facilitates the withdrawal of the blade stacks from under the blade-transferring devices when it becomes necessary to remove the completed stacks and replenish the supply stacks. To do this the operator draws the table forward by means of the handles 24 on the front bar 20 until stop blocks 59 (Fig. 1) attached to the ends of the table engage stop pieces 60 each secured to one of the end uprights 2—2. When in this position the bars 20, 21 and 22 and the blade-stacks which they carry are all exposed in position to be lifted from the table, which at this time is so far beyond the vertical position of the arms 50 and 51 that its weight overcomes the effect of the weights 56 and it therefore remains at rest until pushed backward against the cams 54.

So long as it is controlled by these cams. however, it does not move forward far enough to over-balance the weights 56 and hence the latter remain effective to hold the rollers 55 against said cams throughout the travel of the latter.

It will be evident that the forward and backward movements imparted to the table 19 by the cams 54 and weights 56 result in bringing the middle line of blade stacks beneath each line of blade-transferring devices in alternation and in also bringing either the front line or the rear line of blade stacks beneath the other line of transferring devices at the same time. While the parts are in each of these alternate positions the collective transferring devices are moved downward and upward, the cams 44 being so shaped that they lower and raise the cross-head 26 twice during each complete forward and backward movement of the table 19. As soon as the cross-head completes each downward movement suction is automatically established in one of the pipes 38 and broken in the other pipe 38 by the operation of two pairs of valves 61 and 62 carried by the valve casing 42, which is secured to one of the end uprights of the machine and is divided internally into two pairs of passages 63 and 64, Figs. 6 and 7. The two passages 63 are controlled respectively by the valves 61, each of which is an upwardly-opening puppet valve, and are connected below these valves by a passage 65 formed in the casing 42 and communicating with the suction pipe 43. Each passage 63 is also connected by a perforation 66 with the passage 64 in the same pair, and each of the latter passages is in communication with one of the pipes 41, so that the effect of opening either of the valves 61 is to establish suction in the corresponding pipe 41 and its connections. Each of the valves 62 is a downwardly-opening puppet valve which controls an opening leading from the corresponding passage 64 to the outer air and serves when opened to break the suction in the corresponding pipe 41 and its connections. The stems of all four of the valves 61 and 62 extend upward through and are guided by cap pieces 67 and 68 which close the tops of the passages 63 and 64 respectively, and each of the two valves 62 is provided with a spring 69 surrounding its stem above the corresponding cap-piece 68 and serving to close the valve except when the latter is forcibly opened. The two valves 61, which close by gravity, are held firmly upon their seats by atmospheric pressure when the corresponding valves 62 are open.

The two pairs of valves 61 and 62 are operated by means of a double bell crank lever 70 pivotally supported on an upwardly-extending bracket 71 secured to the top of the

valve casing 42, with the valve-operating arms of the bell crank lever extending laterally in opposite directions and each connected to the stems of the corresponding pair of valves by links 72 and 73 respectively. The upwardly-extending arm of the bell crank lever 70 is connected by a link 74 to the upper end of a lever 75 pivotally mounted at its lower end on the extended end of the tie-rod 5 and is moved in one direction by a spring 76 and in the opposite direction by a cam 77 secured to the main shaft 6 and bearing upon a roller 78 carried by the lever 75. One of the valves 61 and one of the valves 62 are connected to the same arm of the bell crank lever 70, so that they are moved in the same direction at the same time and the similar valves are simultaneously moved in the opposite direction, with the result that the two suction valves 61 are opened in alternation, the two air valves 62 are also opened in alternation, and each suction valve is open while the corresponding air valve is closed and vice versa. The links 72 and 73 are all slotted at their upper ends to provide a certain amount of lost motion, the arrangement being such that each suction valve 61 is closed just before the corresponding air valve is opened, the latter valve is closed just before the corresponding suction valve is opened, and the opening of each air valve occurs while the corresponding line of blade transferring devices are at the limit of their downward movement while over the middle line of blade stacks. This results in breaking the suction in these transferring devices and at the same time suction is established in the other line of transferring devices, which are then in like relation to one or the other of the front and rear lines of blade stacks.

At the end of a predetermined number of downward and upward movements of the cross-head 26 the machine is stopped by the operation of automatic mechanism of which the principal parts are shown in Figs. 12 and 13. These parts are supported by a supplementary frame composed of a hub 79 mounted on the main shaft 6, which turns in the hub, and carrying a pair of upwardly-extending two-part arms 80 provided at their upper ends with bearings through which the belt-shifting rod 13 passes and in which it is adapted to slide longitudinally. The frame is thus supported by the belt-shifting rod and the main shaft, being prevented from moving laterally on the latter by collars 81 secured to the shaft at the ends of the hub 79. In the arms 80 is journaled a shaft 82 carrying a ratchet wheel 83, to which a step-by-step motion is imparted by means of a spring-actuated pawl 84 carried by one arm of a bell crank lever 85 which turns on the shaft 82 and has its

other arm connected to the cross-head 26 by a link 86. The pawl 84 is moved forward by the link 86 during the last portion of the upward movement of the cross-head 26 and is moved backward along the ratchet wheel by a spring 87 when the cross-head descends, its backward movement being limited by the engagement of stop flanges 88 and 89 carried respectively by the pawl and one of the arms 80, as shown in Figs. 2 and 12.

The link 86 is slotted as at 90 to provide for the continuance of the downward movement of the cross-head 26 after the backward movement of the pawl 84 has been arrested, and backward movement of the ratchet wheel is prevented by a locking pawl 91 secured to a rod 92 which is pivotally mounted on the arms 80.

To one face of the ratchet wheel 83 is secured a drum 93 provided with a slot 94 extending laterally inward from its free edge and adapted to receive an arm 95 clamped to the belt-shifting rod 13. A spring 96 connecting one of the brackets 7 and a collar 97 secured to the rod 13 tends to slide said rod in such direction as to shift the driving belt from the fast pulley 9 to the loose pulley 10, and the arm 95 is secured to said rod in such position that except when it is received within the slot 94 in the drum 93 it bears upon the free edge of said drum and thereby holds the driving belt on the fast pulley 9 in opposition to the tension of the spring 96. Consequently when the slot 94, which opens toward the arm 95, is brought opposite said arm by the rotation of the drum the spring 96 slides the rod 13 endwise and moves the arm 95 into the slot, thereby shifting the driving belt on to the loose pulley 10.

In order to stop the machine quickly when the power is thrown off, I provide a friction brake consisting of two metallic disks 98 and 99 mounted on the shaft 8 just inside of one of the bearings for said shaft, these disks being arranged face to face and having a disk 100 of leather or similar material between them. The disk 98 is pinned to the shaft 8 and hence rotates with it, while the disk 99 is held stationary by means of an arm 101 secured thereto and having a forked free end which embraces a fixed pin 102 carried by the upper end of the adjacent bracket 7, as shown in Figs. 2 and 4. The shaft 8 is capable of a slight endwise movement in its bearings and hence the disks 98 and 99 can separate sufficiently to prevent their interposing frictional resistance to the rotation of the shaft, but when the stop mechanism operates an arm 103 rigidly secured to the belt-shifting rod 13 is drawn against the rim of the fast pulley 9 and slides the shaft toward the disks 98 and 99, and since the disk 99 is prevented

from moving endwise by the adjacent shaft bearing the two disks are crowded together and caused to exert pressure on the disk 100 between them, thereby producing the braking effect. The arm 103 itself acts at the same time as a supplementary brake and thus assists in stopping the machine, being provided with a friction pad 104 suitable for engagement with the pulley 9.

The slot 94 can be located in the desired relation to the arm 95 by circumferentially adjusting the drum 93 on the ratchet wheel 83, these parts being connected by bolts passing through said wheel and through a circumferentially-slotted flange 195 on the drum. This adjustment may be supplemented by adjusting the radial position of the arm 95 on the rod 13 by means of a screw bolt 106 carried by the free end of the arm and bearing upon a fixed rod 107 extending laterally from one of the arms 80. In this way the final movement of the ratchet wheel 83 which brings the slot 94 opposite the arm 95 can be caused to leave the drum in such a position that the arm will move freely into the slot without engaging the edges of the latter, the rod 107 being also useful as a guide for steadying said arm during its lateral movements. The relation of the locking pawl 91 to the teeth of the ratchet wheel can be varied by adjustably clamping said pawl on the rod 92 and mounting the latter on eccentric pivots, as shown in dotted lines in Fig. 12, so that by shifting the pawl around the arm its locking position can be adjusted to prevent backlash of the ratchet wheel.

When the apparatus above described is in operation, each downward movement of the cross-head 26 brings the suction pads 33 on one of the two lines of blade-transferring devices into contact with the top-most blades in either the front line or the rear line of blade-stacks, as already explained, and upon the completion of such movement suction is established in these transferring devices and the blades in contact with the suction pads are caused to adhere to the latter by the external atmospheric pressure. The cross-head then moves upward and lifts all the blade-transferring devices above the corresponding positioning pins 23, and thereupon the table 19 is shifted by the cams 54 and brings the middle bar 21 beneath the blade-carrying pads 33, the other line of blade-transferring devices being thereby located above one or the other of the bars 20 and 22. The cross-head 26 then descends again and the blades held by the suction pads above the middle bar 21 are received upon the positioning pins 23 carried by this bar, which are beveled as at 108 to facilitate their entrance into the end perforations of the respective blades. Upon the completion of this downward movement of the cross-

head the suction is broken in the blade-carrying line of transferring devices and is established at the same time in the other line of transferring devices, the pads 33 of which are then in contact with the topmost blades of the other line of supply stacks, whereupon the blades previously picked up by one line of transferring devices are deposited and another blade adheres to each of the transferring devices in the other line. The operation then continues in the same way, the blades being taken from the front and rear lines of stacks in alternation and deposited on the middle line of stacks, until the rotation of the drum 93 brings the slot 94 opposite the arm 95, whereupon the power is thrown off as previously described and the machine stops with the blade-transferring devices elevated above the positioning pins 23. The table 19 is then drawn forward by the operator, the three bars 20, 21 and 22 are removed, the middle bar 21 which now carries a line of completed stacks each containing a predetermined number of blades is replaced by an empty bar, and the other two bars are each replaced by similar bars having on each pair of positioning pins at least half as many blades as are to be included in one of the complete stacks built up on the middle bar. The table is then pushed back into operating position and the operator draws the belt shifting rod 13 against the tension of the spring 96 until the arm 95 moves out of the slot 94 and the driving belt is shifted on to the fast pulley 9, thereby starting the machine. The operator holds the belt-shifting rod immovable until the drum 93 has rotated sufficiently to carry its rim in front of the arm 95, and the machine then builds up blade stacks on the middle bar 21 until, at the end of a predetermined number of operations corresponding to the number of blades which each stack built up by the machine is intended to contain, the machine is again stopped by the automatic stop mechanism.

While my apparatus is particularly adapted for stacking articles like thin razor blades which have sharpened edges, because the edges do not come into contact with anything while being handled, it can obviously be employed without substantial modification for stacking various other articles having the form of flat sheets. It will also be obvious that the machine would be operative if only one line of transferring devices were employed in connection with a line of supply stacks and a line of receiving stacks, although in such case the stacking would be only half as rapid. Transferring devices operating otherwise than by suction can be employed if desired and their relative movements with respect to the stacks can be produced in various ways, but it is preferable to move the transferring devices in a vertical

direction only and to shift the stacks beneath them for the reason that when this is done the sheets transferred have no edgewise movement which might cause them to be displaced on the transferring devices by their own momentum." Various automatic mechanisms may also be used for stopping the machine at the end of a predetermined number of operations, and the details of construction of the different parts may be widely modified without departing from my invention.

I claim:—

1. In a stacking machine, the combination of means for supporting and positioning two supply stacks and a receiving stack, two transferring devices each adapted to take from one supply stack only and deposit on the receiving stack, and means for producing relative vertical and lateral movements between the collective transferring devices and the collective stacks whereby the transferring devices take from the supply stacks in alternation and each transferring device deposits on the receiving stack while the other is taking from its supply stack.

2. In a stacking machine, the combination of means for supporting and positioning two supply stacks and a receiving stack, two transferring devices each adapted to take from a supply stack and deposit on the receiving stack beneath each transferring device in alternation and simultaneously moving a supply stack beneath the other transferring device, and means for lowering and raising the transferring devices while the receiving stack is located beneath each of them.

3. In a stacking machine, the combination of means for supporting and positioning three stacks in line with one another and at equal distances apart, two transferring devices located in a line parallel with the line of stacks above the latter and at a corresponding distance from each other, means for moving the line of stacks to position the middle stack beneath each transferring device in alternation, means for lowering and raising the transferring devices while over the stacks in each position of the latter, and means for causing each transferring device to take from one of the end stacks in the line and deposit on the middle stack while resting thereon.

4. In a stacking machine, the combination of means for supporting and positioning a plurality of supply and receiving stacks arranged in parallel lines, a plurality of transferring devices arranged in line above and parallel with the line of stacks, means for collectively lowering and raising the transferring devices, means for shifting the collective stacks beneath the transferring devices in a direction transverse to the lines of stacks, and means for causing each transferring device to take from a supply stack

and deposit on a receiving stack while resting thereon.

5. In a stacking machine, the combination of means for supporting a plurality of supply and receiving stacks arranged in parallel lines, a cross-head movable upward and downward above the lines of stacks, means for raising and lowering the cross-head, a plurality of transferring devices carried by the cross-head and independently movable upward and downward therein, means for shifting the collective stacks beneath the transferring devices in a direction transverse to the lines of stacks, and means for causing each transferring device to take from a supply stack and deposit on a receiving stack while resting thereon.

6. In a stacking machine, the combination of means for supporting and positioning a plurality of stacks arranged in three equidistant parallel lines, the stacks in two of the lines being supply stacks and those in the other line being receiving stacks, a cross-head movable upward and downward above and parallel with the lines of stacks, means for raising and lowering the cross-head, a plurality of transferring devices carried by the cross-head and arranged in two lines parallel with the lines of stacks and at a corresponding distance apart, each transferring device being movable upward and downward in the cross-head independently of the others, means for moving the collective stacks beneath the transferring devices in a direction transverse to the lines of stacks, and means for causing each transferring device to take from a supply stack and deposit on a receiving stack while resting thereon.

7. In a stacking machine, the combination of a table having means for positioning supply and receiving stacks thereon, transferring means movable upward and downward above the table, means for supporting the table for edgewise movement beneath the transferring means and beyond the latter to expose the stacks for removal and replenishment, and means for reciprocating the table to shift the position of the stacks with respect to the transferring means.

8. In a stacking machine, the combination of a horizontal table having means for positioning supply and receiving stacks thereon, transferring means movable upward and downward above the table, a parallel-motion linkage whereby the table is supported and adapted to move edgewise, and means for moving the table to shift the stacks beneath the transferring means.

9. In a stacking machine, the combination of a horizontal table having means for positioning supply and receiving stacks thereon, transferring means movable upward and downward above the table, a parallel-motion linkage whereby the table is supported and adapted to move edgewise, power-

driven cams for moving the table forward, and weights normally holding the table against the cams but permitting it to be drawn away from the latter.

5 10. In a stacking machine, the combination of a horizontal table having means for positioning supply and receiving stacks thereon, transferring means movable upward and downward above the table, a parallel-motion linkage whereby the table is
10 supported and adapted to move edgewise, power-driven cams for moving the table forward, weights normally holding the table against the cams but permitting it to be
15 drawn away from the latter, and means for holding the table at rest when drawn forward.

11. In a stacking machine, the combination of a table, stack-supporting bars removably carried thereby, means for positioning a series of stacks on each bar, transferring means movable upward and downward above the table, and means for reciprocating the table horizontally to shift the
25 stacks beneath the transferring means.

12. In a stacking machine, the combination of a table, three parallel bars removably supported thereon, means for positioning a line of stacks on each bar, two lines of
30 transferring devices movable upward and downward above the table, means for reciprocating the table horizontally to locate adjacent lines of stacks beneath each line of transferring devices in alternation, and
35 means for lowering and raising the collective transferring devices while the table is at each end of its reciprocatory movement.

13. In a stacking machine, the combination of a horizontal table supported on a
40 parallel-motion linkage, three parallel bars removably supported on the table at equal distances from one another, means for positioning three equal lines of stacks on the several bars, one on each, two parallel lines
45 of transferring devices movable upward and downward above the table and spaced in accordance with the lines of stacks, cams for moving the table forward beneath the transferring devices, weights normally holding
50 the table against the cams but permitting it to be drawn forward beyond the control of said cams to remove the bars from beneath the transferring devices, and stops for arresting the table when drawn forward to
55 a position wherein it over-balances the weights.

14. In a stacking machine, the combination of means for supporting and positioning two supply stacks and a receiving stack,
60 two transferring devices each comprising a downwardly-facing suction pad, means for moving the receiving stack beneath each transferring device alternately and simultaneously moving a supply stack beneath the
65 other transferring device, means for lower-

ing and raising the transferring devices while the receiving stack is located beneath either of them, and means for establishing suction in each transferring device while
70 resting on the top of a supply stack and simultaneously breaking suction in the other transferring device.

15. In a stacking machine, the combination of means for supporting and positioning a plurality of supply and receiving
75 stacks, a cross-head movable upward and downward above the stacks, a plurality of suction devices carried by the cross-head and independently movable upward and downward therein, a pipe carried by the
80 cross-head, a flexible tube connecting the pipe with a source of suction, independent flexible connections between said pipe and the several suction devices, means for raising and lowering the cross-head, means for
85 shifting the stacks beneath it, and means for alternately establishing and breaking suction in the connections between said flexible tube and the source of suction.

16. In a stacking machine, the combination of means for supporting and positioning supply and receiving stacks arranged in parallel lines, a cross-head located above the
90 stacks, lines of suction devices carried by the cross-head, means for producing relative lateral and vertical movements between the lines of stacks and the suction devices, pipes
95 carried by the cross-head, connections between each pipe and a line of suction devices, independent connections extending from said pipes to a source of suction, and means
100 for establishing and breaking suction in each of said connections.

17. In a stacking machine, the combination of means for supporting and positioning
105 three lines of stacks, of which those in the outer lines are supply stacks and those in the middle line are receiving stacks, a cross-head located above the stacks, two lines of suction devices carried by the cross-head, means whereby each line of suction
110 devices in alternation is brought into position to deposit on the receiving stacks and the other line is simultaneously brought into position to take from a line of supply stacks,
115 two pipes carried by the cross-head, connections between each pipe and a line of suction devices, a valve casing connected to a source of suction, independent connections between
120 said casing and pipes, a pair of suction valves controlling said connections respectively, a pair of air valves for breaking the suction in the respective connections, and means for opening and closing the suction
125 valves in alternation and for opening each air valve when the corresponding suction valve is closed.

18. In a stacking machine, the combination of two lines of suction devices, a valve casing connected to a source of suction, independent
130

pendent connections between said casing and the lines of suction devices, a pair of suction valves controlling said connections respectively, a pair of air valves for breaking the suction in the respective connections, a double bell-crank lever having oppositely-extending arms each connected to the suction valve and the air valve corresponding to one of said connections, and means for operating the bell-crank lever.

19. In a stacking machine, the combination of means for supporting and positioning two supply stacks and a receiving stack, two transferring devices each adapted to take from a supply stack and deposit on the receiving stack, means for producing relative movements between the stacks and the transferring devices whereby the latter take from the supply stacks in alternation and each deposits on the receiving stack while the other is taking from a supply stack, and means for automatically stopping the machine at the end of a predetermined number of transferring operations.

20. In a stacking machine, the combination of means for supporting and positioning supply and receiving stacks, transferring devices each adapted to take from a supply stack and deposit on a receiving stack, means for shifting the stacks beneath the transferring devices, means for lowering and raising the transferring devices, and means for automatically stopping the machine at the end of a predetermined number of transferring operations and leaving the transferring devices in elevated position.

21. In a stacking machine, the combination of means for supporting and positioning supply and receiving stacks, a cross-head located above the stacks, means for raising and lowering the cross-head, transferring devices carried by the cross-head, means for shifting the collective stacks beneath the transferring devices, means for causing each transferring device to take from a supply stack and deposit on a receiving

stack, and means operated by the cross-head during its upward movement for stopping the machine at the end of a predetermined number of transferring operations and leaving the transferring devices in elevated position.

22. In a stacking machine, the combination of means for supporting and positioning supply and receiving stacks, transferring mechanism adapted to take from a supply stack and deposit on a receiving stack, means comprising a driving shaft having fast and loose pulleys thereon for operating the transferring mechanism, a belt-shifter cooperating with said pulleys, a spring for moving the belt-shifter in one direction, an arm secured to the belt-shifter, a rotary drum adapted to obstruct the movement of said arm under the influence of said spring and provided with a slot to receive the arm when the drum is in a predetermined position, means comprising a pawl and a ratchet operated by the transferring mechanism for imparting a step-by-step rotation to the drum, and a friction brake operative on the driving shaft when said arm enters the slot in the drum.

23. In a stacking machine, the combination of a horizontal table having means for positioning supply and receiving stacks thereon, a cross-head located above the stacks, transferring devices carried thereby, means for raising and lowering the cross-head, means for moving the table edgewise beneath the transferring devices, means for causing each transferring device to take from a supply stack and deposit on a receiving stack, a stop mechanism operative when in a predetermined position to stop the machine, and means operative with the upward movement of the cross-head for imparting a step-by-step motion to the stop mechanism.

Signed at Boston, Mass., this 28th day of December, 1917.

WILLIAM E. NICKERSON.