

**Nov. 1, 1927.**

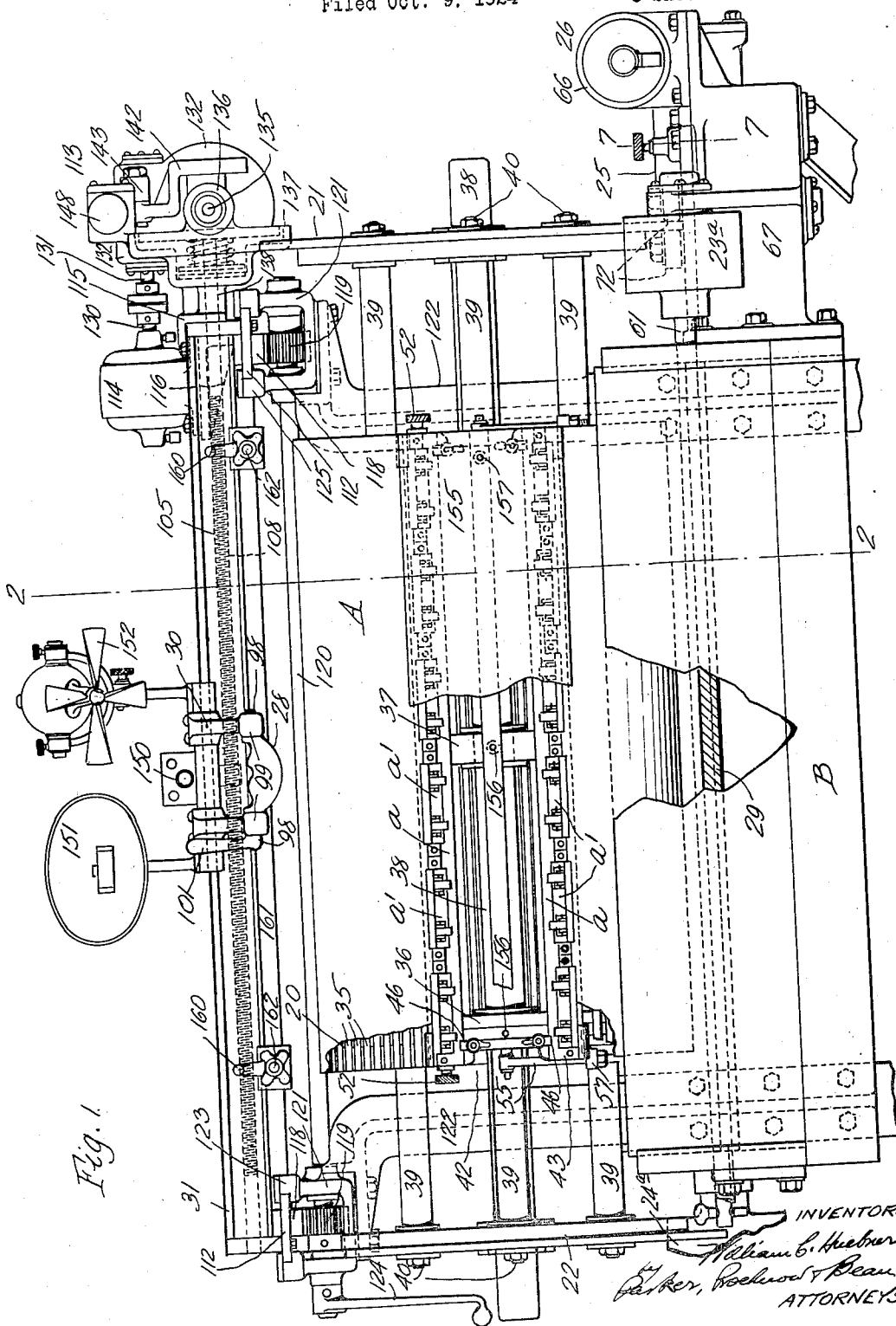
W. C. HUEBNER

COATING MACHINE

Filed Oct. 9, 1924

**1,647,360**

6 Sheets-Sheet 1



**INVENTOR.**

William C. Huebner

By Ben Rocknow & Bean.

ATTORNEYS

Nov. 1, 1927.

W. C. HUEBNER

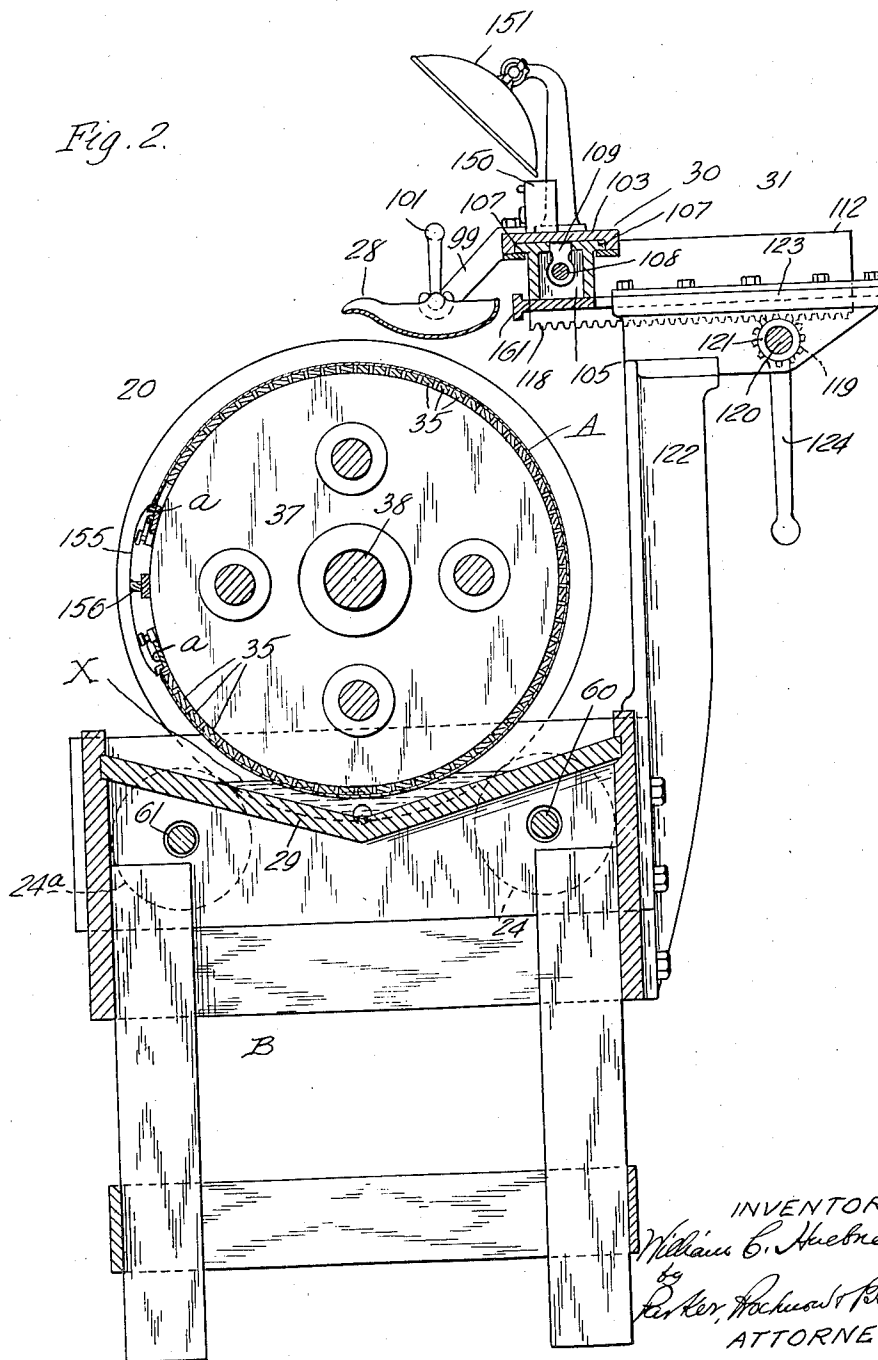
COATING MACHINE

Filed Oct. 9, 1924

1,647,360

6 Sheets-Sheet 2

Fig. 2.



INVENTOR.  
William C. Huebner  
By  
Parker, Richard & Bean  
ATTORNEYS.

Nov. 1, 1927.

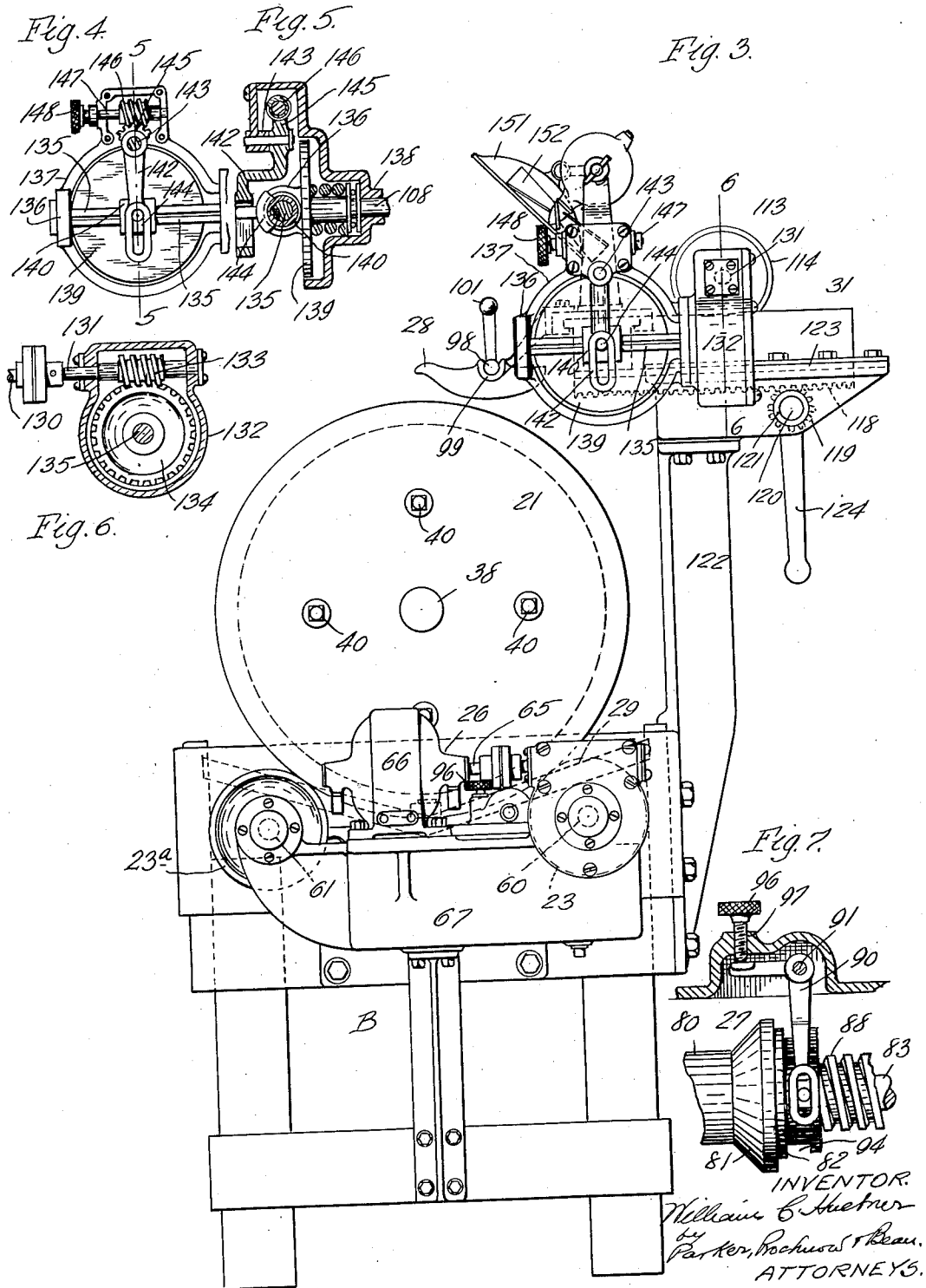
1,647,360

W. C. HUEBNER

COATING MACHINE

Filed Oct. 9, 1924

6 Sheets-Sheet 3



Nov. 1, 1927.

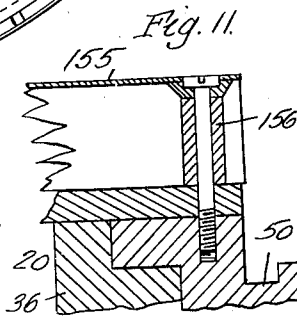
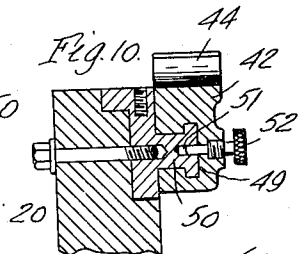
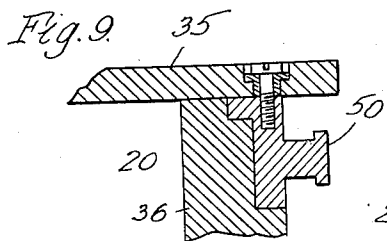
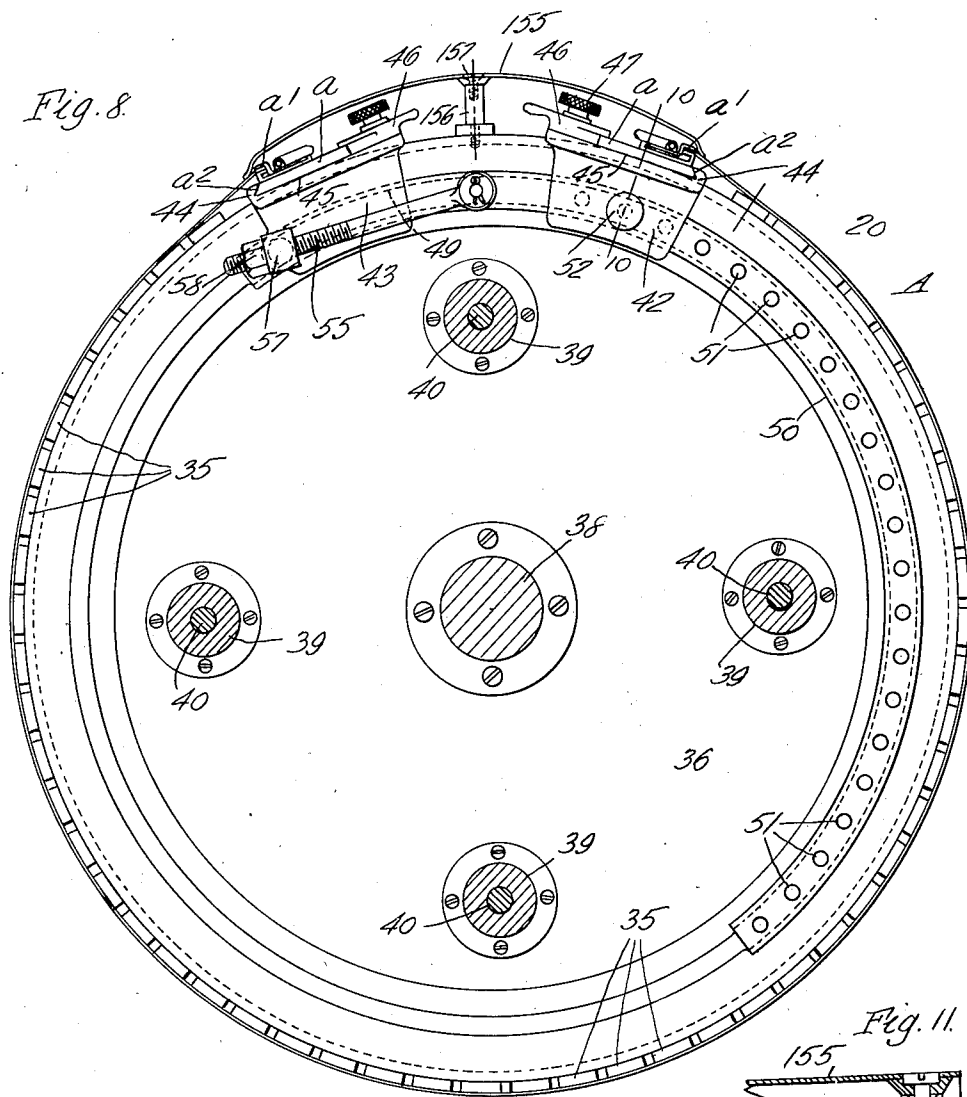
1,647,360

W. C. HUEBNER

COATING MACHINE

Filed Oct. 9, 1924

6 Sheets-Sheet 4



INVENTOR.  
William C. Huebner  
by Parker, Rockwood & Evans.  
ATTORNEYS.

Nov. 1, 1927.

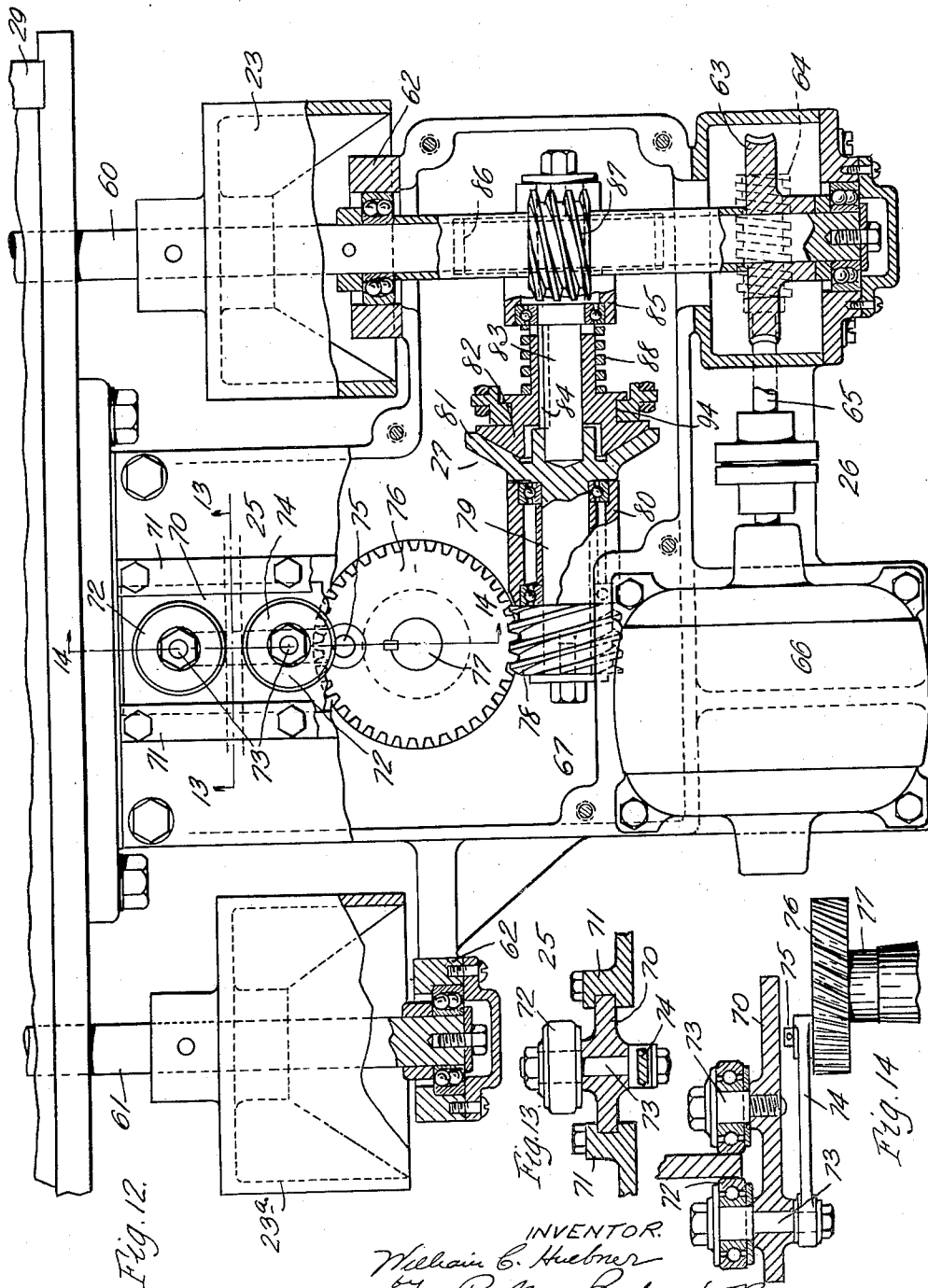
1,647,360

W. C. HUEBNER

COATING MACHINE

Filed Oct. 9, 1924

6 Sheets-Sheet 5



INVENTOR.  
William C. Huebner  
by Parker, Prochman & Bean  
ATTORNEYS.

Nov. 1, 1927.

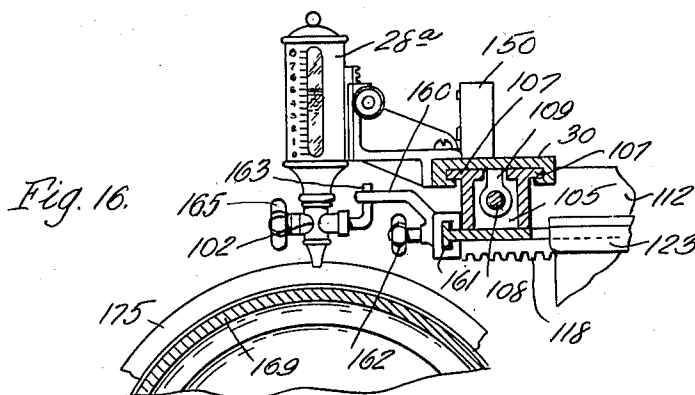
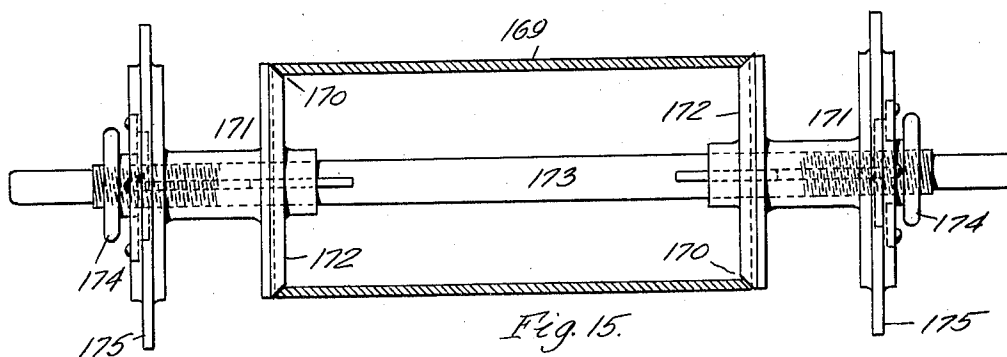
1,647,360

W. C. HUEBNER

COATING MACHINE

Filed Oct. 9. 1924

6 Sheets-Sheet 6



INVENTOR.

William C. Huebner  
by Parker, Rockwood & Bean  
ATTORNEYS.

## UNITED STATES PATENT OFFICE.

WILLIAM C. HUEBNER, OF BUFFALO, NEW YORK.

## COATING MACHINE.

Application filed October 9, 1924. Serial No. 742,710.

This invention relates to improvements in coating machines, more particularly to machines of this character which are employed in applying the light sensitive coatings or emulsions to flexible photographic plates or sheets and films, which may be formed of sheet metal, paper, rubber, celluloid or other materials. These machines may also be used to apply emulsions, liquids or solutions to other flexible sheets, and are adapted to be used for otherwise treating the coated sheets, for instance, to apply developing and fixing solutions to photographic sheets or films after they have been exposed and for washing the same between and after the application of said solutions.

Machines of this character have heretofore been provided for coating plates, sheets or the like, but these machines give very unsatisfactory results for the reason that the sheet or element to be coated must be mounted flat in the machine, in a horizontal plane, and is rotated at high speed on a vertical axis coinciding substantially with the center of the sheet or element, while the coating fluid or solution is applied by pouring it on the center of the sheet and is spread over the surface by centrifugal action. This results in very uneven coatings, or uneven action of solutions on the sheet or element because of the fact that the outer portions of the sheet or element travels much faster than the central portion. The results from this type of machine are so unsatisfactory that much work is spoiled and material wasted by its use. Further, it is difficult to properly mount and stretch a thin, flexible sheet in such a machine so that its surface will be perfectly flat and horizontal and the surfaces of the sheets are often uneven and wavy, making it impossible to provide a coating of even thickness over its entire surface.

One of the objects of the present invention is to provide a practical and efficient machine for the purposes stated which is adapted to produce even coatings on flexible sheets, films or other flexible elements, or which may be used to distribute liquids or solutions for treating such elements in an even manner over the entire surface thereof.

Another object is to construct the machine so that the drum, with the sheet or element in place thereon, can be easily removed from the machine and placed on a similar machine

or machines to permit the element to be subjected to a series of different solutions or treatments.

Other objects are to provide a machine of this sort having a drum on which the flexible sheet or element may be mounted, means for rotating the drum, and means for evenly distributing the coating or treating medium or solution on the sheet or element during the rotation of the drum; also to provide means for imparting an endwise reciprocating motion to the drum during the rotation thereof so as to spread the coatings or solutions evenly over the surface of the flexible element thereon; also to construct the machine so that the drum may have either a rotating movement only, or both rotating and reciprocating movements simultaneously, as desired; also to provide a vessel or receptacle for the solutions or coating fluids and means for automatically feeding or moving this vessel longitudinally of the drum while the drum is rotating so that the solutions or fluids may be poured on the sheet or element on the drum in a uniform manner; also to provide means for automatically starting and stopping the flow of fluid from said vessel at predetermined points in its path of travel over the drum, and also to improve and simplify machines of this character in the other respects hereinafter described and claimed.

In the accompanying drawings,

Fig. 1 is a front elevation of a coating machine embodying the invention.

Fig. 2 is a transverse sectional elevation thereof on line 2—2, Fig. 1.

Fig. 3 is an end elevation thereof.

Fig. 4 is a side elevation partly in section of a part of the variable speed driving mechanism for the feed carriage of the coating means.

Fig. 5 is a vertical section thereof on line 5—5, Fig. 4.

Fig. 6 is a similar view of another part of driving mechanism on line 6—6, Fig. 3.

Fig. 7 is an elevation partly in section of the clutch controlling means for the drum reciprocating mechanism, on an enlarged scale.

Fig. 8 is a transverse vertical section of the coating drum, on an enlarged scale.

Figs. 9, 10, and 11 are fragmentary sectional detail views showing the construction of the coating drum.

Fig. 12 is a horizontal plan partly in section and on an enlarged scale of the drum driving and reciprocating mechanism.

Fig. 13 is a transverse vertical section of the reciprocating slide thereof on line 13—13, Fig. 12.

Fig. 14 is a longitudinal vertical section thereof on line 14—14, Fig. 12.

Fig. 15 is a longitudinal sectional elevation of a rotogravure cylinder and means for mounting the same for use in the machine of the present invention.

Fig. 16 is a fragmentary transverse sectional elevation of a vessel for discharging fluids upon the element supported on the coating drum and showing automatic means for closing the valve thereof.

The machine shown in the drawings as an embodiment of the present invention comprises generally, a horizontally arranged substantially cylindrical drum 20 around and on which the flexible sheet or element A to be coated or treated is placed and which is provided with adjustable means for securing and drawing the element taut on the drum, circular driving disks 21, 22 secured at opposite ends of the drum 20, friction rolls or wheels 23, 23<sup>a</sup> and 24, 24<sup>a</sup> on which the disks 21, 22 respectively rest to rotatably support the drum 20, and means for rotating certain of said wheels to drive the drum. Mechanism 25 is also provided which is adapted to engage one of the driving disks to impart endwise reciprocation to the drum, said reciprocating mechanism 25, as well as the friction rolls 23 and 24 being rotated by means of a drive mechanism 26, and including a clutch device 27 for coupling the reciprocating mechanism to and uncoupling it from the driving means at will, so that the drum 20 may be rotated either with or without a simultaneous endwise reciprocating motion. A vessel or receptacle 28 for the coating solution or other liquid to be applied to the element A is preferably disposed above the drum 20, while a trough 29 is arranged below said drum to receive the surplus fluid flowing from the element on the drum. The vessel 28 is mounted on a carriage 30 which is arranged to travel lengthwise over the drum 20, and means for driving the carriage is provided on a supporting frame 31, which is arranged to move laterally away from the drum so that the carriage 30 and operative parts may be moved out of the way to permit the drum 20 to be lifted out of the machine and placed on another similar machine for permitting additional or different treatments to be given to the flexible sheet or element A.

The machine has been designed primarily for the purpose of applying uniform light sensitive coatings to sheet metal press plates, and after such plates have been exposed to

light, to permit them to be developed, fixed, washed or otherwise treated on the machine or on a series of such machines, by transferring the drum 20, with the sheet or element thereon, successively from one machine to another. The flexible sheet or member will hereinafter be termed the "element" for the sake of brevity, but it should be understood that while the machine may be used for coating or applying liquids or solutions to flexible sheets or the like, the machine is equally adapted for use in coating or otherwise treating cylinders such as rotogravure cylinders having a rigid metal body portion on which the sensitized or other coating is adapted to be applied.

In the construction disclosed in Figs. 1 to 14 of the drawings, the drum 20 comprises a plurality of longitudinal bars or slats 35 secured at their opposite ends to the peripheries of drum heads 36 and intermediate their ends to a reinforcing member 37. A shaft 38 passes centrally through the heads 36 and member 37 and extends outwardly beyond the opposite heads 36, its ends being secured centrally in the driving disks 21, 22. A plurality of spacing sleeves 39 arranged at suitable intervals around the shaft 38 are secured between the driving disks 21 and 22 and the adjacent drum heads 36 by means of tie bolts 40, passing through the sleeves, to form a rigid connection between the drum proper 20 and said driving disks. The ends of the shaft 38 extend outwardly beyond the driving disks 21, 22 to provide handles or lifting portions to permit the drum to be lifted out of the machine.

The element A, is preferably secured at its opposite end edges detachably to bars *a*, each of which has a plurality of clamps or jaws *a'*, in which the edges of the element are inserted and clamped. The bars have inner beveled edges *a''*. Each of the heads 36 of the drum 20 is provided with two members or blocks 42, 43, see Figs. 1 and 8. The block 42 at each end of the drum is provided with an undercut shoulder 44 under which the beveled edge *a''* of one of the securing bars *a* is adapted to be seated, a face 45 on which the end of the bar rests, and a pivoted fastener 46, which is adapted to engage over the outer edge of the bar to fasten it to the block 45, said fastener being retained in such position by a clamping screw 47. The block 42 is further provided on its inner face with an undercut groove 49, by which it is slidably retained on a curved shouldered guide rib 50 on the end of the drum. The ribs 50 are disposed at the outer faces of the drum heads 36 concentric with the axis of the drum 20, and each is provided with a plurality of correspondingly spaced holes or seats 51, while each attaching block is provided with a dowel pin or screw 52, adapted to fit the

holes 51 and having threaded connection with the block, so that, by manipulating the screw 52 the block 42 can be locked in different positions along the rib 50. The attaching blocks 43 for the other bar *a* of element A, are provided with shoulders 44, seats 45 and pivoted fasteners 46, similar to those on blocks 42, and are also formed with grooves 49 whereby they also slidably engage the ribs 50.

Means are provided for adjusting the blocks 43 on the drum 20 relatively to the other blocks 42 to stretch or draw the element A taut on the drum. These means preferably comprise a screw rod 55 for each block pivotally secured to the adjacent drum head 36, between the blocks 42, 43 and passing through a hole in a swivel lug 57 on the block 43, said screw being provided with a nut 58 which bears against the outer face of the lug 57. By tightening up the nuts 58 the blocks 43 can be moved towards the other blocks 42, thus drawing the element tightly around the drum against the slats 35, and by providing the spaced holes 51 and locking screws 52, the blocks 42 can be positioned at different distances from the blocks 43 as may be necessary to accommodate elements of different lengths. Elements of any width not exceeding the length of the drum may be mounted thereon, by providing securing bars *a* therefor which are long enough to extend from one drum head 36 to the other. The described construction further permits the elements to be readily placed on, or removed and replaced on the drum or on another drum, as desired.

As shown in Figs. 1 and 3, the friction rolls 23, 23<sup>a</sup> are disposed below and at opposite sides of the center of the driving disk 21, while the other friction rolls 24, 24<sup>a</sup> are similarly disposed with reference to the disk 22, and the edges of the disks are adapted to bear and roll on the rolls 23, 23<sup>a</sup> and 24, 24<sup>a</sup> respectively. The drum is therefore supported in its operative position in the machine by means of the friction rolls. By rotating one or more of the friction rolls, rotation is imparted to the drum 20. Preferably the rolls 23, 24 and the rolls 23<sup>a</sup>, 24<sup>a</sup> are respectively secured on parallel, horizontal shafts 60, 61 journaled in bearings 62 on a base frame B, which may be of any suitable construction adapted to support the various operative parts of the machine. The shafts 60, 61 extend longitudinally beneath the drum 20, and one of them, for instance the shaft 60, is adapted to be positively driven and by the rotation of the friction rolls 23, 24 thereon cause the drum to rotate. The other friction rolls 23<sup>a</sup>, 24<sup>a</sup> are idler rolls.

Any suitable means for driving the shaft 60 may be provided, that shown comprising a worm wheel 63, on the shaft 60, and a

worm 64 on the shaft 65 of an electric motor 66. These parts are supported on a bracket or housing 67 of the base B. The means mentioned for reciprocating the drum endwise is preferably constructed as follows (see Figs. 12-14).

70 represents a horizontal slide adapted to reciprocate longitudinally in guides 71 and having on its upper side a pair of anti-friction rollers 72, journaled on vertical studs 73 on the slide. The rolls are disposed so that their peripheries engage the opposite faces of the peripheral portion of disk 21. At the under side of the slide 70 is a pitman 74 suitably pivoted at one end to the slide 70, and at its other end to a crank pin 75, on a spiral gear 76 secured on a vertical stud shaft 77 journaled in the housing 67. The gear 76 is rotated to actuate the crank 74 by a spiral pinion 78, secured on one end of a transverse shaft 79 journaled in a bearing sleeve 80. The other end of the shaft 79 has secured thereto one member 81 of a cone clutch, the other member 82 of which is arranged to slide into and out of engagement with the member 81 on a shaft 83, with which it is rotatably connected by a key or spline 84. One end of the shaft 83 is journaled in a bearing 85 in the housing 67 and the other end is seated in the hub of the clutch member 81. The shaft 83 is geared by a spiral gear 86 and a spiral pinion 87 to the shaft 60 for rotating the shaft 77 to reciprocate the slide 70, when the clutch members are in engagement. The clutch member 82 is adapted to be pressed into driving engagement with its cooperating member 81 by a suitable spring 88, but, as the machine is usually first operated with the drum rotating only, and not reciprocating, means are provided for actuating the clutch so that the rotation of the shaft 83 may be either transmitted to the gear 76 for reciprocating the slide 70 or, by releasing the clutch, to allow the drum to be rotated only without reciprocation.

Owing to the fact that the drum 20 is relatively heavy it is desirable that the clutch members 81, 82 may be permitted to engage gradually when it is desired to reciprocate the drum so as to avoid sudden strains on the driving mechanism. For thus actuating the clutch, a bell crank lever 90 (Fig. 7) is shown pivoted at 91 in the cover of the housing 67 and having a bifurcated arm provided with pins entering an annular groove 94 in the hub of the clutch member 82. The other arm of the lever 90 is engaged by the end of a screw 96 which turns in a threaded hole 97 in the cover, and has an operating knob outside the housing. By turning the screw in one direction the lever 90 is swung and moves the clutch member 82 to the right (see Fig. 7) to disengage the clutch. By turning the screw in the

opposite direction the clutch is gradually engaged by the pressure of the spring 88 against the member 82. Any other suitable clutch and clutch operating means may be used.

The described drum operating means permits the drum to be rotated by the motor 66 through the gears 63, 64, shaft 60 and friction rolls 23, 24 and also permits it to be simultaneously rotated and reciprocated as desired by actuating the screw 96 to engage the clutch members 81, 82, from the single motor or other source of power.

As shown, the friction rolls 23, 23<sup>a</sup> and 24, 24<sup>a</sup> are provided with wide peripheries, for the reason that, when the reciprocating mechanism is in operation, the edges of the disks 21, 22 will be moved gradually across the faces of these rolls in an endwise direction, and therefore the peripheries of the rolls must be wide enough to accommodate such movements of the disks.

The vessel or receptacle 28 for the coating or other liquid may be of any suitable form adapted for the particular kind of solution to be used. The vessel 28 shown is in the form of a ladle, see Figs. 1-3, and is provided with trunnions 98 journaled in arms 99 extending forwardly from the carriage 30. The ladle has a pouring lip arranged substantially over the longitudinal axis of the drum 20, and a handle 101 enables the operator to tip the ladle to gradually pour the solution on the element A as the carriage 30 moves across the machine. In Fig. 16 the ladle or vessel 28 is replaced by a cylindrical vessel 28<sup>a</sup> adapted to contain developing, fixing or the like solution which is discharged by a valve 102 in the bottom of the vessel. This valve is preferably automatically actuated to close it when the carriage reaches a predetermined position at each side of the element A so as to permit the fluid to discharge only on said element, by adjustable means to be later described.

The carriage 30 rests and is adapted to slide on the top of a hollow horizontal guide rail or member 105 secured on the frame 31 and extending from end to end of the machine parallel with the drum 20. The rail 105 has opposite guide ways 107 in the carriage, which is thus retained in place on the rail. The carriage is preferably moved to and fro from end to end of the machine by a revoluble feed screw 108 disposed longitudinally in the hollow rail 105, and turning in a nut 109 secured to the carriage. The frame 31 is provided with a pair of horizontal end bars 112, extending rearwardly from the ends of the rail 105, and the carriage driving mechanism 113, including a motor 114, is mounted on brackets 115, 116 secured to one of these bars so as to be operatively connected to an end of the feed screw 108.

The operative position of the carriage guide rail 105, carriage 30 and parts of the driving mechanism 113 is such as to prevent the drum from being lifted and removed from the machine. The carriage supporting frame 31 is therefore arranged so that it can be moved rearwardly to a position out of the way of the drum 20. In the construction shown for this purpose each of the end bars 112 is provided on its under side with a transverse rack 118 adapted to mesh with a pinion 119. The pinions are secured to the opposite ends of a shaft 120, journaled in bearings 121 in upright brackets 122 at the rear of the machine behind the drum. The brackets are provided with transverse horizontal guide ways 123 in which the end bars of the frame 31 are slidably retained. One end of the shaft 120 is provided with a crank handle 124 for rotating it, so that the supporting frame 31 may be easily moved forwardly and rearwardly to and from operative position over the drum. Any other suitable construction may be employed for this purpose.

The drive mechanism 113 for the carriage 30 preferably includes a variable speed device, and the connections between the driving motor 114 or other source of power and the screw shaft 108 are arranged as follows:

The shaft 130 of the motor 114 is coupled to a shaft 131 which extends into and is journaled in a gear casing 132 secured on the bracket 115 and is provided therein with a worm 133 meshing with a worm wheel 134, see Fig. 6. This wheel 134 is secured on a horizontal shaft 135 extending forwardly and having one end journaled in a bearing in the casing 132 and its other end in a bearing 136 formed on an extension 137 of the casing 132. One end of the screw shaft 108 extends through a bearing 138 on the extension 137 and is provided with a friction drive disk 139. A friction wheel or roller 140 is splined on the shaft 135 and is adapted to frictionally engage and rotate the disk 139, adjusting means being provided whereby the roller may be positioned to engage the disk at any desired distance from the center of rotation of the disk to permit the disk 139 to be driven at different speeds. The adjusting means shown for this purpose, see Figs. 1 and 3-6, includes a lever 142 pivoted on the casing at 143 and having a slotted end which receives a stud projecting from a fork member 144 disposed in a circumferential groove in the roller 143. The lever is further provided at its opposite end with a toothed segment 145 which meshes with a worm 146, on a shaft 147 which is provided with a knob 148, which when actuated to turn the worm, will cause the lever 142 to swing on its pivot and slide the roller 140 on the shaft 135 across the face of the friction disk 139 so that by actuating

the worm 146 any desired speed may be imparted to the screw shaft 108 and through it to the feed carriage 30.

Any suitable reversing and controlling means may be used whereby the direction of travel of the carriage 30 may be reversed after it reaches one or the other end of the guide rail 105. In the present construction the motor 114 is of the reversible type and a reversing switch or control panel 150, arranged for instance on the carriage 30, see Fig. 1, permits the direction of movement of the carriage to be reversed when desired at any point in its travel between the ends of the carriage guide. The carriage is also preferably provided with an electric heater 151 and an electric fan 152 for directing heated air onto the element A after it has been coated or otherwise treated, to expedite the drying thereof.

The drum 20 is preferably provided with means for closing or bridging the space between the ends of the element A so as to prevent the entrance of the coating or other solutions into the interior of the drum. The means shown consists in a curved sheet metal plate or deflector 155, which is adapted to be removably secured to studs 156 extending outwardly from the heads 36, 37, by screws or bolts 157 with the side edges of the plate extending over and engaging the end portions of the element A. A number of the deflectors 156 of different widths are provided for use with elements of different sizes. The length of all of the deflectors is substantially the same as the length of the drum 20, so that by controlling the length of travel of the carriage 30 within the limits of the edges of the element being treated, the solutions or liquids are prevented from entering the drum. The adjustable valve closing means before mentioned for actuating the valve 102 of the cylindrical vessel 28<sup>a</sup> preferably comprises a pair of fingers 160 which are slidably adjustable on a longitudinal horizontal guide rib 161 of the guide rail 108 and are adapted to be clamped thereon in any required position by clamping screws 162, see Figs. 1 and 16. The fingers extend into the path of a bent stem or part 163 of the valve 102 and when the carriage 30 approaches one of the fingers the stem 163 is engaged and turns the valve and shuts off the flow of solution from the vessel 28<sup>a</sup>. The fingers are adjusted to positions adjacent the side edges of the element A so as to close the valve before the discharge nozzle of the vessel passes beyond the edges of the element so that if the carriage continues its movement beyond the edges no fluid is wasted. Upon the return travel of the carriage the valve is opened, after passing the first stop, by the handle 165 to start the flow of the solution, and the valve will be again automatically closed when it

reaches the other side edge of the element A by the other finger 160.

The described construction provides a practical machine for the purpose stated, in which a variety of sizes of flexible elements or sheets may be coated or otherwise treated with liquids, and in which the elements may be removed from the machine while still on the drum and placed in another machine for subsequent treatment. The reciprocating and rotating means for the drum insures an even coating of the element, or an even distribution of the various treating liquids thereon.

While the machine is used primarily for the purpose stated it may be equally well adapted for use in coating or treating various process cylinders, such as copper rotogravure cylinders. When it is desired to treat such a cylinder a special mandrel or support therefor is provided as shown in Fig. 15. The cylinder 169 is open at its ends as shown at 170, and a pair of heads or disks 171 are provided having portions 172 which seat in the open ends of the cylinder and are supported on a shaft 173, to which they are splined to permit them to move into and out of engagement with the cylinder. The shaft is threaded adjacent its ends and a clamp nut 174 is provided for each head which is adapted to be screwed onto the shaft to engage and force the head tightly against the cylinder. The heads are each provided with an annular driving disk or flange 175 similar to the disks 22, 23 of the drum 30 whereby the cylinder 169 may be rotatably supported on the friction wheels 23, 23<sup>a</sup>, 24, 24<sup>a</sup> as in the case of the drum 20. The ends of the shaft 173 extend outwardly beyond the disks 175 to provide handles or portions to enable the cylinder to be lifted out of the machine.

For developing exposed elements in cylindrical form or otherwise treating them with solutions, the trough 29 can be used to hold a sufficient amount of developing or fixing solution or other liquid so that the element can be rotated and reciprocated at will while dipping into the liquid X as shown in Fig. 2, so that a uniform action will take place over the cylindrical element while in motion. This manner of using the machine enables successful treatment of the elements with liquids which might cause streaks or uneven distribution of the liquids if they are poured on the element as before described. The element can be successfully treated with various solutions in this way of using the solutions in the troughs of two or more machines and by moving the cylindrical drum from one machine to another to carry out certain required steps in a process for chemical treatment to attain a given result on the element.

I claim as my invention:—

1. In a machine for applying a coating or other liquid upon a flexible element, the combination of a horizontal drum, means for detachably securing said element around the periphery of said drum, a containing vessel for the liquid supported above said drum, means for discharging said solution from said vessel upon said element, means for rotating said drum about its axis, and means for causing said vessel to travel lengthwise of said drum to permit said liquid to be discharged upon said element in a path transverse to the direction of rotation of said drum.
2. In a machine for applying a coating or other liquid upon a flexible element, the combination of a horizontal drum, means for stretching and detachably securing said element around the periphery of said drum, a containing vessel for the liquid supported above said drum, means for discharging said solution from said vessel, means for rotating said drum about its axis, means for imparting an endwise reciprocating movement to said drum during the rotation thereof, and means for moving said vessel lengthwise of said drum to permit said liquid to be poured upon said element in a path transverse to the direction of rotation of said drum.
3. In a machine for applying a coating or other liquid upon a flexible element, a drum removably supported in said machine, means for detachably securing said element around the periphery of said drum, means for rotating said drum, a vessel for containing the liquid, means for supporting said vessel in an operative position above said drum and moving it lengthwise of said drum to permit said liquid to be discharged upon said element during the rotation of said drum to cause an even distribution of the liquid in said element, said vessel support and vessel being mounted to move to an inoperative position to permit said drum to be removed from the machine with said element in place thereon.
4. In a machine for applying a coating or other liquid upon a flexible element, the combination of a horizontal drum, means for detachably securing said element around the periphery of said drum, means for rotating said drum about its axis, a carriage movable in a direction parallel with the axis of said drum, a containing vessel for the liquid pivotally supported on said carriage and adapted to be tilted to discharge liquid upon said element, a longitudinal guide for said carriage, and driving means for moving said carriage on said guide across the machine so that said liquid may be discharged upon said element in a path which is transverse to the direction of rotation of said drum.
5. In a machine for applying a coating or other liquid upon a flexible element, the combination of a horizontal drum, means for detachably securing said element smoothly around the periphery of said drum, drive disks connected to the ends of said drum, means engaging said disks to rotate said drum on its axis, a containing vessel for the liquid, a carriage on which said vessel is supported above the drum to permit the liquid to discharge from the vessel upon said element, a longitudinal guide on which said carriage is adapted to travel, drive means for moving the carriage on said guide including a variable speed mechanism, said movable carriage being adapted to permit the liquid to be discharged on said element in a path which is transverse to the direction of rotation of said drum.
6. In a machine for applying a coating or other liquid upon a flexible element, the combination of a horizontal drum, means for detachably securing said element smoothly around the periphery of said drum, means for rotatably supporting said drum, means for rotating the same about its axis, and means for discharging liquid on said element in a path which is transverse to the direction of rotation of said drum.
7. In a machine for applying a coating or other liquid upon a flexible element, the combination of a horizontal drum, means for stretching and detachably securing said element around the periphery of said drum, a drive disk connected to said drum, driving means on which said disk removably rests to rotate said drum about its axis, a containing vessel for the liquid, and means for causing said vessel to travel longitudinally over said drum for discharging the liquid from the vessel on said element in a path transverse to the direction of rotation of said drum.
8. In a machine for applying a coating or other liquid upon a flexible element, the combination of a horizontal drum, means for stretching and detachably securing said element around the periphery of said drum, drive disks connected to the ends of said drum, wheels at opposite ends of and below the axis of said drum on which said drive disks are adapted to rest, means for rotating one of said wheels to rotate said drum, a containing vessel for the liquid, and means for causing said vessel to travel longitudinally over said drum and for discharging the liquid from the vessel on said element in a path transverse to the direction of rotation of the drum.
9. In a machine for applying a coating or other liquid upon a flexible element, the combination of a horizontal drum, means for stretching and detachably securing said element around the periphery of said drum, a drive disk connected to said drum, driving means engaging said disk to rotate said drum about its axis, mechanism hav

part engaging said drive disk for reciprocating said drum lengthwise, a containing vessel for the liquid, and means for causing said vessel to travel longitudinally over said drum for discharging liquid from said vessel on said element in a path transverse to the direction of rotation of said drum.

10. In a machine for applying a coating or other liquid upon a flexible element, the combination of a drum, means for stretching and detachably securing said element around the periphery of said drum, a drive disk connected to said drum, driving mechanism having parts engaging said disk to rotate said drum about its axis, a liquid containing vessel arranged to discharge liquid on said element, mechanism having a part engaging said drive disk for reciprocating said drum lengthwise, and drive mechanism for simultaneously actuating said drum rotating mechanism and said drum reciprocating mechanism.

11. In a machine for applying a coating or other liquid upon a flexible element, the combination of a drum, means for stretching and detachably securing said element around the periphery of said drum, a drive disk connected to said drum, driving mechanism having parts engaging said disk to rotate said drum about its axis, a liquid containing vessel arranged to discharge liquid on said element, mechanism having a part engaging said drive disk for reciprocating said drum lengthwise, and drive means operatively connected to said drum rotating mechanism, and means whereby said drive means may be operatively connected to said reciprocating mechanism to actuate the same for reciprocating said drum simultaneously with its rotation, said connecting means being also adapted to be disconnected from said drive mechanism to render said reciprocating mechanism inoperative.

12. In a machine for applying a coating or other liquid upon a flexible element, the combination of a drum, means for stretching and detachably securing said element around the periphery of said drum, a drive disk connected to said drum, driving mechanism having parts engaging said disk to rotate said drum about its axis, a liquid containing vessel arranged to discharge liquid on said element, mechanism engaging said disk for reciprocating said drum lengthwise, and a source of power to which said driving mechanism is operatively connected, a clutch interposed between said source of power and said reciprocating mechanism, and means for actuating said clutch to connect said reciprocating mechanism with or disconnect it from said source of power so that said drum may be rotated with or without a simultaneous reciprocating motion.

13. In a machine for applying a coating or other liquid upon a flexible element, the

combination of a horizontal drum removably supported in said machine, means for detachably securing said element around the periphery of said drum, means for rotating said drum, a containing vessel for the liquid, and a carriage on which said vessel is tiltably mounted.

14. In a machine for applying a coating or other liquid upon an element having a cylindrical form, the combination of a device for supporting said element to rotate about a horizontal axis, means for rotating said device, said device with said element in place thereon being removable from said rotating means and from the machine, and means for discharging the liquid upon said element while it is being rotated in the machine.

15. In a machine for applying a coating or other liquid upon an element having a cylindrical form, the combination of a device for supporting said element to rotate about a horizontal axis, means for rotating said device and reciprocating the same lengthwise, said device with said element in place thereon being removable from said rotating and reciprocating means and from the machine, and means for discharging the liquid upon said element while it is being rotated in the machine.

16. In a machine for applying a coating or other liquid upon an element having a cylindrical form, the combination of a device for supporting said element to rotate about a horizontal axis, means for rotating said device and reciprocating the same lengthwise, said device with said element in place thereon being removable from said rotating and reciprocating means and from the machine, means for throwing said reciprocating means into and out of action at will, and means for discharging the liquid upon said element while it is being rotated in the machine.

17. In a machine for applying a coating or other liquid upon an element having a cylindrical form, the combination of a device for supporting said element to rotate about a horizontal axis, means for rotating said device, said device with said element in place thereon being removable from said rotating means and from the machine, means for discharging the liquid upon said element while it is being rotated in the machine, and means for supporting said liquid discharging means to travel over said rotating element parallel with its axis of rotation.

18. In a machine for applying a coating or other liquid upon an element having a cylindrical form, the combination of a device for supporting said element to rotate about a horizontal axis, means for rotating said device, said device with said element in place thereon being removable from said rotating means and from the machine, means

for discharging the liquid upon said element parallel with its axis of rotation, said liquid discharging device and supporting means being movable to permit the removal of said element supporting device from the machine.

19. In a machine of the character described, the combination with a rotatable drum, and means for applying a liquid to a flexible element on said drum, of means for stretching and detachably securing a flexible element around the periphery of the drum, comprising securing bars secured to the ends of said element and adapted to remain on said element when the latter is removed from the machine, means on said drum to which the securing bar at one end of said element is detachably connected and which are adapted to be adjusted to and secured in different positions around said drum to accommodate elements of different lengths, and adjustable means with which the securing bar at the other end of the element is detachably connected and which are adapted when adjusted to draw said element taut around said drum.

20. In a machine of the character described, a rotatable drum, a head at each end of said drum, clamping bars adapted to grip the ends of said element, securing blocks on said drum heads and having parts adapted to receive one of said clamping bars, and means for adjustably positioning said blocks in different locations on said heads to accommodate elements of varying lengths, and stretching blocks on said drum heads adapted to engage the other clamping bar, and means for adjusting said blocks to apply tension to said element and stretch the same around said drum.

21. In a machine of the character described, a rotatable drum, a head at each end of said drum, clamping bars adapted to grip the ends of said element, securing blocks having seats for receiving the ends of one of said clamping bars, guides on said drum heads on which said securing blocks are adapted to slide to different positions to accommodate elements of varying lengths, means for locking said securing blocks in desired position on said guides, stretching blocks having seats adapted to receive the other clamping bar, sliding connections between said stretching blocks and said drum heads, and means for sliding said blocks relatively to said heads to apply tension to said element to stretch the same smoothly on said drum.

22. In a machine of the character described, a rotatable drum, a head at each end of said drum, clamping bars adapted to grip

the ends of said element, securing blocks having seats for receiving the ends of one of said clamping bars, a circumferential guide on each of said drum heads to which one of said securing blocks is slidably connected, a series of equally spaced holes in said guides and means adapted to be received in either of said holes for locking said blocks on said guides in any selected position to accommodate elements of varying lengths, stretching blocks slidably arranged on said drum heads, and having seats for receiving the other clamping bar, and means for sliding said blocks relatively to said heads to apply tension to said element and stretch the same smoothly over said drum.

23. In a machine of the character described, a rotatable drum, means for stretching and detachably securing a flexible element around the periphery thereof, gripping means adapted to engage the ends of said element, members on said drum detachably connected to the gripping means at one end of said element and adapted to be adjusted to different positions around said drum to accommodate elements of varying lengths, means detachably engaging the other gripping means and adapted to stretch said element around said drum, and a deflector plate detachably secured to said drum and adapted to bridge the space between the ends of said element.

24. In a machine of the character described, a rotatable drum, means for stretching and detachably securing a flexible element around the periphery thereof, gripping means adapted to engage the ends of said element, members on said drum detachably connected to the gripping means at one end of said element and adapted to be adjusted to different positions around said drum to accommodate elements of varying lengths, means detachably engaging the other gripping means and adapted to stretch said element around said drum, and a plurality of deflector plates of different widths any of which may be detachably secured to said drum so as to bridge the space between the ends of elements of different widths.

25. In a machine for applying a coating or other liquid upon an element having a cylindrical form, the combination of a device for supporting said element to rotate about a horizontal axis, means for rotating said device, said device with said element in place therein being removable from said rotating means, and from the machine, and means for holding the liquid so that the element dips therein while it is being rotated in the machine.

WILLIAM C. HUEBNER.