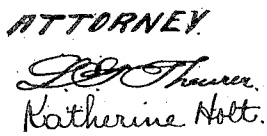


1,276,187.

7 SHEETS—SHEET 1.



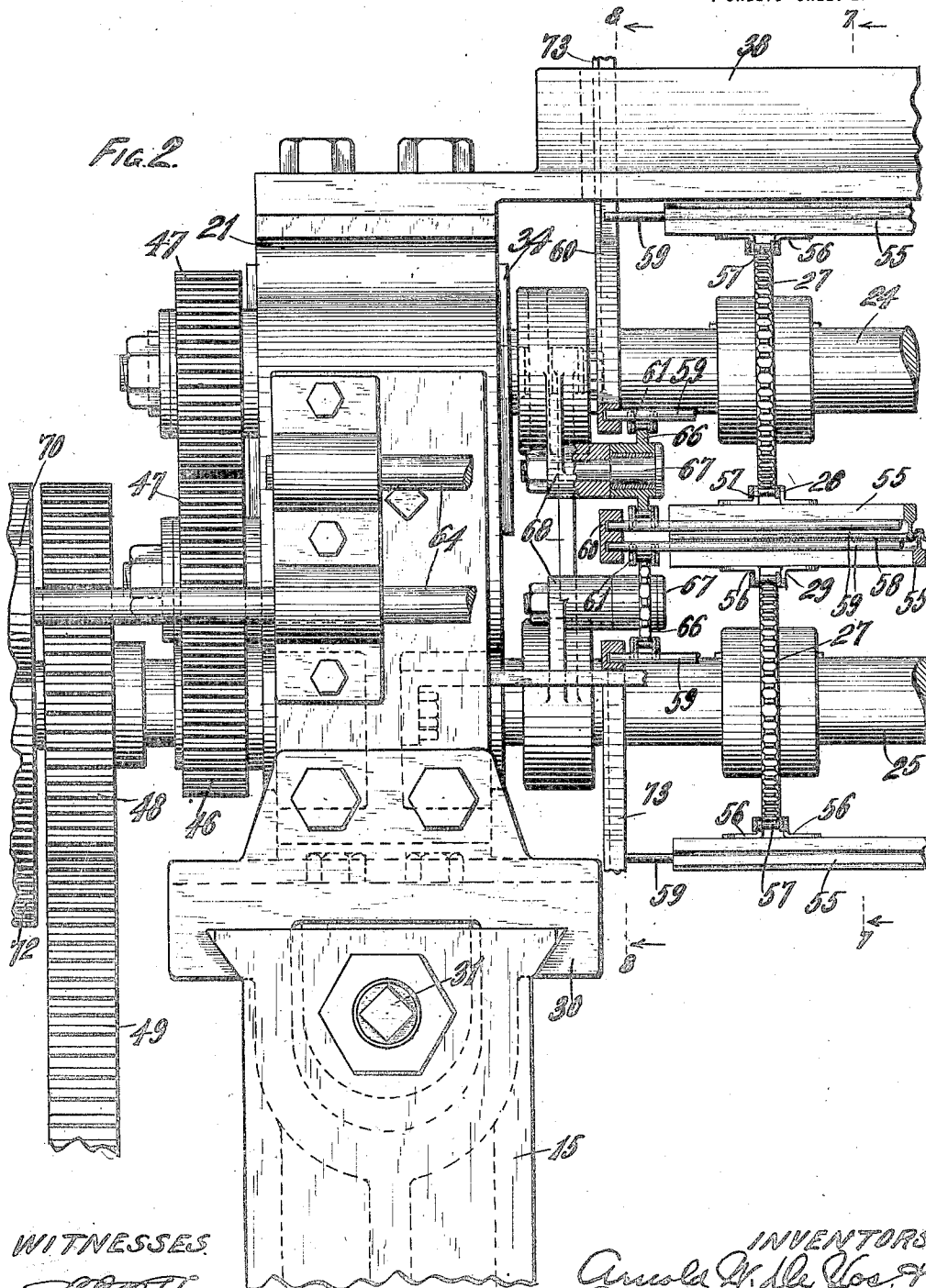
INVENTORS,
Arnold W. de Voet
Charles M. Moring
J. R. Caldwell
ATTORNEY.

A. W. DE VOS & C. M. DERING.
 VENEER CORRUGATING MACHINE.
 APPLICATION FILED NOV. 15, 1915.

1,276,187.

Patented Aug. 20, 1918.

7 SHEETS—SHEET 2.



WITNESSES

L. C. Theiss
Katharine Holt

INVENTORS

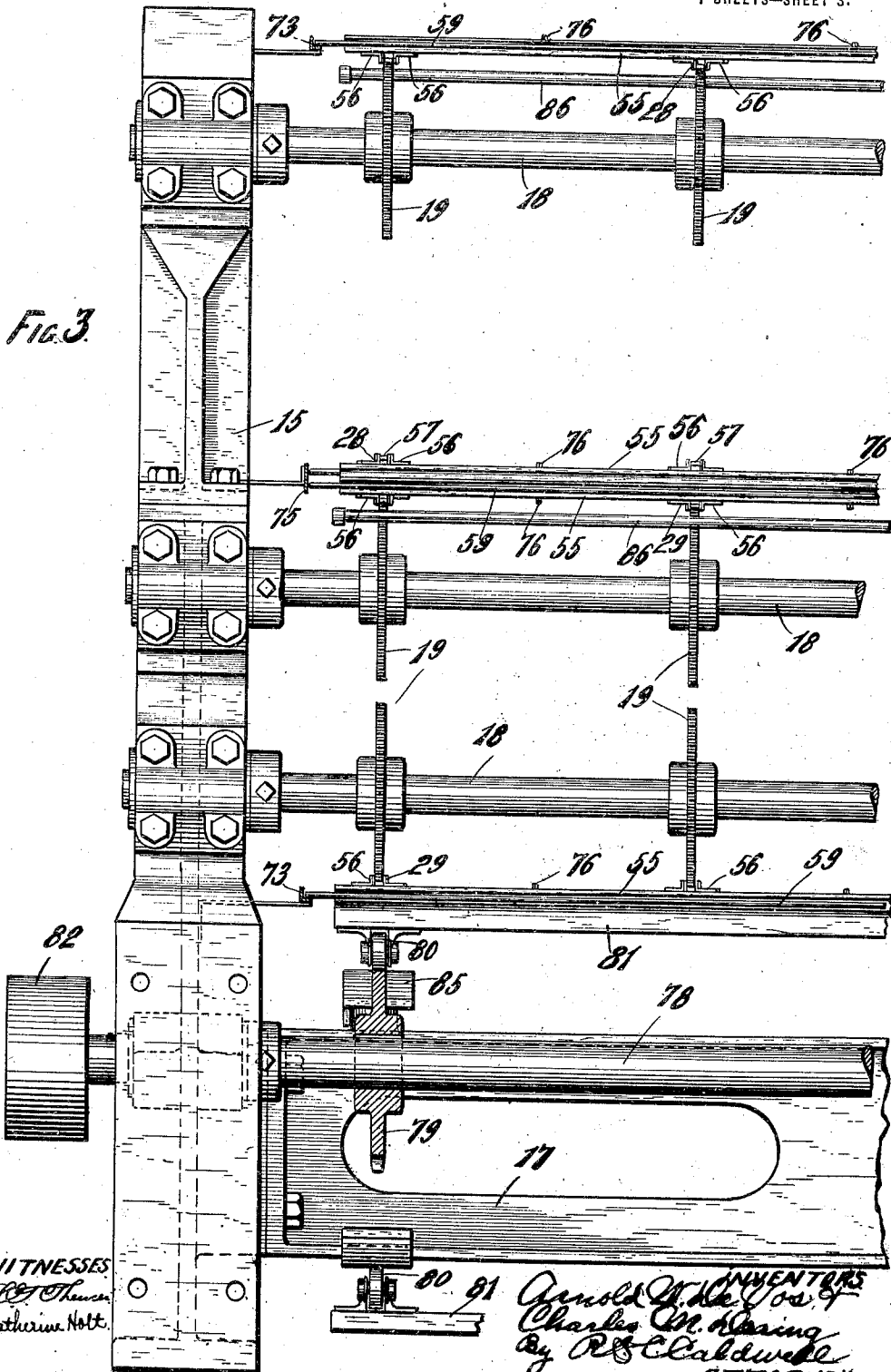
Arnold W. de Vos &
Charles M. Dering
By R. S. Caldwell
 ATTORNEY

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7 SHEETS—SHEET 3.



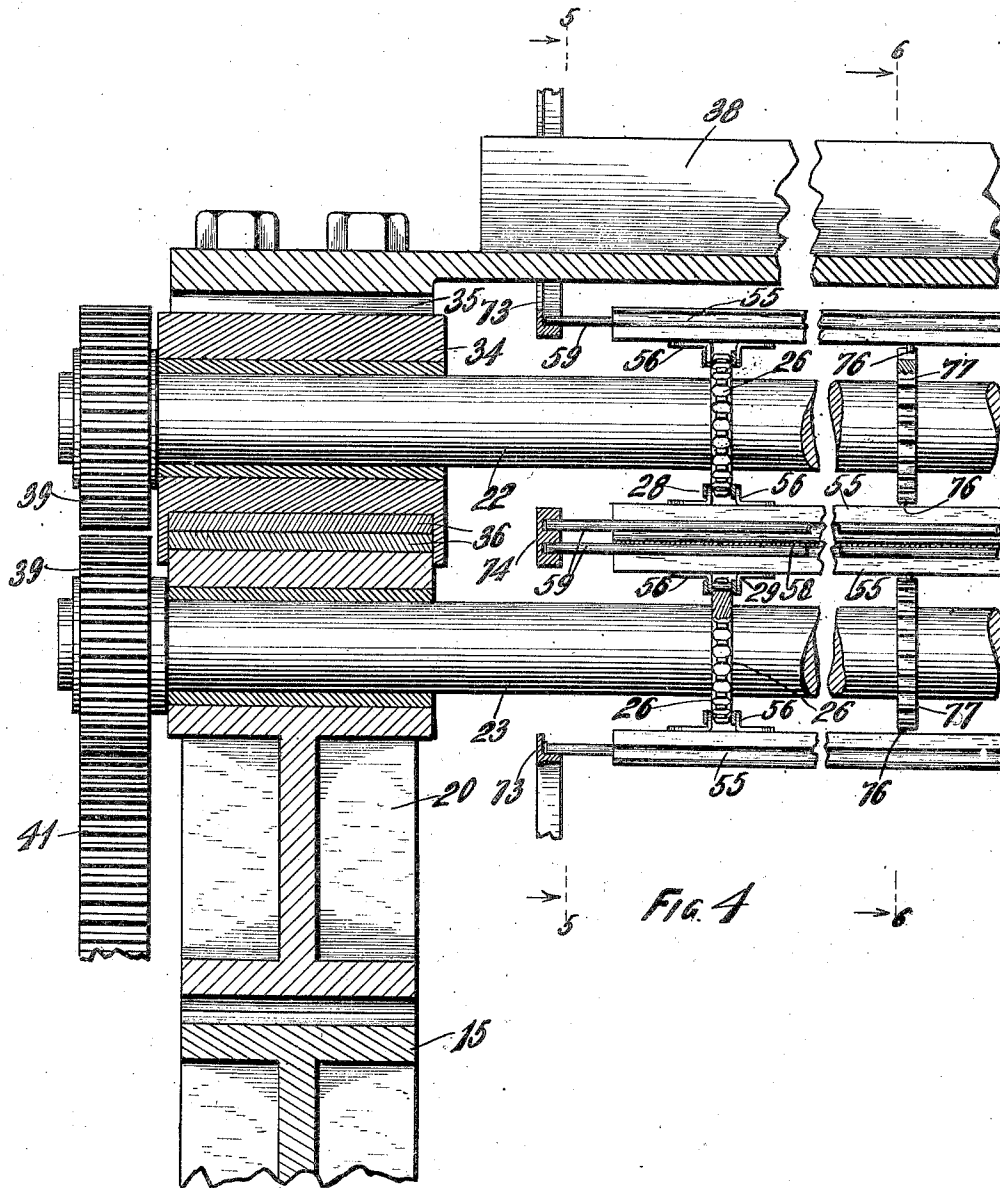
WITNESSES
 J. H. Thayer
 Katherine Nott.

INVENTORS
 Arnold W. de Vos &
 Charles M. Dering
 By R. B. Caldwell
 ATTORNEY

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1,276,187.

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 7 SHEETS—SHEET 4.



WITNESSES:

Wm. H. Thuermer
 Katherine Holt.

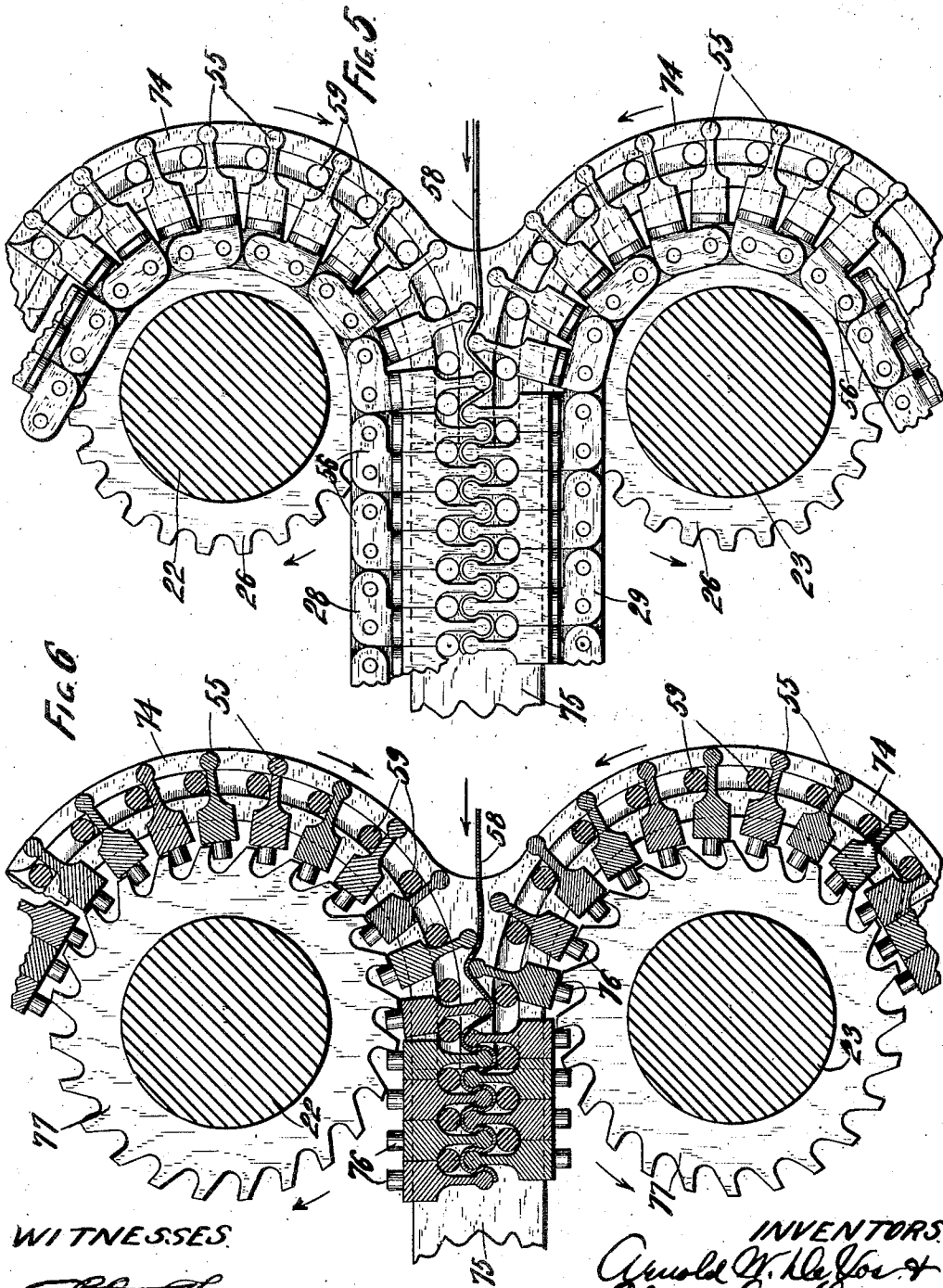
INVENTORS
*Arnold W. De Vos, &
 Charles M. Dering.*
 By *R. S. Caldwell*
 ATTORNEY

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1,276,187.

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7 SHEETS—SHEET 5.



WITNESSES

L. E. Thayer
 Katherine Holt.

INVENTORS

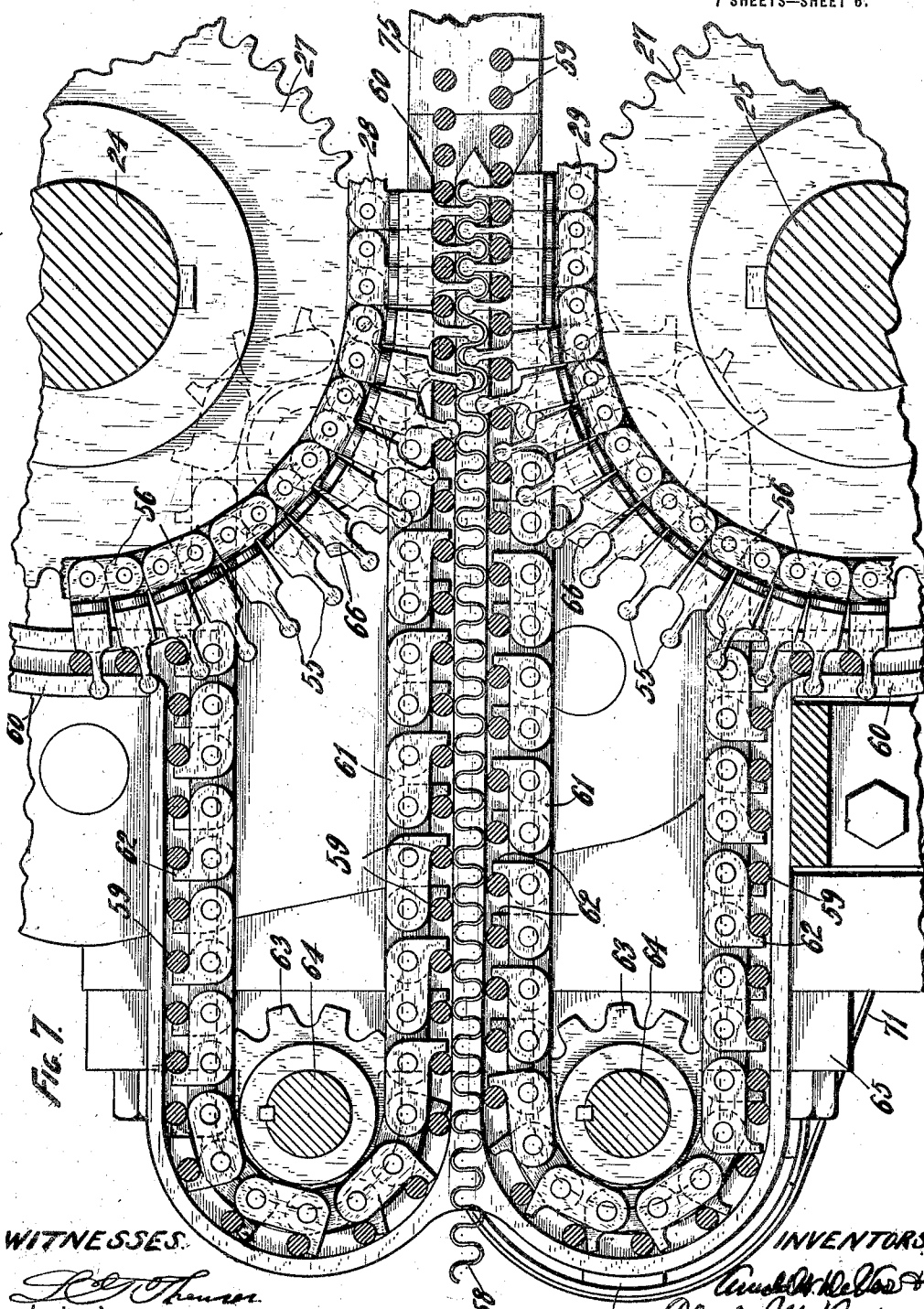
*Arnold W. DeVos &
 Charles M. Dering*
 By *R. S. Caldwell*
 ATTORNEY

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1,276,187.

Patented Aug. 20, 1918.

7 SHEETS—SHEET 6.



WITNESSES:

J. C. Thomas
Katherine Holt

INVENTORS

Amos W. De Vos &
Charles M. Dering

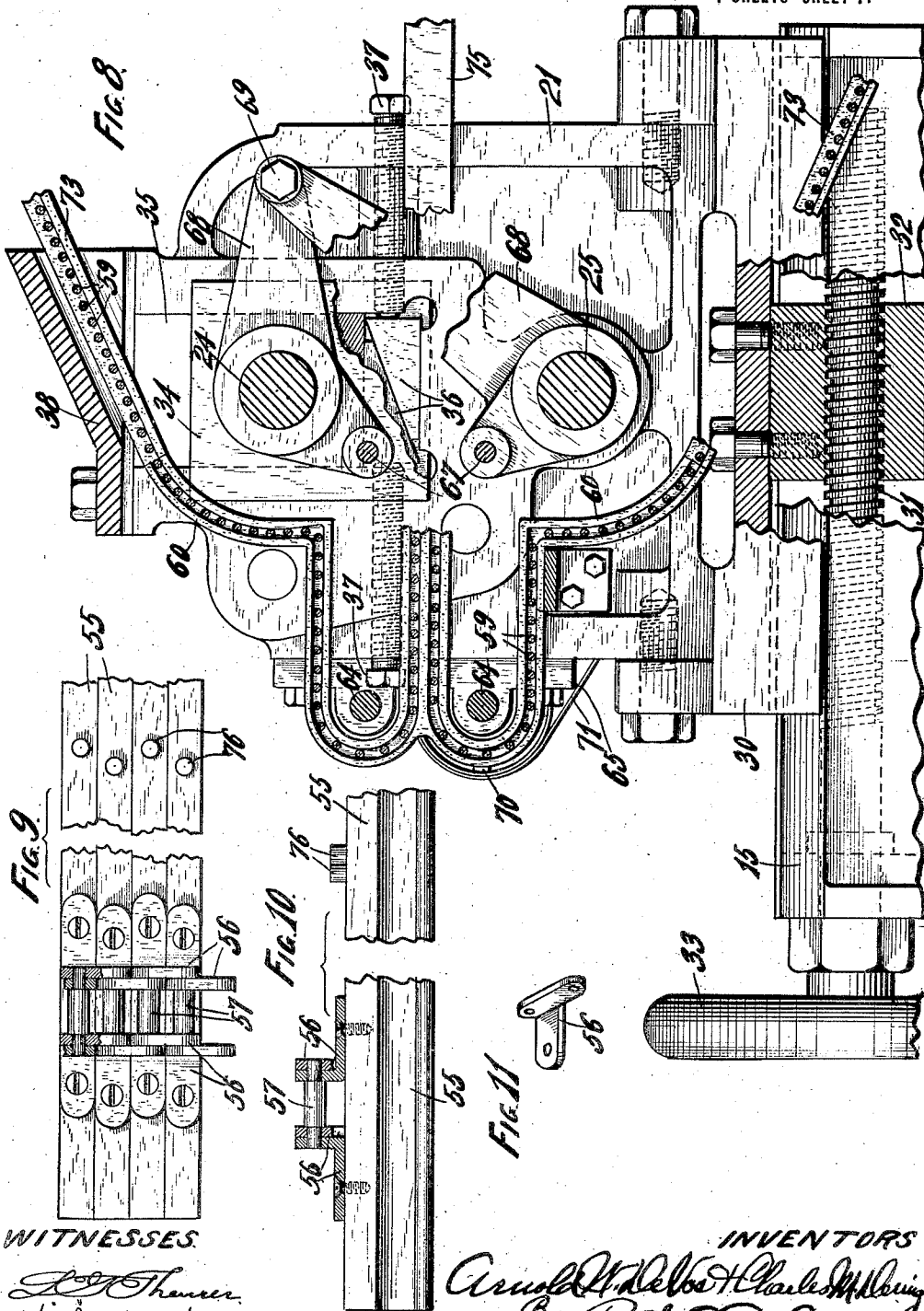
By *R. S. Caldwell* ATTORNEY

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 APPLICATION FILED NOV. 15, 1915.

1,276,187.

Patented Aug. 20, 1918.

7 SHEETS—SHEET 7.



WITNESSES

J. J. Thayer
Katherine Holt

INVENTORS

Arnold W. DeVos & Charles M. Dering
 By *R. S. Caldwell*
 ATTORNEY

UNITED STATES PATENT OFFICE.

ARNOLD W. DE VOS AND CHARLES M. DERING, OF MILWAUKEE, WISCONSIN, ASSIGNORS
TO CORRUGATED VENEER PACKING PRODUCTS CO., OF MILWAUKEE, WISCONSIN, A
CORPORATION OF WISCONSIN.

VENEER-CORRUGATING MACHINE.

1,276,187.

Specification of Letters Patent.

Patented Aug. 20, 1918.

Application filed November 15, 1915. Serial No. 61,466.

To all whom it may concern:

Be it known that we, ARNOLD W. DE VOS and CHARLES M. DERING, citizens of the United States, and residents of Milwaukee, in the county of Milwaukee and State of Wisconsin, have invented new and useful Improvements in Veneer-Corrugating Machines, of which the following is a description, reference being had to the accompanying drawings, which are a part of this specification.

The present invention has for its object to provide a machine for corrugating thin wood veneer to produce packing pads or the like shipping coverings for glass bottles and other fragile articles. An object of the invention is to provide a machine of this character which will be continuous in its operation and capable of receiving a sheet of limp, wet veneer at one end and discharging it in dry, formed, corrugated pads at the other end.

Another object of the invention is to provide such a machine that will shape the corrugations in the wood veneer packing pad so that each corrugation will have its side walls inclined inwardly toward each other at the open side thereof, and the end corrugations will thus be capable of interlocking with one another when the ends of the pad are brought together in overlapping relation. In other words, an object of the invention is to provide a machine for producing corrugated veneer packing pads as covered by Letters Patent to Louis F. Flipse, No. 901,334, dated October 20, 1908, and No. 1,156,895, dated October 19, 1915.

Another object of the invention is to provide a veneer corrugating machine comprising interfitting endless chains of parallel forming rods adapted in their movements to fold veneer between them, and traveling together with the crimped veneer therebetween for a sufficient distance to cause the veneer to become thoroughly dry so that it will retain the sinuous shape in which it is held by the forming rods, the forming rods being preferably heated to facilitate the drying operation.

Another object of the invention is to provide an efficient means for stripping the corrugated veneer from the forming rods at the discharge end of the machine.

With the above and other objects in view

the invention consists in the veneer corrugating machine as herein claimed and all equivalents.

Referring to the accompanying drawings, in which like characters of reference indicate the same parts in the different views,

Figure 1 is a side elevation of a veneer corrugating machine constructed in accordance with this invention, intermediate parts being broken away;

Fig. 2 is an end elevation of a portion of the discharge end of the machine, parts being sectioned;

Fig. 3 is a sectional elevation through a portion of the machine on the plane of line 3—3 of Fig. 1;

Fig. 4 is a sectional elevation of a portion of the machine at the feeding end thereof on the plane of line 4—4 of Fig. 1;

Fig. 5 is a sectional view on the plane of line 5—5 of Fig. 4;

Fig. 6 is a similar view on the plane of line 6—6 of Fig. 4.

Fig. 7 is a sectional detail view on the plane of line 7—7 of Fig. 2, showing the action of the stripper rods at the discharge end of the machine;

Fig. 8 is a sectional view on the plane of line 8—8 of Fig. 2;

Fig. 9 is a back view of a portion of one of the forming chains;

Fig. 10 is an edge view thereof with the chain links sectioned; and,

Fig. 11 is a perspective view of one of the forming chain link members.

In these drawings 15 indicates a series of frame sections which are arranged in pairs on opposite sides of the machine and which may be of any desirable number according to the length of the machine and which may be added to or subtracted from to vary the length of the machine to suit the particular requirements of the conditions under which the machine is operated, such sections being bolted together to form a rigid framework for supporting the various working parts in their operative relations. Each of the intermediate frame sections 15 has an upper frame section 16 formed therewith, or preferably bolted thereto, and cross girts 17 connect the frame sections on opposite sides of the machine at intervals. The intermediate frame sections 15 and the upper frames 16 have shafts 18 journaled in them and these

shafts at intervals are provided with idler sprocket wheels 19. Front shaft housings 20 and rear shaft housings 21 are mounted on the respective end frame sections 15 and the former have journaled in them an upper shaft 22 and a lower shaft 23, while the latter have a corresponding upper shaft 24 and a lower shaft 25. These upper and lower shafts are provided at intervals with sprocket wheels corresponding with the idler sprocket wheels 19, the smaller sprocket wheels at the front end of the machine being designated by the reference numeral 26, while the larger sprocket wheels at the rear end of the machine are designated by the reference numeral 27. A series of upper and lower forming chains 28 and 29 respectively pass around the sprocket wheels 26 at the front end of the machine and travel together in close parallel relation as far as the sprocket wheels 27 at the rear end of the machine, in the meantime being supported by the upper idler sprocket wheels 19 of the intermediate frame sections. After separating by passing around the sprocket wheels 27 at the rear end of the machine the chains return to the front end of the machine, the upper chains 28 traveling on the idler sprocket wheels 19 of the upper frames 16, while the lower chains 29 travel around the lower idler sprocket wheels 19 of the intermediate frames.

Suitable provision is made for taking up the slack in the forming chains 28 and 29. As here shown, the rear shaft housings 21 best seen in Fig. 8, are mounted on take-up slides 20 which are slidable in ways on the rear end frame sections and are movable by means of take-up screws 31 journaled in said rear end housings and engaging nut members 32 secured to the slides. The take-up screws may be provided with removable hand wheels 33 by which they may be turned for adjusting the take-up slides 20 nearer to or farther from the front end of the machine and thereby adjust the tension of the forming chains.

The forming chains 28 and 29 are adjustable with relation to each other by so mounting the upper shafts 22 and 24 as to be capable of vertical movement. This is done by journaling these shafts in bearing blocks 34 which are vertically slidable in openings 35 of the shaft housings 20 and 21 respectively, as best seen in Fig. 8. The bearing blocks 34 are rectangular and have parallel flanges around three edges which have a close working fit against the dressed faces of the shaft housings around the openings 35. Between these flanges and between the bottom of the bearing blocks and the lower walls of the openings 35 are complementary pairs of wedge blocks 36 each engaged by a set screw 37 threaded through the shaft housing whereby the tightening of

the set screws will cause the wedge blocks to slide and lift the bearing blocks 34 with their shafts. The upper ends of the openings 35 are closed by bearing caps 38 which connect the shaft housings 20 together and also connect the shaft housings 21 together.

The forming chains 28 and 29 are of such length that they are preferably driven at both ends of the machine, though in some instances a driving connection at one end of the machine may suffice. At the front of the machine the shafts 22 and 23 are provided with gear pinions 39 which respectively mesh with a pair of intermeshing pinions 40 mounted on the shaft housings 20, and thus constitute a back gear driving connection between the two shafts which will permit of the adjustment of the upper shaft without interfering with the driving connection between them, and the said pinions 39 of the lower shaft 23 mesh with gear wheels 41 mounted on studs on the front end frame sections and meshing with pinions 42 on a drive shaft 43 journaled across the machine and carrying a belt pulley 44 for connection with any suitable driving motor.

At the rear of the machine a similar driving connection is provided, pinions 45 and 46 being mounted on the ends of the shafts 24 and 25 and meshing respectively with intermeshing back gears 47, the shaft 25 having gear wheels 48 meshing with large gear wheels 49 mounted on swinging frames 50 and meshing with pinions 51 on a driving shaft 52 which is provided with a belt pulley 53 also adapted to be connected with a driving motor. The swinging frames 50 are pivotally mounted around the center of driving shaft 52 so that the gear wheels 49 may be moved into or out of mesh with the gear wheels 48 to allow for the adjustment of the take-up slide, and these swinging frames may be locked in their adjusted positions by screws 54 passing through arc-shaped slots thereof and threaded in the rear end frame sections.

The two series of forming chains 28 and 29 carry forming blades 55 which extend across the machine and lie close together, actually in side by side contact with each other during the straight line portions of the travel of the chains. To accomplish this the chains are specially constructed, as shown in Figs. 9 and 10, with links formed of parallel angular brackets 56 with their outstanding bracket arms secured to the backs of the forming blades 55, and pivot rollers 57 have their reduced ends loosely mounted in the upstanding portions of each pair of brackets and in the offset or laterally extending ends of the upstanding portions of the adjacent pair of brackets which overlap therewith. The forming blades 55 are alike and of the same shape in cross section from end to end with the contracted central web-like portion

connecting the substantially rectangular base with a cylindrical bead of considerably larger diameter than the thickness of the web, such beads forming the outer edges of the blades, as shown in Figs. 5, 6, and 7. In the portion of travel of the chains 28 and 29 where they travel together in close relation from the front end of the machine to the rear end of the machine their blades 55 are interlocked, the enlarged cylindrical beaded edges of each set of blades lying within the spaces between the contracted web-like portions of the other set of blades; which interlocking relation is effected by the separation of the blades as they travel around the sprocket wheels 26 at the front end of the machine and is discontinued by the separation of the blades in their travel around the sprocket wheels 27 at the rear end of the machine.

The wet sheet of wood veneer 58 is fed between the two endless chains of traveling forming blades at the front end of the machine and becomes folded back and forth between the interfitting forming blades following the shape of the cylindrical beads or enlarged rounded edges thereof, and in this manner is carried to the rear end of the machine, and as the moisture thereof is driven off by the application of heat during its travel through the machine it retains its crimped or corrugated form as it issues from between the separating chains of forming blades. In order that it may not continue to cling to the forming blades suitable stripping mechanism is provided to separate the corrugated veneer from the forming blades as the latter begin to turn around the sprocket wheels 27. For this purpose stripping rods 59 are carried in the spaces between the contracted web-like portions of adjacent forming blades of both forming chains, and these stripping rods 59 are of such length that they project beyond both ends of the forming blades and only leave the said spaces between the forming blades at the rear end of the machine where they continue their straight line movement for a distance beyond the divergent travel of the chains of forming blades. The stripping rods are guided in their detour from the path of travel of the forming blades by having their ends engaged in guide grooves of guide strips 60 and propelled through said grooves by means of stripping chains 61, the links of which have outwardly projecting lugs 62 to engage the stripping rods for this purpose. The stripping chains 61 pass around sprocket wheels 63 which are fixed on shafts 64 journaled in bearings 65 secured to the ends of the rear shaft housings 21. At the other end of their travel the stripping chains pass around sprocket wheels 66 which for convenience are mounted on studs 67 of bell crank levers 68

which are fulcrumed on the shafts 24 and 25 and have their longer ends fastened to an anchor stud 69 on the shaft housing 21. The connection of the upper bell crank lever 68 with the anchor stud 69 is with sufficient play to prevent interference with the vertical adjustment of the bearing blocks 34. The shafts 64 are independently driven from the shafts 24 and 25, there being a pulley 70 on one end of the upper shaft 64 connected by a belt 71 with a pulley 72 on the shaft 24 and a similar pulley 70 at the other end of the lower shaft 64 connected by a belt 71 with a pulley 72 on shaft 25.

The stripping rods are thus taken by the lugs of the stripping chains 61 from the spaces between the blades of the forming chains and are conducted horizontally along the guide grooves of the guide strips 60 to form parallel top and bottom traveling walls with the corrugated veneer between them, the movement of the stripping rods from the spaces between the blades of the forming chains serving to force the veneer off of said forming blades and into the horizontal discharge guideway. The stripping rods continue with the stripping chains 21 around the sprocket wheels 63 and back to the spaces between the forming blades 55 and still continue in the guide grooves of the guide strips 60 until reaching the straight line travel of the forming chains where they leave the sprocket wheels 27. At this point the guide strips 60 connect with angle iron guide strips 73 which support the stripping rods with their horizontal flanges and prevent longitudinal movement thereof with their vertical flanges. These angle iron guide strips 73 continue along the travel of the forming chains to the front end of the machine where they connect with grooved guide strips 74 which guide the stripping rods in their travel around the sprocket wheels 26. During the active portion of the travel of the forming chains from the front end of the machine to the rear end of the machine the stripping rods 59 are held against longitudinal movement by abutting against flat guide strips 75 which extend from the guide strips 74 to the guide strips 60.

In order that the forming blades 55 may not bend or bow between the sprocket wheels 26 during the operation of folding or crimping the veneer at the front end of the machine, they are provided with projecting lugs 76 on the inner edges thereof midway between the sprocket wheels 26, and spur wheels 77 fixed on the shafts 22 and 23 engage therewith to resist any such tendency.

In order to support the return length of the lower forming chain a movable platform is provided for it to rest upon. Shafts 78 are journaled across the frame in the frame sections next to the ends, and sprocket wheels

79 thereon have roller chains 80 traveling around them, each link of the roller chains having the end of one of the slats of platform sections 81 secured thereto. One of the shafts 78 has a pulley 82 on its end which is connected by a belt 83 with a pulley 84 on one of the gear wheels 41 so that the conveyer or moving platform may be positively driven. The rollers of the chains 80 ride on angle iron track rails 85 supported by the cross girts 17 to prevent the conveyer from sagging, and the forming blades 55 of the lower forming chain rest on the platform or conveyer and thus materially relieve the shafts 23 and 25 from the strain of the weight thereof.

Suitable provision is preferably made for heating the forming blades to facilitate the drying of the veneer during its travel with the forming chains to the discharge end of the machine, and such means may consist of gas pipes 86 extending across the machine beneath the rearwardly traveling forming chains at intervals, and also beneath the path of return travel of the upper forming chain 28.

In operation sheets of wood veneer of suitable size for convenient handling, and rendered limp by steaming or soaking in water, are fed successively between the forming chains at the front end of the machine, and the forming blades in turning around the sprocket wheels 26 engage alternately the opposite faces thereof to fold it back and forth in the manner clearly shown in Figs. 5 and 6. Preferably, though not necessarily, the cylindrical bead at the edge of each forming blade of one chain is larger than the space between the corresponding beads of the forming blades of the other chain, so that the corrugations in the veneer comprise alternate ridges and grooves with their common side walls converging to contract the openings to the grooves, thereby permitting the ridges at one end of a sheet or pad of corrugated veneer to interlock with the grooves at the other end thereof in the manner shown in the Flipse patents.

The veneer sheets are fed to the machine with the grain of the wood approximately in the direction of travel so that the folds extend across the grain, and because of the movements of the forming blades at the time of their engagement with the veneer and as they approach their straight line travel they subject the veneer folds to a certain degree of tension which causes the veneer to be stretched around their interfitting beaded edges, and the veneer folds are shaped therebetween as the veneer dries in its travel through the machine.

By the time the veneer reaches the rear end of the machine it is thoroughly dry and will, therefore, retain the shape of the parts of the forming blades over which it has been

stretched, not only by the action of the blades as before mentioned, but by the shrinking of the veneer when drying. Notwithstanding its tendency to remain in engagement with the forming blades and follow one chain of blades or the other around the sprocket wheels 27 because of its resiliency when dry, the corrugated veneer is compelled to continue its straight-line travel beyond the sprocket wheels 27 by being confined between the moving walls of the discharge passageway formed by the extended travel of the stripping rods 59. The operation is continuous, one sheet of veneer after another being fed to the machine, so that the finished product is quickly and economically produced.

The pairs of shafts at the ends of the machine, around which the forming chains travel, are adjustable with relation to each other by means of the movements of the wedge blocks 36 to obtain the proper spacing of the forming chains at the ends of the machine, and these chains may be kept under proper tension by the adjustment of the take-up mechanism controlled by the turning of the hand wheels 33.

While the machine of this invention is primarily designed for corrugating wood veneer, it is obvious that it may operate upon sheets of other materials, such as paper or thin sheet metal, to produce the desired headed corrugations which will permit of interlocking of the corrugations of one sheet with those of another, or the corrugations of one end of a sheet with the corrugations of the other end, and the term, "veneer" as here used is intended to include all such thin sheet material capable of being folded to form corrugations and of retaining its corrugated form.

What we claim as new and desire to secure by Letters Patent is:

1. A corrugating machine for corrugating sheet material, comprising a plurality of upper and lower chains having a parallel travel in close relation to each other, suitably operated shafts, sprocket wheels on the shafts around which the chains travel, a series of forming blades connected with the links of the upper chain, a series of forming blades connected with the links of the lower chain, said forming blades of one series having their edges interfitting with the edges of the forming blades of the other series during their parallel travel and adapted to have the sheet material fed between them as they turn around the shafts, spur wheels on the shafts between the sprocket wheels, and lugs on the forming blades engaged by the spur wheels.

2. A corrugating machine for corrugating wood veneer, comprising a frame of interchangeable connected sections, chain supporting means on the intermediate sections,

sprocket wheels at the ends of the frame, and chains of forming blades mounted on the sprocket wheels and traveling on the chain supporting means in close parallel relation from one end of the frame to the other with the edges of their forming blades interfitting and receiving between them sheets of limp, moist wood veneer at one end of the machine and discharging such veneer corrugated and in a dry state at the other end of the machine, the length of the frame and of the chains being adjustable to effect the drying of the veneer under given conditions.

3. A corrugating machine for corrugating sheet material, comprising chains of forming blades traveling in parallel close relation to each other, the forming blades of one chain having their edges interfitting with the edges of the forming blades of the other chain and adapted to receive and fold the sheet material between them at one end of the machine, and means traveling with the chains for stripping the veneer from the forming blades at the other end of the machine.

4. A machine for corrugating wood veneer, comprising means for folding limp, moist sheets of veneer, forming members for holding the folded veneer between them until it is dry, and means extending the full length of the forming members for stripping the dry veneer from the forming members.

5. A machine for producing corrugated wood veneer, comprising traveling forming members moving into interfitting relation at one end of the machine to receive the sheets of limp, damp wood veneer between them, and traveling together with the veneer held therebetween during the drying of the veneer, and means traveling with the forming members for stripping the dry veneer from the forming members at the other end of the machine.

6. A machine for producing corrugated wood veneer, comprising chains of forming blades traveling together with the edges of the blades interfitting and adapted to receive and fold the wood veneer between them at one end of the machine, stripping rods contained in the spaces between the forming blades of each chain, and means for conducting the stripping rods beyond the chains at the other end of the machine for stripping the corrugated material from the forming blades.

7. A corrugating machine for corrugating sheet material, comprising a pair of chains of forming blades traveling together, the edges of the forming blades being enlarged and the edges of the forming blades of one chain interfitting with the edges of the forming blades of the other chain, stripping rods carried in the spaces between the

forming blades, and stripping chains having lugs for engaging the stripping rods, said stripping chains being so positioned as to continue the travel of the stripping rods beyond the joint travel of the chains of forming blades to strip the corrugated veneer therefrom and then return the stripping rods to the spaces between the forming blades.

8. A corrugating machine for corrugating sheet material, comprising a pair of forming chains of forming blades traveling together the length of the machine, the forming blades of one chain interfitting with the forming blades of the other chain and adapted to receive and fold a sheet of material therebetween at one end of the machine, stripping rods carried in the spaces between the forming blades, a pair of stripping chains having lugs to engage the stripping rods, said stripping chains being so positioned as to cause the stripping rods to continue their path of travel beyond the point where the forming chains part at the end of their travel together and to return them to the spaces between the forming blades, and grooved guides with the ends of the stripping rods fitting therein to guide said rods in their travel with the stripping chains.

9. A corrugating machine for corrugating sheet material, comprising a pair of forming chains of forming blades traveling together and having the forming blades of one chain interfitting with the forming blades of the other chain and adapted to receive and fold the sheet material between them at the beginning of the joint travel of the chain, and a stripper for separating the corrugated material from the forming chains at the end of their joint travel, comprising parallel traveling walls forming a passageway between them for the finished product.

10. A corrugating machine for corrugating sheet material, comprising a frame, shaft housings mounted on the ends of the frame, a pair of shafts journaled in each shaft housing, one shaft of each pair being adjustable with relation to the other, sprocket wheels on the shafts, a pair of forming chains of forming blades mounted on the sprocket wheels, said forming blades of one chain having their edges interfitting with the edges of the forming blades of the other chain, stripping rods carried by the forming chains between the forming blades thereof, bell cranks mounted on the shafts of the shaft housing at the rear end of the machine, each of said bell cranks having one arm anchored on the shaft housing, sprocket wheels mounted on the other arms of the bell cranks, a pair of suitably driven shafts journaled on the shaft housing at the rear end of the machine, sprocket wheels thereon, stripping chains passing around the

sprocket wheels of said pair of shafts and the sprocket wheels of the bell cranks, lugs projecting from the links of the stripping chains and traveling in the path of the stripping rods and adapted to cause said stripping rods to continue their movement in the same direction after the forming chains have turned around their sprocket wheels and then return the forming rods to the forming chains, and grooved guides on the

shaft housings in which the ends of the stripping rods travel.

In testimony whereof, we affix our signatures, in presence of two witnesses.

ARNOLD W. DE VOS.
CHARLES M. DERING.

Witnesses:

KATHERINE HOLT,
R. S. C. CALDWELL.