

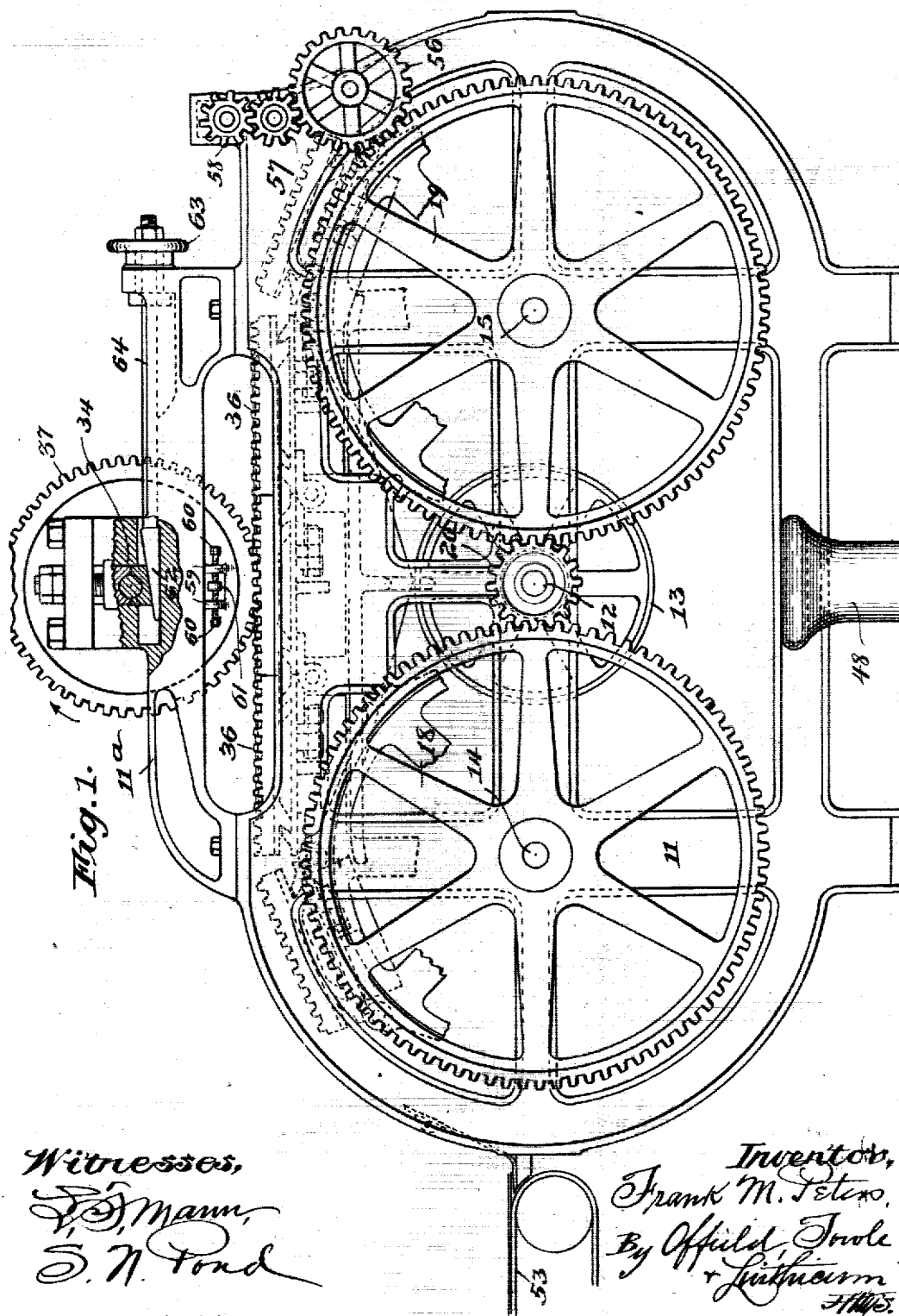
No. 865,523.

PATENTED SEPT. 10, 1907.

F. M. PETERS.
MACHINE FOR FORMING CARTON BLANKS.

APPLICATION FILED JAN. 9, 1905.

6 SHEETS—SHEET 1.



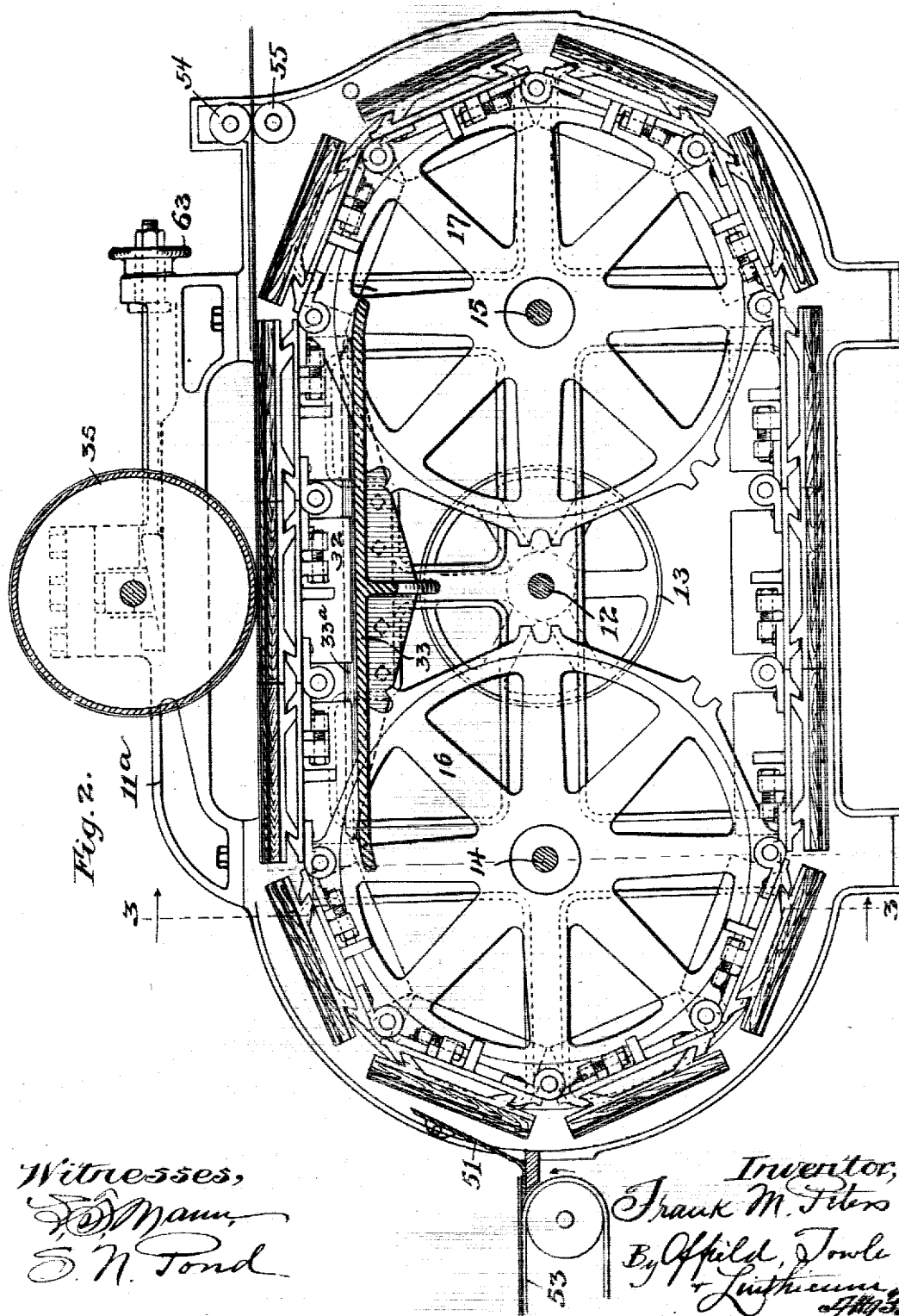
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6 SHEETS—SHEET 2.



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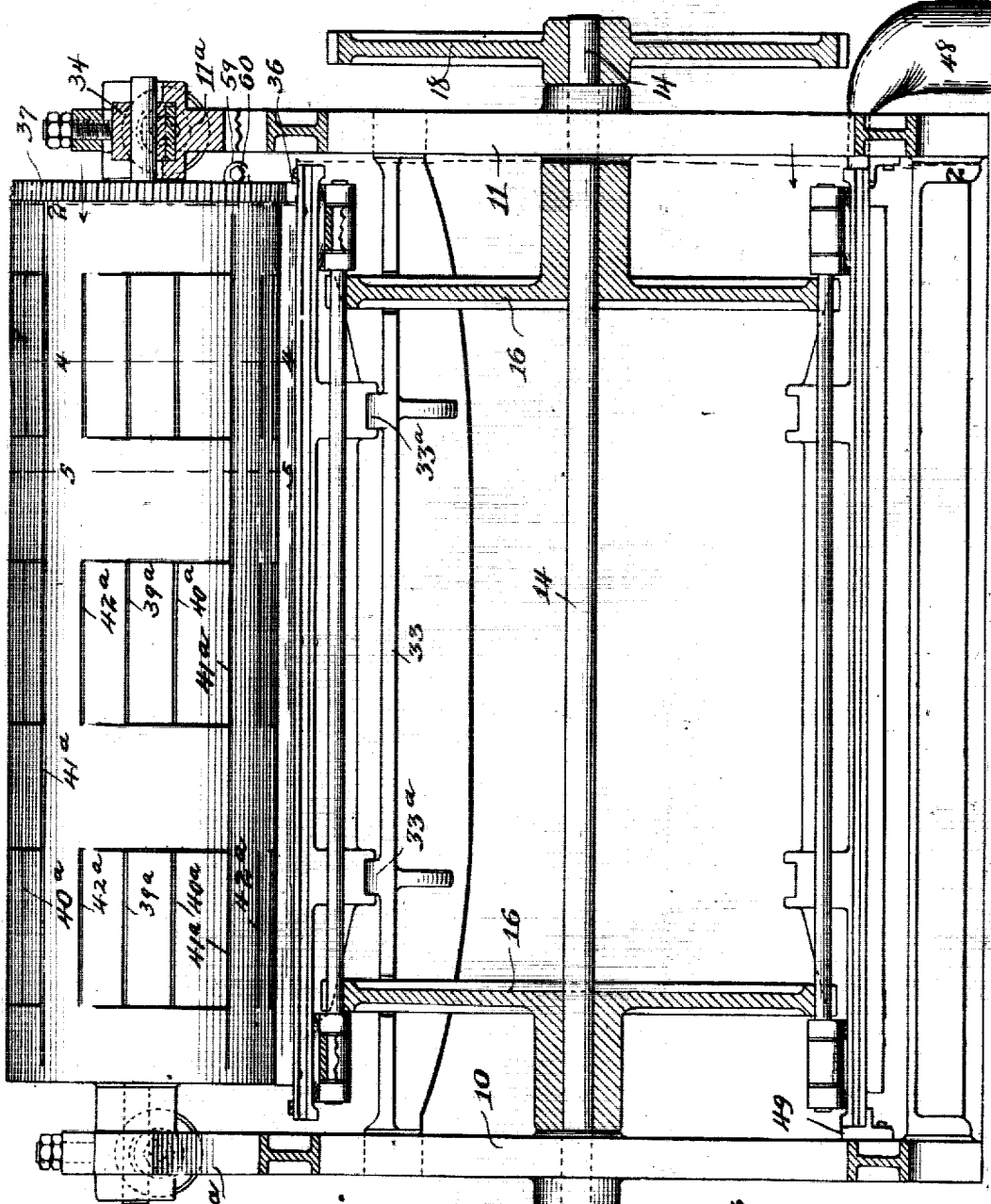
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Fig. 3.



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Fig. 4.

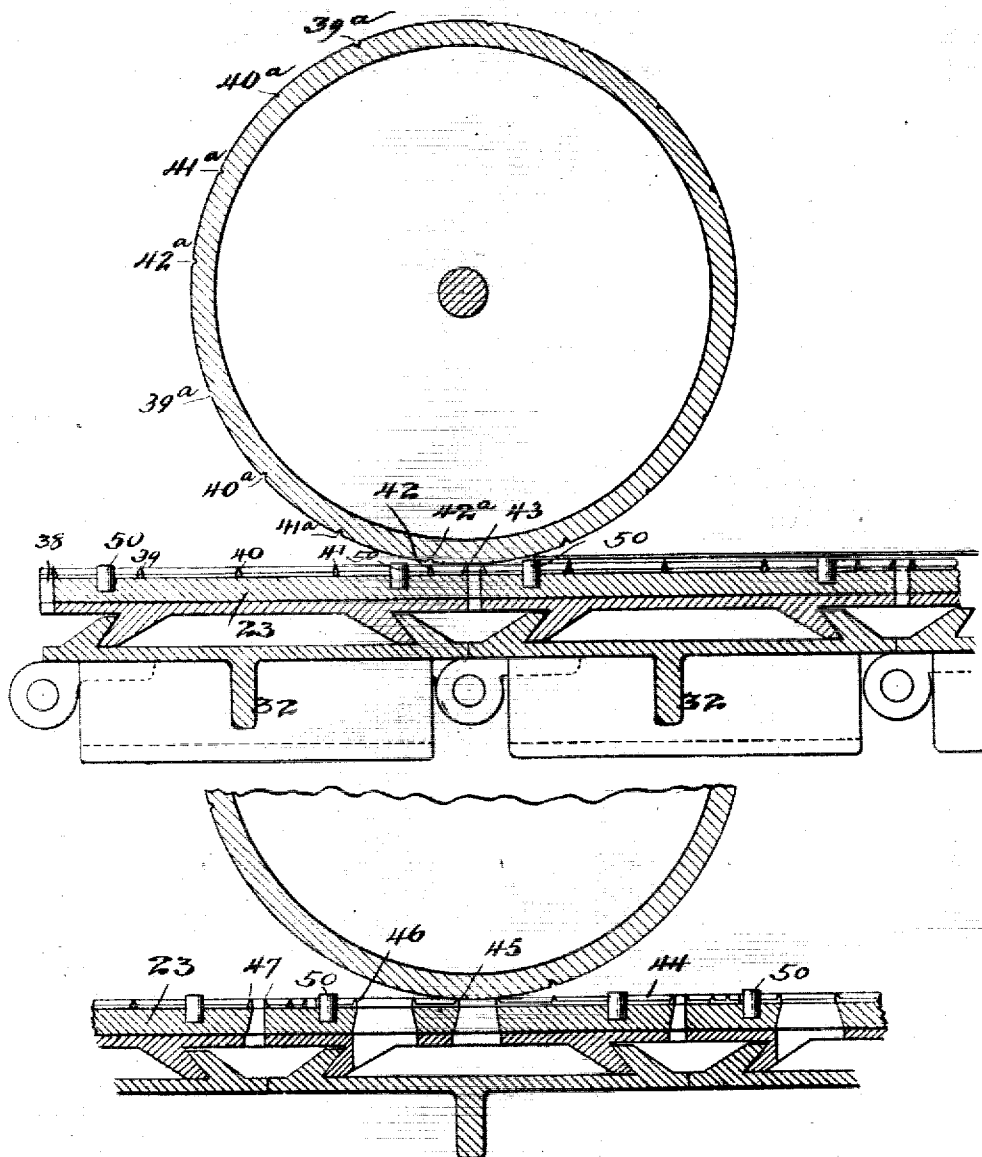


Fig. 5.

Witnesses,
J. D. Mann,
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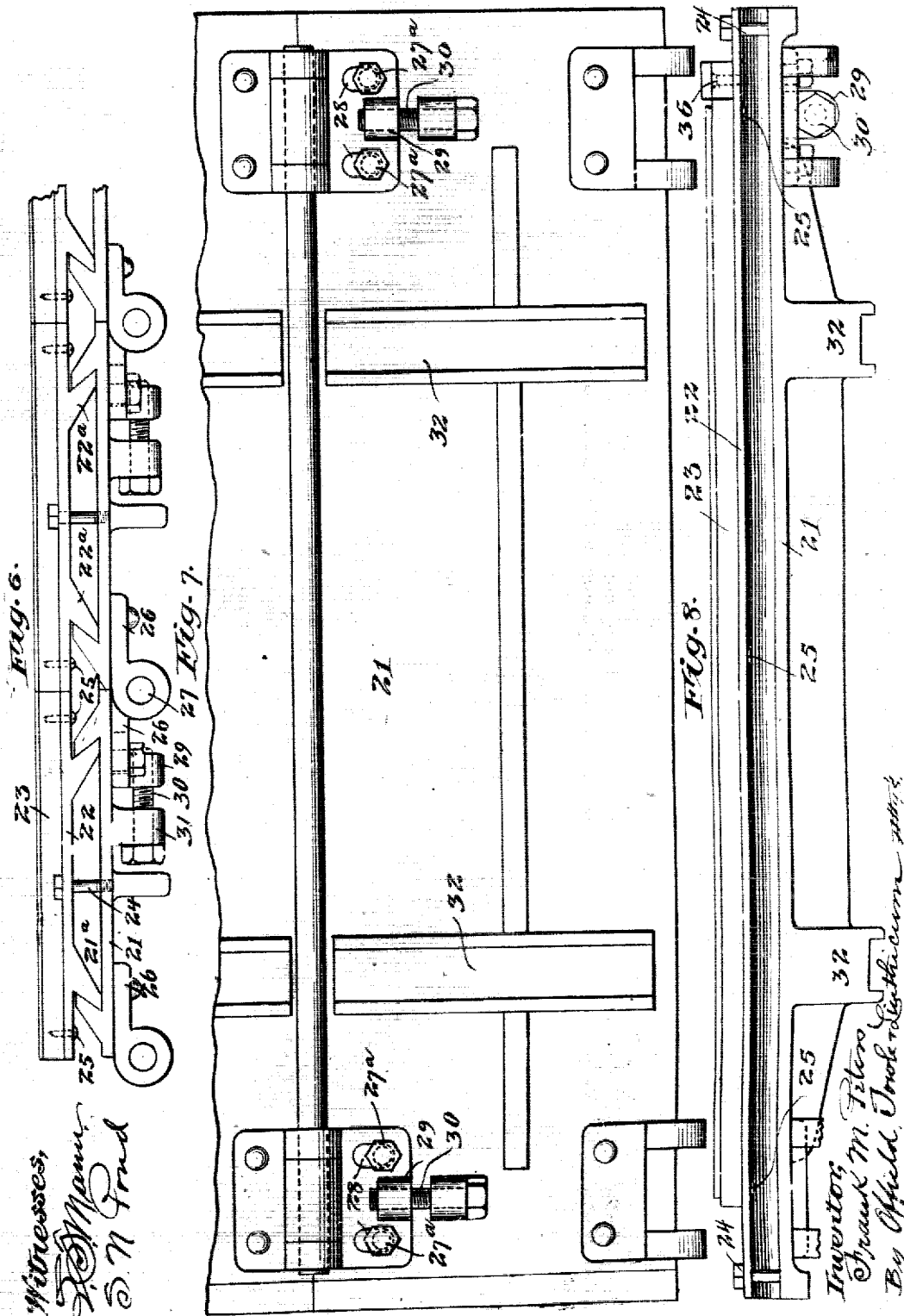
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6 SHEETS—SHEET 5.



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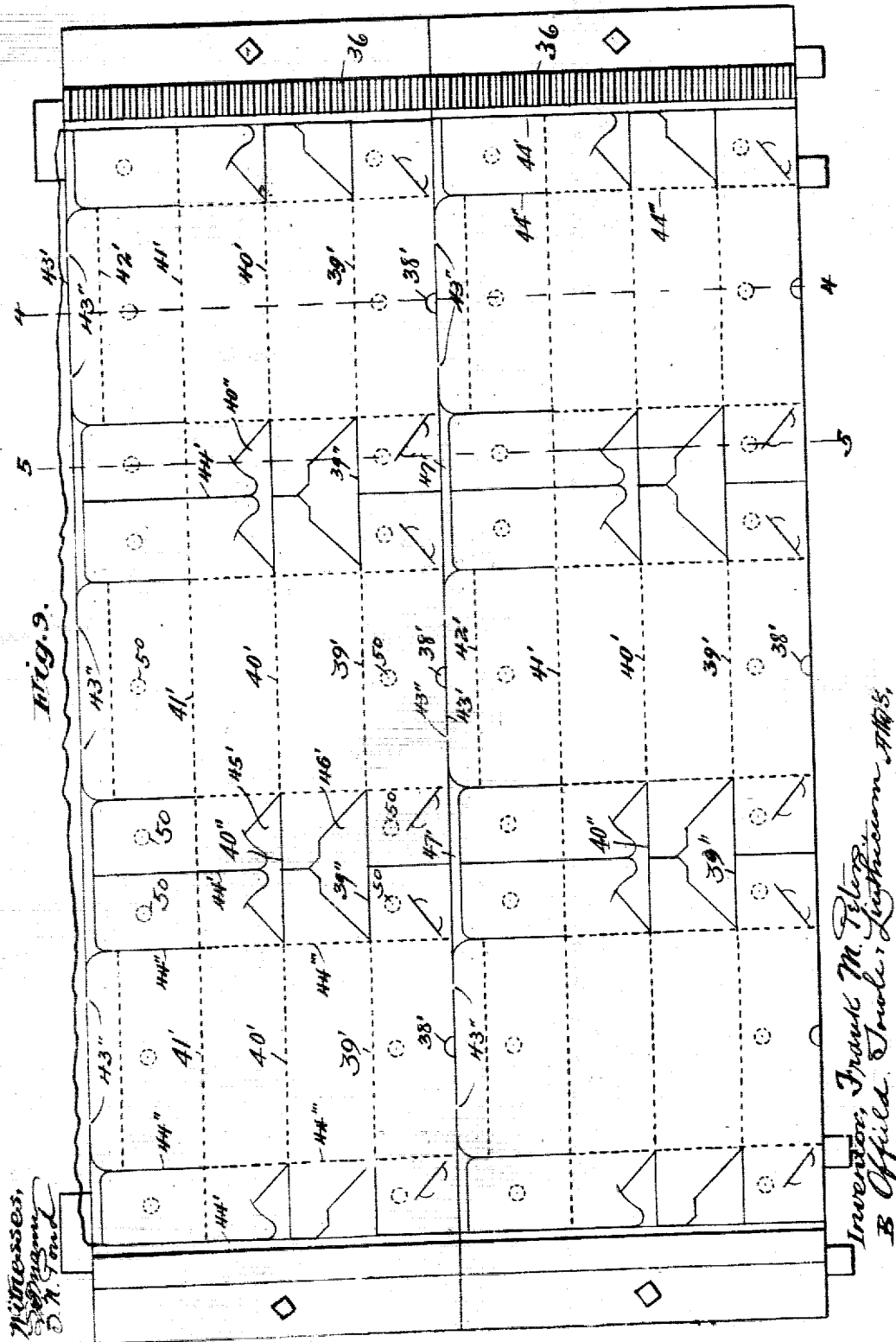
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6 SHEETS—SHEET 6.



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UNITED STATES PATENT OFFICE.

FRANK M. PETERS, OF CHICAGO, ILLINOIS.

MACHINE FOR FORMING CARTON-BLANKS.

No. 865,523.

Specification of Letters Patent.

Patented Sept. 10, 1907.

Application filed January 9, 1905. Serial No. 240,351.

To all whom it may concern:

Be it known that I, FRANK M. PETERS, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Machines for Forming Carton-Blanks, of which the following is a specification.

My invention relates to machines for forming carton blanks from which paper, pasteboard and similar cartons or boxes are subsequently set up; and the invention has for its object to provide a new and improved machine by means of which such cartons may, in large quantities, be rapidly cut and creased or scored into complete form ready for setting up from a single roll or sheet of blank material.

To this end my invention resides in a machine possessing as its chief structural characteristic an endless traveling die-member made up of a plurality of endwise hinged die plates, each adapted to the formation of a single carton blank or a series of said blanks, in association with a rotary die-roll disposed across the path of said traveling die-plates, said roll and plates being provided on their cooperating surfaces with means for cutting and scoring the sheet into the desired form of the blanks as said sheet travels between them.

Among other important features, the machine is characterized by the provision of a novel driving connection between the two die-members; novel means for ridding the machine during its operation of the cut-out portions or scrap; means for effecting certain adjustments essential to the true and correct operation of a machine of this character, and other novel and desirable features which will be hereinafter more particularly pointed out in the detailed description of the parts of the machine and its manner of operation.

A machine embodying the invention in a preferred form is illustrated in the accompanying drawings, wherein—

Figure 1 is a side elevational view of the complete machine, with certain parts omitted for the sake of clearness; Fig. 2 is a vertical sectional elevation substantially on the line 2-2 of Fig. 3; Fig. 3 is a transverse vertical section substantially on the line 3-3 of Fig. 2; Fig. 4 is an enlarged cross-sectional view through the roller and traveling die substantially on the line 4-4 of Figs. 3 and 9; Fig. 5 is a similar fragmentary view substantially on the line 5-5 of Figs. 3 and 9; Fig. 6 is a detail side elevational view of a portion of an endless die, illustrating more particularly the manner and means of uniting and adjusting the component parts thereof; Fig. 7 is an enlarged bottom plan detail view of the same parts in a plane at right angles to the plane of Fig. 6; Fig. 8 is an enlarged edge elevational view of one of the die-plates; and Fig. 9 is a top plan

of a pair of adjacent die-plates containing cut and scored blanks lying thereon.

Referring to the drawings, 10 and 11 designate a pair of upright parallel side frame members in and between which is journaled a driving shaft 12 carrying on one overhanging end a driving pulley 13. In the opposite ends of the side frames are journaled shafts 14 and 15, on which are keyed or shrunk large sprocket wheels 16 and 17, respectively, there being a pair of such sprocket wheels on each shaft located just inside the side frame members 10 and 11. On one overhanging end of the shafts 14 and 15 are mounted large gears 18 and 19, respectively, both meshing with an interposed pinion 20 fast on the same end of the driving shaft 12. The two pairs of large sprockets 16 and 17 serve to support and drive an endless chain or die-plate carrier made up of a series of endwise connected hinged supporting plates, as best shown in Figs. 2, 6, 7 and 8. These carrier supporting plates, marked 21, have each a wide dovetailed groove 21^a extending entirely across the same, in which fits a correspondingly shaped slide 22^a on the innerside of a die-plate 22. The die-plate 22 preferably has an outer surface plate 23 which may be of wood, metal or any material best suited for cooperation with the rotary die-member hereinafter described, and the plates 21 and 22 may be removably united by screw bolts 24, while the surface plates 23 may be removably secured to the die-plates 22 as by screws 25, all as clearly shown in Fig. 6.

On the under side of each end of the carrier-plate 21 is secured a hinge member 26, the adjacent hinge members of adjacent plates being flexibly united by hinge pintles 27. In order to take up wear at the pivotal connections of the plates, one member of each hinge may be secured to its plate 21 by bolts 27^a passed through slots 28 of the hinge, as shown in Fig. 7, thereby permitting the adjustment of the hinge member toward and from the pintle; and to effect such adjustment the hinge member may have a depending lug 29 provided with an internally threaded aperture engaged by a screw bolt 30 anchored in a depending lug 31 on the under side of the plate 21. On the under sides of the carrier plates 21 are also cast grooved guide shoes 32 which engage rail guides 33^a (Fig. 2) on the upper surface of a stationary table or platform 33 mounted between the side frame members of the machine between the upper portions of the driving and supporting sprockets 16 and 17. By this means the several hinged sections of the endless traveling die-member, as they mount and override the table 33, are supported and guided thereon during their travel thereover.

Suitably mounted in split-box journals carried by auxiliary side frame supports 10^a and 11^a surmounting the side frames 10 and 11, respectively, is a die-roll 35.

This roll is designed to be rotated from the endless die-plate carrier underlying the same, the means herein shown therefor comprising racks 36 disposed across one end of the outer face of the several die-plates engaging a gear 37 on the same end of the die-roll (see Figs. 1 and 3).

The outer surface of each of the tables 23 is provided with a series of cutting and scoring knives raised thereon; while the peripheral surface of the roll 35 is provided with a series of longitudinal and transverse grooves that cooperate with some of said knives and with certain portions of other knives of the die-plates. To illustrate the relations of the knives and grooves, reference may be made to Figs. 4, 3 and 9, wherein it will be seen that the left hand or forward margin of each die-plate as viewed in Fig. 4 has a plurality of semi-circular raised knives 38 (one for each carton blank) that, through engagement with the solid portion of the periphery of the roll, cut out the semi-circular notches indicated at 38' in Fig. 9.

Inwardly of the knives 38 is a straight knife 39 extending entirely across the plate, which knife cooperates throughout certain portions thereof with grooves 39^a of the roll to form scores or indentations indicated by the lines 39' in Fig. 9. The grooves 39^a of the roll do not extend continuously across the latter, as shown in Fig. 3, being interrupted, and where the knife 39 engages the solid portions of the roll between said grooves it obviously cuts the blank entirely through, as indicated by the lines 39'' in Fig. 9. A similar knife 40 cooperates with similar grooves 40^a in the roll to form the indentations 40' and cuts 40''. Another knife 41 cooperates with a groove 41^a extending the full length of the roll, as shown in Fig. 3, to form the scores 41'. Still another sectional knife 42 cooperates with an interrupted groove 42^a to form the scores 42' in the blanks; and, finally, a straight knife 43 cooperates with the solid surface of the roll to form the end cut of the complete blank indicated by the line 43'. The roll-engaging faces of the tables also carries certain other knives forming the longitudinal and oblique cuts and indentations of the blank. The knives of the die-plates which form said longitudinal cuts and indentations are indicated at 44, in Fig. 5, certain of these last named knives cooperating with the solid periphery of the roll to form the side cuts 44', and others cooperating partially with solid portions and partially with grooved portions of the periphery of the roll, to form the intermediate cuts 44'' and scores 44'''. As indicated in Fig. 5 the plates are still further provided with oblique and irregular shaped knives, shown in cross-section at 45, 46 and 47, respectively, in Fig. 5 and arranged at varying angles to each other, which knives cooperate with solid portions of the roll to cut out the irregular shaped parts indicated by the spaces 45', 46' and 47', respectively, in Fig. 9, whereby the end flaps of the carton blank are given a formation adapting them to be folded and interlocked in setting up the carton. As shown in Fig. 5, those portions of the space of the plates bounded by the knives which create the irregular excisions of the blank, indicated by the spaces 45', 46' and 47' are cut out through the spaces formed by the hollow slides of the die-plates; and said spaces are successively brought into communication at one end with a pipe 48 through which compressed air is forced, so that the scrap of the blank that lodges between the knives is blown out and dis-

charged as the plates are undergoing their return movement on the under side of the sprockets, for which purpose the end of the hollow plates opposite to the end which is in communication with the air pipe is closed against the escape of air therefrom as by sliding over a stationary closure indicated by 49 in Fig. 3.

The peripheral surface of the roll, as herein shown, is adapted to the formation of three endwise adjacent blanks on each quarter surface, making twelve blanks in all that may be cut by each complete rotation of the roll. It is also to be understood that those portions of the knives which merely cooperate with the grooves of the roll to score or indent the sheet are formed with a dull or blunt edge, so as to avoid the cutting of the sheet, while other portions of said knives which effect the cutting and the slitting of the sheet are, of course, provided with sharp cutting edges.

For convenience in handling and stacking the cut and scored cartons as they are delivered by the machine, it is desirable that, when delivered, they be not entirely separated, but be attached at one or two points so as to be easily separable later, when the individual cartons are to be set up. This result may be attained in the present machine by simply nicking, at intervals, all but one of the knives 43 which form the divisions between successive endwise adjacent series of carton blanks, thereby leaving said blanks, in groups of twelve, connected by thin integral tongues or strips, indicated at 43'' in Fig. 9.

50 designates a series of rubber buttons set at intervals into the outer face of each of the plates 23, and supporting the blank sheet as it passes beneath the die-roll. These buttons, being of elastic material, yield readily to the pressure of the roll; but when the sheet has passed the latter and the blanks have been cut and defined, the resiliency of the buttons operates to raise the blank off the knives and render it free to drop down over the guard 51 (Fig. 2) onto a discharge conveyer 53.

54 and 55 designate a pair of embossing or printing rolls suitably mounted in and between the side frame members of the machine between the die-roll and the reel or other source (not shown) from whence the blank sheet is delivered to the machine. Said rolls may conveniently be driven from the gear 19 through an intermediate gear 56 engaging the lower roll-pinion 57, said pinion driving a companion pinion 58 on the upper roll 54.

In a machine of this character it is essential to be able to secure perfect registration between the cooperating rotary and rectilinear die-members, and more particularly perfect registration between the cooperating knives and grooves which effect the scores or indentations. In order that the roll may be readily set to bring its peripheral grooves into exact registration with the knives of the die-plates, I provide the adjusting means shown in Fig. 1, wherein 59 designates a pair of ears fast on the face of the gear 37, carrying set-screws 60 which engage opposite sides of a lug 61 on the adjacent face of the roll, thereby enabling the roll to be set to a fine angular adjustment relatively to its driving gear. In order to effect the proper adjustment of the knife edges to the surface of the roll for the cutting operation, so as to cut through the sheet without turning or dulling the edge of the knives, I provide

means for finely adjusting the height of the die-roll above the underlying die-plates, such means, as herein shown, comprising a wedge 62 (Fig. 1) underlying the split journal 34, on each end of the roll, and adjustable inwardly and outwardly by a hand wheel 63 cooperating with a screw-threaded rod 64 constituting the stem of the wedge.

The operation of the machine has already been to a considerable extent disclosed in the foregoing description, but may be briefly described as follows. Power being applied to the pulley 13, the end of a blank sheet from a suitable delivery reel or other source is passed through the embossing or printing rolls 54 and 55 (where such rolls are employed) and introduced to the nip of the die-roll. As it travels between the latter and the successive die-plates, the knives of the latter cooperate with the grooved and solid portions of the roll to effect the desired indentations and excisions of the blank, the machine as herein shown being capable of simultaneously cutting and scoring three complete carton blanks on each plate of the carrier, the particular number of such blanks thus formed being, of course, optional with the builder of the machine. The carton blanks thus cut and scored are raised out of engagement with the cutting and scoring knives by the resilient buttons as the sheet passes out from under the roll, and as the carrier rounds the sprocket wheels at the end of the machine toward which the blanks are traveling, said blanks either separately or in attached groups slide off the plates and over the guard plate 51 onto the discharge conveyer 53. The pieces of scrap retained in the faces of the plate are subsequently blown out and discharged as soon as the hollow die-plates pass into registration with the compressed air pipe 48, whereupon the plates, thus cleared of scrap, ride around the sprockets on the opposite end of the machine and pass into engagement with the tracks on the supporting plate 33, when they again cooperate with the roll in the formation of additional blanks, the production of blanks thus being continuous and uninterrupted so long as the machine is kept in operation and the supply of blank stock thereto is maintained.

It is evident that the machine hereinabove described and shown in the drawings is capable of modification and change in respect to details of construction and size, number and relative arrangement of parts by those skilled in the art without departing from the principle of the invention or sacrificing any of the advantages thereof. Hence, I do not limit the invention to the particular mechanical embodiment thereof herein shown, except to the extent indicated in specific claims.

I claim:—

1. In a machine of the class described, the combination with a supporting frame, of a roll mounted therein, and an endless series of endwise connected plates mounted to travel in surface contact with the periphery of said roll, the contacting surfaces of said roll and plates being provided with cooperating knives and grooves for effecting the scoring of a blank sheet passed between them, substantially as described.

2. In a machine of the class described, the combination with a supporting frame, of a roll mounted therein having grooves formed in its peripheral surface, and an endless

series of endwise connected plates mounted to travel in surface contact with the periphery of said roll, the roll-contacting surfaces of said plates having knives cooperating with the grooves of the roll to score a blank sheet passed between them, and also having other knives cooperating with the solid portions of the periphery of said roll to effect cuts and excisions in said sheet, substantially as described.

3. In a machine of the class described, the combination with a supporting frame, of sprocket-wheels mounted at either end thereof, a series of die-plates flexibly connected at their ends to form an endless carrier mounted on and driven by said sprocket wheels, a superposed die-roll cooperating with the outer surfaces of said die-plates to effect the formation of carton blanks from a solid sheet passed between them, and means for driving said plates and roll, substantially as described.

4. In a machine of the class described, the combination with a supporting frame, of a pair of sprocket wheels mounted at either end thereof, a series of die-plates hinged together at their ends forming an endless carrier mounted on and driven by said sprocket wheels, a superposed die-roll cooperating with the outer surfaces of said die-plates to effect the formation of carton blanks from a solid sheet passed between them, means for driving said sprocket wheels, and means for driving said roll from said endless carrier, substantially as described.

5. In a machine of the class described, the combination with a supporting frame, of a pair of sprocket wheels mounted at either end thereof, a stationary table mounted between the upper portions of said pairs of sprocket wheels, said table being provided with guide-ways, a series of die-plates hinged together at their ends forming an endless carrier mounted on and driven by said sprocket-wheels, said die-plates having supporting guides cooperating with the guide-ways of said table, a superposed die-roll cooperating with the outer surfaces of said die-plates to effect the formation of carton blanks from a solid sheet passed between them, means for driving said sprocket-wheels, and means for driving said roller from said endless carrier, substantially as described.

6. In a machine of the class described, the combination with a supporting frame and a die-roll mounted therein, of a series of die-plates hinged together at their ends to form an endless carrier and provided with means for supporting and driving them in surface-contact with said roll, the roll-contacting surfaces of said die-plates having knives to effect the cutting and scoring of a blank sheet passed between them and the cooperating surface of said roll, and also having depressible resilient devices serving to free the blank from engagement with said knives after the same has passed the roll, substantially as described.

7. In a machine of the class described, the combination with a supporting frame, of a die-roll mounted therein, an endless series of endwise connected hollow die-plates mounted to travel in surface contact with the periphery of said roll, each of said die-plates having openings formed through its roll-engaging surface bounded by knives adapted to effect excisions in a blank sheet passed between the same and the roll, and means for subsequently introducing a pneumatic blast to the interior of said die-plates to discharge the scrap from said openings, substantially as described.

8. In a machine of the class described, the combination with a supporting frame and a die-roll mounted therein, of an endless die-carrier comprising a series of endwise hinged links transversely dovetailed on their outer surfaces, and die-plates removably engaging said dovetailed surfaces of the links and cooperating with said die-roll, substantially as described.

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