

April 1, 1924.

J. SHELLENBERGER

1,489,014

VARIABLE RATCHET DRIVE FEED MECHANISM

Filed Sept. 30, 1919

3 Sheets-Sheet 3

Fig. 6.

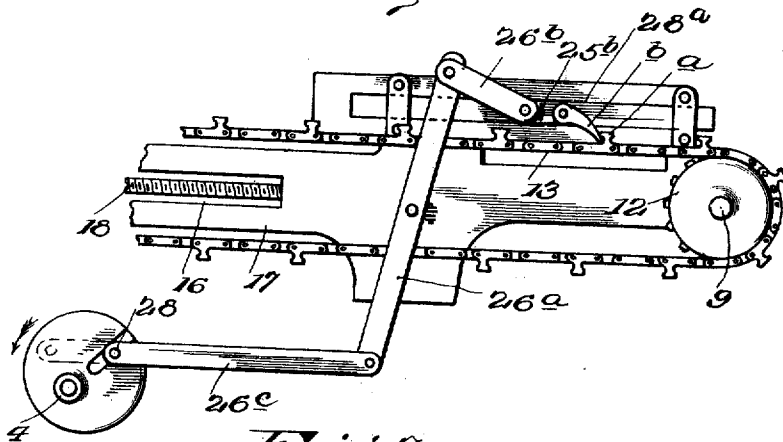


Fig. 7.

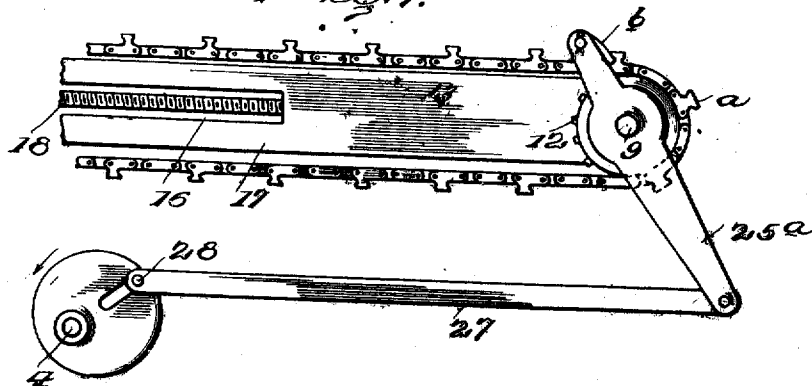
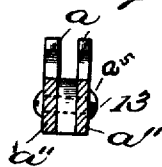


Fig. 3.



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April 1, 1924.

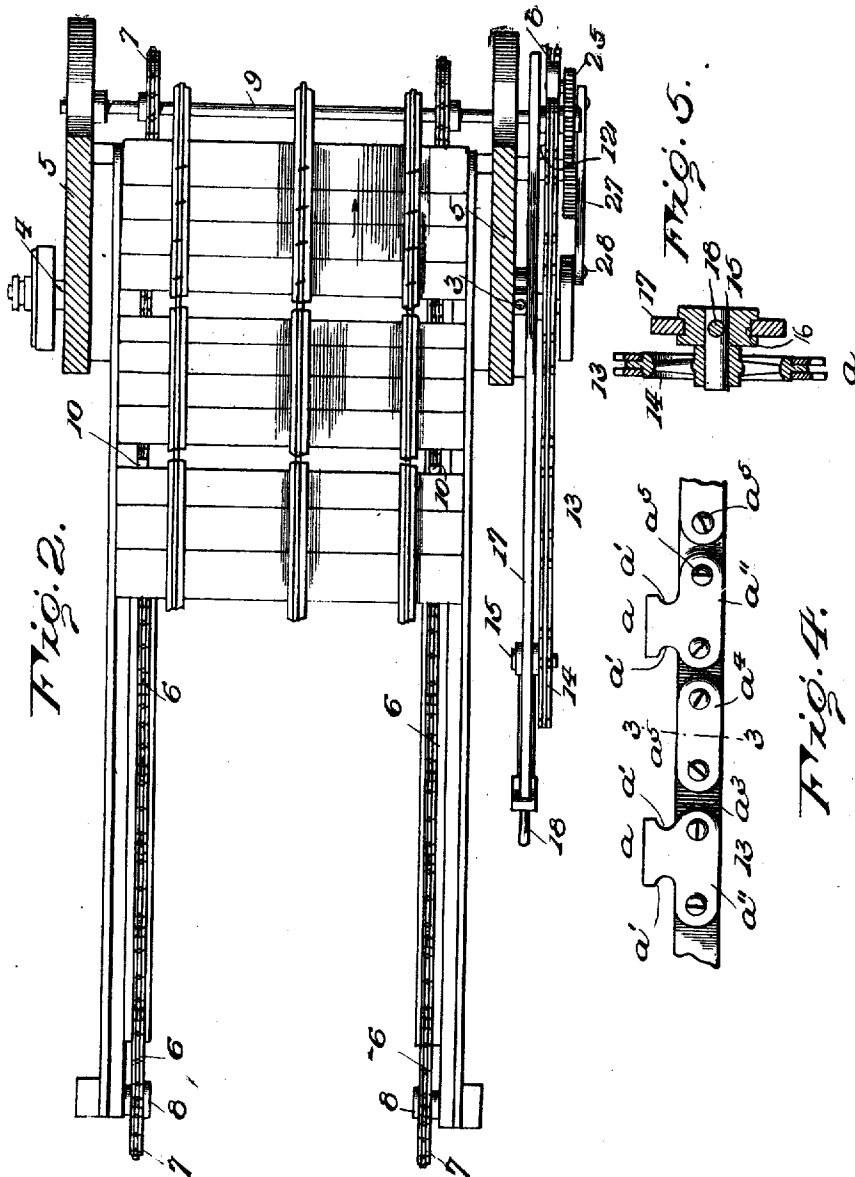
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1,489,014

VARIABLE RATCHET DRIVE FEED MECHANISM

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3 Sheets-Sheet 2



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April 1, 1924.

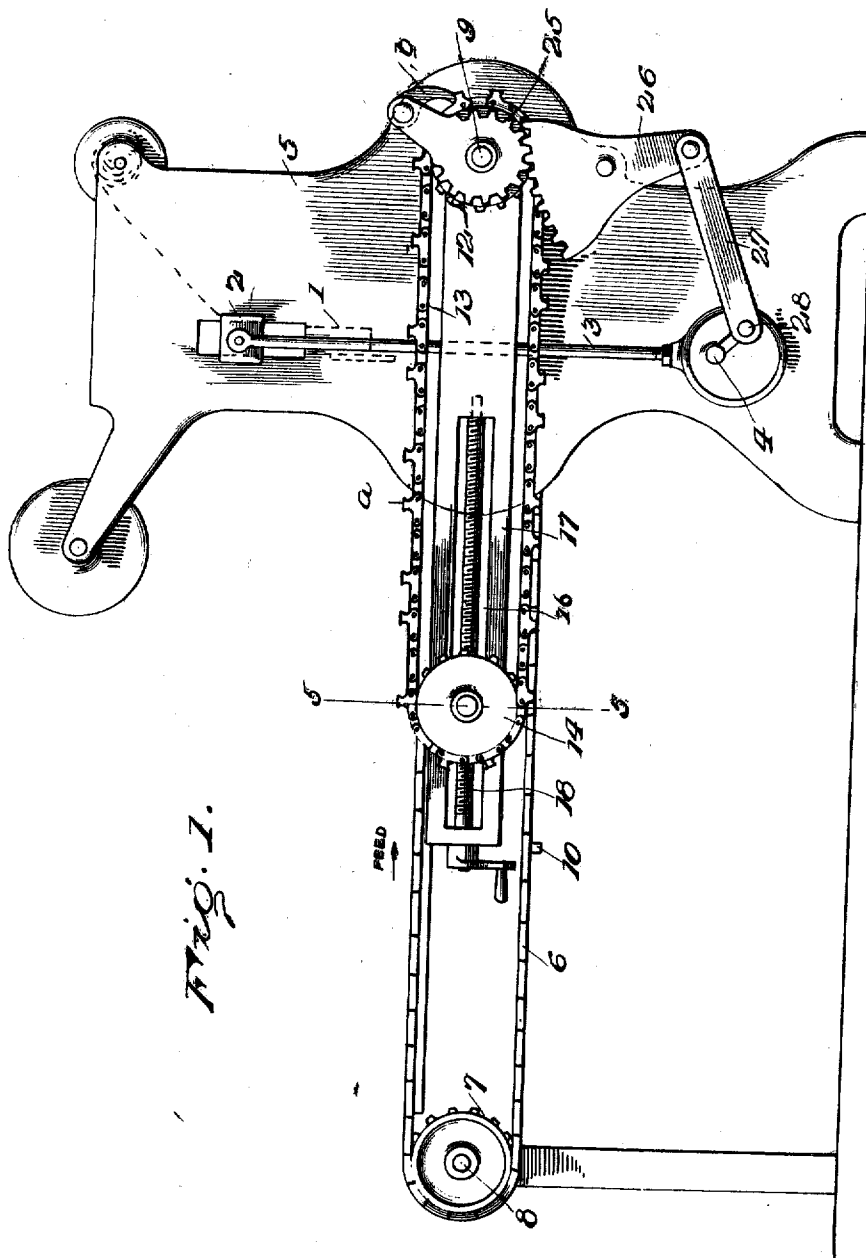
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1,489,014

VARIABLE RATCHET DRIVE FEED MECHANISM

Filed Sept. 30, 1919

3 Sheets-Sheet 1



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Patented Apr. 1, 1924.

1,489,014

UNITED STATES PATENT OFFICE.

JOHN SHELLENBERGER, OF ROME, GEORGIA, ASSIGNOR TO SEALED CASE COMPANY, A CORPORATION OF NEW YORK.

VARIABLE RATCHET DRIVE FEED MECHANISM.

Application filed September 30, 1919. Serial No. 327,583.

To all whom it may concern:

Be it known that I, JOHN SHELLENBERGER, a citizen of the United States of America, and resident of Rome, Floyd County, State of Georgia, have invented certain new and useful improvements in Variable Ratchet Drive Feed Mechanisms and the like, of which the following is a specification.

This invention relates to certain improvements in actuating devices for step by step feed mechanisms and the like; and the objects and nature of the invention will be readily understood by those skilled in the art in the light of the following explanation of the accompanying drawings illustrating what I now believe to be the preferred mechanical expression or embodiment of my invention from among other forms, constructions and arrangements within the spirit and scope thereof.

The wire bound box blanks of commerce are usually produced in elongated flat form of a length to bend along intermediate transverse lines so that a single blank will form two or more, usually all four, side walls of a box or container, with the binding wires continuous throughout the length of the blank and across the joints or spaces at said transverse lines between the sections of the blank. These blanks usually consist of thin pieces or boards of lumber or veneer, cleats or battens, binding wires, and staples straddling the wires and securing the wires, lumber and cleats or battens together.

The staples are arranged in rows along the binding wires but the staples of a row are not uniformly spaced because of the joints or spaces between the various sections of the complete blank where staples cannot be located. These wire bound blanks are usually produced by more or less automatic machinery wherein periodically movable or step by step feeding mechanism carries the properly assembled parts of each blank forwardly to periodically movable stapling devices, said devices applying the staples while the feeding mechanism is at rest, the spacing of the staples longitudinally of the blank being determined by the length of the feeding or forward strokes of the feeding mechanism. In these machines, the feeding mechanism is actuated by a ratchet wheel and pawl timed to move in certain relation with respect to the movements of the stapling devices. The

circumference of the ratchet wheel is usually of such length that a complete wire bound blank will be stapled, will pass through the stapling devices, on each complete revolution of said wheel. In such machines, the throw of the ratchet is usually uniform or the same at every stroke, and hence the spacing of the staples is determined by the arrangement of the teeth of the ratchet wheel. A ratchet wheel can be of the proper diameter and have its teeth so arranged as to locate the staples as desired along a blank of a certain known length with a certain known arrangement of joints or spaces between the sections of the blank. In other words, this ratchet wheel will constitute a pattern for a run of similar blanks uniform in size. Difficulties arise, however, when it is desired to produce blanks of a different size or arrangement on the one machine. It then becomes necessary to provide a separate ratchet wheel for each blank size or arrangement. A blank of a different length requires a ratchet wheel of a different diameter with a different tooth pattern or arrangement, and a blank of the same length but with a different spacing of the joints or spaces between the sections will require a ratchet wheel with a correspondingly peculiar tooth pattern or arrangement.

This same difficulty is true of ratchet-wheel-actuated step by step feed mechanisms in machines used for other purposes and work than stapling, when it becomes desirable to vary the spacing or the lengths of the steps making up a complete operation.

It is the object of my invention to provide ratchet actuating means for step by step feed mechanisms wherein the ratchet teeth or elements movable in an endless path can be increased or decreased in number and wherein the spacing or arrangement of such teeth can be varied, with the end in view of overcoming the hereinbefore mentioned difficulties.

With these and other objects in view, my invention consists in certain novel features in construction and in combinations and arrangements as more fully and particularly set forth and specified hereinafter.

Referring to the accompanying drawings:—

Fig. 1, illustrates one among other applications of my invention; said figure par-

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tially and diagrammatically showing in side elevation, a wire bound box blank machine.

Fig. 2, is a horizontal section partially illustrating such machine and showing a portion of a wire bound blank therein.

Fig. 3, is a cross section on the line 3—3.

Fig. 4, is a detail view of a portion of the ratchet chain.

Fig. 5, is a sectional view on the line 5—5, Fig. 1.

Figs. 6 and 7, are detail views of modifications.

In the embodiment illustrated, I have disclosed my invention adapted and applied to stapling or wire bound box blank machinery, although I do not wish to so limit my invention as my invention can be adapted for actuating step by step feeding mechanisms in machinery for performing various functions on or with respect to work periodically moved forward by such mechanism.

In the drawings, I more or less diagrammatically illustrate a wire bound box blank machine, embodying vertically-movable stapling mechanism 1, operated to periodically apply staples to the work by vertically reciprocating cross head 2, actuated by one or more pitmen 3, eccentrically connected with and reciprocated by rotary drive shaft 4, mounted in the standards or uprights 5, of the machine framework. Any suitable mechanisms can be provided for assembling the thin boards or sheets of lumber, the binding wire, and the battens or cleats, if battens or cleats are to be employed, and spacing or otherwise arranging the sheets and battens or cleats to provide the space or joints between the sections that will form the various side walls of the completed container, and for carrying such assembled elements of the blank forwardly through the stapling mechanism for proper application of the staples.

In the particular example illustrated, I show a common form of link belt feed for propelling the elements of the blank through the stapling mechanism and for moving the completed blank therefrom. This feed comprises several similar spaced parallel endless chains 6, moving together as one chain and mounted on sprockets 7, located on a pair of horizontal cross shafts 8, 9, mounted in suitable journal boxes in the machine frame work. The shaft 8 is an idler, and the feed chains are propelled by shaft 9. The feed drive shaft 9 at one end projects beyond the side of the machine frame to receive the actuating ratchet mechanism of my invention. This chain feed is arranged longitudinally of the machine, and is of any suitable length. Usually the chain feed in length exceeds the combined lengths say of two or more completed wire bound box blanks. Each chain of the feed is formed with a projecting lug 10, usually adjustable

longitudinally of the chain and corresponding lugs 10 of the chains are in alignment transversely of the feed to form a stop or gage for the front end of a wire bound blank. Where the length of the chain feed permits, several sets of such gage lugs are usually provided spaced apart longitudinally of the feed a distance equal to the length of the blank to be formed plus any desired distance that is to intervene between the rear end of a completed blank and the advancing end of the following blank. In assembling the wood sheets for a blank, the first sheet is lined up against lugs 10 that constitute a gage or stop, in advance of the stapling mechanism and the remaining sheets are assembled in proper position and succession behind said first sheet, as will be readily understood by those skilled in the art. The sheets are assembled on cleats, if cleats are to be employed. If battens are to be used, as shown, they are properly assembled on the sheets, and the binding wires are assembled on and longitudinally of the battens. The ordinary, or any other suitable means, are employed, to supply the binding wires and cause the same to be fed forward with the blanks. The stapling mechanism applies the staples to straddle the binding wires and drives the staples through the battens and into the sheets to secure the binding wires, battens and sheets together. The binding wires are continuous throughout the length of the blank and the battens, where employed, are also continuous throughout the blank.

This feed is advanced periodically step by step through the medium of my improved ratchet mechanism applied to the chain feed drive shaft, in this instance through the medium of a sprocket wheel 12, fixed on the projecting end of shaft 9. This ratchet mechanism embodies an endless chain or link belt 13 passing over and driving wheel 12 and also passing over and meshing with an idler sprocket wheel 14. This wheel 14 is carried by a slide block 15 adjustable longitudinally of ratchet chain 13 toward and from the wheel 12. For instance, I show this block slidable in guideway 16, in supporting bracket 17, suitably secured to the machine frame. Various means can be provided for adjusting the slide block, although I show handled rotary screw 18 for this purpose. The screw is mounted against longitudinal movement and the slide block has a threaded bore receiving the screw and hence constitutes a non-rotary nut on the screw and movable longitudinally thereof on the rotation of the screw.

This endless ratchet chain is in effect a ratchet wheel and is provided with any suitable ratchet teeth *a* through the medium of which the chain is propelled (rotated) by any suitable pawl or dog *b* or the equivalent thereof. I here use the term ratchet

"teeth" in a broad or generic sense to include any suitable projections or shoulders or other means with which the ratchet chain is provided and with which the pawl or its equivalent cooperates to advance the chain step by step. As an example I show the chain illustrated, provided with outwardly (radially) extending projections or lugs a having transverse concavities or rounded depressions a' in their rear end edges and also preferably in their front end edges. Each concavity preferably extends across the full width of the lug and is located intermediate the length of the lug end. In this example, these lugs are rigid with and project outwardly from certain links a'' of the chain and are offset from the central portions of the links, i, e, each lug is located relatively close to one end of its link and relatively remote from the other end of its link and both ends of the lug are formed to operatively receive the pawl.

The chain, in the example shown, is made up of series of links a'' , a^3 , a^4 , detachably and pivotally connected in any suitable or well known manner as by pivots a^5 . The links are detachably connected so that links can be removed or added to increase and diminish the length (circumference) of the chain, to reverse any one or more of the links a'' , or to arrange the links a'' according to any desired spacing either uniform or irregular. The idler sprocket wheel 14 can be adjusted to correspond to the length of the chain and maintain the chain stretched as may be required, by the addition or removal of chain links.

The pawl b can be of any suitable construction and formation and moved back and forth on its operative and return strokes by any suitable means and in any desirable manner although the operation of the pawl is, in this instance, timed with the operation of the stapling devices so that the stapling devices will perform their stapling operations on the blanks while the pawl is on its return strokes with the feed mechanism at rest and hence so that the stapling devices will be at rest so far as the blanks are concerned while the feed mechanism is performing its feeding strokes.

In the example illustrated by certain figures of the drawing, I show the pawl b carried by and pivoted to a gear or toothed sector 25 loosely mounted on shaft 9 and arranged beside sprocket 12 with the pawl above the chain and its free end resting loosely thereon. This pawl carrier is swung or oscillated by lever 26 fulcrumed to a frame standard 5 and having a toothed sector meshing with the teeth of the pawl carrier 25. The depending long arm of the lever is pivotally connected with the drive shaft 4 through the medium of link 27 and eccentric or crank connection 28. This

crank connection is preferably adjustable and the connection between link 27 and lever 26 is also preferably adjustable for obvious purposes, such as varying the throw or stroke of the pawl.

If so desired, the pawl b can be mounted on lever or carrier 25^a to the lower end of which the link 27 to the crank of shaft 4 can be pivotally joined. The pawl b can be carried by a slide instead of a swinging or pivoted carrier. For instance, the pawl b can be pivotally joined to a reciprocating slide 25^b so that the free end of the pawl operatively engages the ratchet chain. This slide is confined to reciprocate in guideway 28^a carried by bracket 17. The slide is reciprocated in the desired sequence with respect to the operations of the stapling devices by the crank 28 of shaft 4 through the medium of lever 26^a and links 26^b and 26^c.

I do not wish to limit my invention to any particular pawl carrier and means for operating the same.

The pawl b is so arranged with respect to the ratchet chain and its teeth, that on its return stroke the pawl will slide loosely along the ratchet chain and over a ratchet tooth and drop behind said tooth, and then on its operative stroke, the free end of the pawl will engage the rounded depression or concavity a' of said tooth and rotate or move the ratchet chain forwardly the required distance to advance the feed and blanks carried thereby a step or feeding movement.

In the specific embodiment illustrated, the concavities a' are of advantage in holding the pawl to the tooth and preventing the pawl from slipping from the tooth and in reducing wear to the minimum. The pawl moves a fixed and predetermined distance on each operative stroke, and hence the length of the advance of the feed and blanks at each feeding stroke is controlled by the arrangement and spacing of the ratchet teeth. The spacing and location of the staples longitudinally of the completed blank is determined by the location and spacing of the ratchet teeth along the endless ratchet connection or wheel, and hence said connection or wheel forms a pattern for the stapling arrangement on the blanks.

In practice, the length of the ratchet chain or endless connection, the circumference thereof, is preferably equal to the length of the completed blank plus the distance or spacing between the rear end of a completed blank and the front end of the succeeding blank. The ratchet teeth on the ratchet chain indicate or represent the transverse portions of the blank that will be successively presented to the stapling devices to receive transverse rows of staples, and the location of each ratchet tooth on the ratchet

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chain with respect to the other teeth of the chain determines the location of the transverse rows of staples on the blank with respect to the remaining staples and the various portions of the blank. The teeth are so arranged on the chain that one or more transverse rows of staples will be applied to each sheet or board of the blank avoiding the spaces between boards and the joints between sections, and this necessitates irregular spacing of the teeth. Usually in adjusting the ratchet chain or wheel for a run of blanks of a certain size and section arrangement, links are detached and the chain removed from the sprocket wheel and straightened out on a pattern of the blank to be produced, and links are then detached and attached so that teeth a will be located over each transverse row of staples on the blank and not elsewhere, and so that the length of the chain will equal the length of the blank plus the desired spacing between blanks. The chain is then restored to its sprocket wheels in such manner that the first tooth will be in engagement with the pawl and with the feed chains so arranged that the gage or stop 10 thereof will be at the beginning of its operative movement with respect to the stapling devices to receive the first board of the blank to be formed so that the first transverse rows of staples will be properly applied to and located on the next operative stroke of said devices.

Whenever, a change is to be made in the length or section arrangements of the blanks to be produced, the ratchet chain is adjusted accordingly. The distance between each ratchet tooth and the following tooth can be varied by adding or removing links a^3 , a^4 . This spacing of teeth can also be arranged by reversing some of the links a'' because of the off center arrangement of the teeth of said links.

I have thus provided, what is in effect, an adjustable ratchet wheel, and I thereby overcome serious difficulties heretofore encountered in the operation of ratchet operating devices for step by step feed mechanisms for wire bound box blank machines, as well as for other machines where devices periodically perform various functions or operations on or with respect to work that is advanced thereto step by step and where it is desirable to vary the spacing or lengths of the steps of the series.

It is evident that various changes, variations and departures might be resorted to without departing from the spirit and scope of my invention and hence I do not wish to limit myself to the exact disclosures hereof.

What I claim is:—

1. Ratchet driving means for step by step

feed mechanism, comprising a succession of ratchet teeth, feed-mechanism-propelling means carrying said teeth in an endless path and driven by said teeth, said teeth being individually shiftable to vary the tooth spacing and arrangement longitudinally of said path, and an actuating pawl operating at each drive stroke to successively engage and advance one of said teeth whereby said means is propelled step by step according to said tooth arrangement and spacing.

2. Ratchet means for driving step by step feed mechanism, comprising an endless traveling connection adjustable in length and provided with ratchet teeth adjustable to vary their spacing and arrangement longitudinally of said connection, and a driving pawl operating at each drive stroke to engage one of said teeth whereby said connection is advanced step by step according to the location and spacing of the teeth.

3. Ratchet means for driving step by step mechanism and the like, comprising an endless feed-mechanism-propelling connection embodying separable detachable links whereby the connection can be varied in length by adding and removing links, certain of said links being formed with ratchet teeth whereby the tooth spacing and arrangement longitudinally of said connection can be varied by shifting the relative positions of said ratchet teeth links in said connection, and a driving pawl for successively engaging and advancing said teeth to propel said connection step by step according to the tooth spacing and arrangement.

4. Ratchet devices for driving mechanisms step by step, comprising means movable in an endless path and coupled to said mechanism for propelling the same step by step, said means embodying individually removable ratchet teeth shiftable to provide various ratchet tooth spacings and arrangements throughout said path, and a driving pawl operating at each drive stroke to engage and advance one of said teeth and correspondingly propel said means step by step.

5. Ratchet devices for driving mechanism step by step, comprising an endless link belt coupled to said mechanism to advance the same step by step, said belt embodying detachable links formed with ratchet teeth, and a driving pawl operating at each drive stroke to engage and advance one of said teeth to propel said belt step by step.

6. Ratchet mechanism for driving a step by step feed, provided with an endless succession of ratchet teeth and embodying means whereby said teeth can be increased and decreased in number and whereby the spacing of said teeth can be varied, and driving means operating at each drive stroke to engage and advance one of said

teeth whereby said feed is propelled step by step according to the tooth spacing and arrangement.

7. A step by step feed, and means for periodically operating on the work advanced by said feed, said feed embodying a work gage or stop, in combination with ratchet mechanism positively coupled to said feed to drive the same step by step and bearing certain relation to said gage, said mechanism provided with an endless series of ratchet teeth and embodying means whereby the spacing between and relative arrangement of said teeth can be varied, and driving devices timed to move with respect to the movements of said means for periodically operating on the work and operating at each drive stroke to engage and advance one of said teeth whereby said feed is propelled step by step according to the tooth spacing and arrangement.

8. Actuating means for step-by-step feed mechanism comprising an adjustable endless travelling chain comprising separable links, certain of said links provided with outwardly projecting ratchet teeth rigid therewith, and a pawl movable back and forth and engaging one of said teeth upon each back and forth movement to propel the chain.

9. Actuating means for feed mechanism comprising an endless traveling chain comprising separable links whereby the chain can be expanded and contracted and whereby the links can be variously arranged therein, certain of said links formed with ratchet teeth, sprocket wheels carrying said chain, one of said wheels constituting the driving means for said feed mechanism, means whereby the distance between said wheels can be varied, and means for periodically and successively engaging said teeth to propel said chain forwardly step by step.

10. Actuating means for feed mechanism comprising a wheel for driving said mechanism, an endless chain for driving said wheel, an adjustable idler wheel for said chain, said chain provided with spaced ratchet teeth projecting outwardly therefrom, a pawl carrier movable back and forth over said chain, actuating means for said carrier, and a pivoted pawl depending from said carrier and arranged to successively engage said teeth to propel said chain forward step by step.

11. Actuating mechanism for feeding means comprising an endless chain arranged to propel said means step by step, said chain embodying pivotally joined separable links, certain of said links formed with similar projecting lugs forming ratchet teeth rigid therewith, whereby the chain can be contracted or expanded by the removal or addition of links and whereby the spacing and arrangement of said teeth can be varied,

supporting means for said chain, and means to periodically and successively engage said teeth and thereby move said chain forward step by step.

12. Actuating means for feed mechanism comprising an endless chain arranged to propel said mechanism, supporting means for said chain, said chain provided with projecting ratchet teeth having intermediate transverse concave depressions in their edges, a pawl at its free edge formed to engage said depressions and propel the chain forwardly through the medium of said teeth, and means to operate said pawl back and forth to successively engage said teeth and push the same forwardly.

13. Actuating means for feed mechanism comprising an endless chain arranged to propel said mechanism, supporting means for said chain, said chain including detachable reversible links formed with rigid outwardly projecting ratchet teeth, each ratchet tooth being similarly formed at its front and rear edge to receive the edge of a pawl for pushing the chain forward, a pawl for successively engaging said teeth to propel the chain, and pawl operating means.

14. A machine for use in making boxes comprising, in combination, work-forwarding means; fastener-setting mechanism; and a single means for causing relative progression between said mechanism and the work, comprising a feed chain having connection with said work-forwarding means and a reciprocating motion-imparting device adapted to propulsively engage said chain intermittently.

15. A machine for use in making boxes comprising, in combination, endless work-forwarding means provided with devices for relatively positioning box parts; fastener-setting mechanism; and means for causing relative progression between said mechanism and the work, comprising a feed chain having connection with said work-forwarding means, a plurality of members carried thereby and a motion-imparting device adapted to propulsively engage said members successively.

16. A machine for use in making boxes comprising, in combination, work-forwarding means including spacing means; fastener-setting mechanism; and feeding means comprising a series of adjustable members all having connection with the work-forwarding means and movable therewith and a motion imparting device adapted to propulsively engage said members successively; said machine being adapted to operate without interruption on materials for a plurality of boxes.

17. A machine for use in making boxes comprising, in combination, work-forwarding means including spacing means; fastener-setting mechanism; and work-feeding

means comprising adjustable controlling members all having connection with the work-forwarding means and movable therewith and a motion-imparting device adapted to propulsively engage said controlling members successively to advance the work variable distances intermittently; said machine being adapted for uninterrupted operation upon materials for a plurality of boxes.

18. A machine for use in making boxes comprising, in combination, work-forwarding means; fastener-setting mechanism; and means for causing relative progression between said mechanism and the work, comprising a feed chain having connection with said work-forwarding means, a plurality of selectively spaced members adjustably carried thereby and a motion-imparting device adapted to engage each said member in turn and advance it to the same point relative to said fastener-setting mechanism.

19. A machine for use in making boxes comprising, in combination, work-forwarding means; fastener-setting mechanism; and means for causing relative progression between said mechanism and the work, comprising a feed chain having connection with said work-forwarding means, a plurality of selectively spaced members adjustably carried thereby, and a motion-imparting device adapted to engage each said member in turn and advance it a distance equal to the distance between the engaged member and its predecessor.

20. A machine for use in making boxes comprising, in combination, work-forwarding means; fastener-setting mechanism; and regulable work-feeding means, comprising a series of selectively spaced devices having connection with the work-forwarding means and an actuator adapted to propulsively engage each of said devices in turn to advance the work variable distances corresponding to the spaces between said devices; said machine being adapted to operate without interruption on materials for a plurality of boxes.

21. A machine for use in making boxes comprising, in combination, endless work-forwarding means; fastener-setting mechanism; and means to cause relative progression therebetween in steps of controlled length to locate fasteners at desired points on the work, comprising a series of members having connection with the work-forwarding means and spaced apart variable distances equal to the desired distances between fasteners and a motion-imparting device adapted to propulsively engage said members successively.

22. A machine for use in making boxes comprising, in combination, work-forwarding chains and means to advance said work-forwarding chains in steps of controlled

length to locate fasteners at selected points on the work, comprising a feed chain having connection with said work-forwarding chains and carrying a series of adjustable members selectively spaced and a motion-imparting device adapted to engage said members successively.

23. A machine for use in making boxes comprising, in combination, work-forwarding and spacing means; fastener-setting mechanism; and means to cause relative progression between said mechanism and the work in steps of controlled length to locate fasteners at desired points thereon, comprising a series of devices having connection with the work-forwarding means and located relative to selected fastener-receiving points on the work and a motion-imparting feed member adapted to engage each of said devices in turn and advance its corresponding fastener-receiving point to fastener-receiving position.

24. A machine for use in making boxes comprising, in combination, work-forwarding means; fastener-setting mechanism; and means to cause relative progression between said mechanism and the work in steps of controlled length to locate fasteners at desired points thereon, comprising a series of devices having connection with the work-forwarding means and spaced apart distances equal to the desired distances between fastener-receiving points on the work and a motion-imparting feed member adapted to engage each of said devices in turn to advance the work a distance equal to the distance between the engaged device and its predecessor; said machine being adapted to operate without interruption on materials for a plurality of boxes.

25. A machine for use in making boxes comprising, in combination, fastener-setting mechanism; a conveyor for spacing and advancing box parts; and means to feed said conveyor in steps of controlled length to present selected fastener-receiving points on the work to said mechanism, comprising a reciprocating actuator adapted during variable fractions of its throw to propulsively engage successively each of a series of members having adjustably connected with the conveyor and movable therewith; said machine being adapted to operate without interruption on materials for a plurality of boxes.

26. A machine for use in making boxes comprising, in combination, work-forwarding and positioning means; binding-wire-applying means including fastener-setting mechanism; and work-feeding mechanism including means to cause feed steps of variably selected lengths to bring the work to selected positions to receive fasteners, said means comprising controlling members movable with the work and motion-imparting

means successively engaging each of said controlling members to carry the work to fastener-receiving positions.

27. A machine for use in making boxes comprising, in combination, work-forwarding means; binding-wire-applying means including fastener-setting mechanism; and means to successively present variably selected fastener-receiving points on the work in fastener-receiving position, comprising a plurality of members having connection with the work-forwarding means and located longitudinally thereof at points corresponding to the selected fastener-receiving points on the work and a motion-imparting device engaging each said member in turn and advancing its corresponding fastener-receiving point on the work to fastener-receiving position.

28. A machine for use in making boxes comprising, in combination, work-forwarding means adapted to receive and position materials for a plurality of box blanks; fastener-setting mechanism; and means to present variably selected fastener-receiving points on said plurality of blanks in fastener-receiving position, comprising a plurality of members having connection with the work-forwarding means and located at points corresponding to the selected fastener-receiving points on the work and a motion-imparting device engaging each said member in turn and advancing its corresponding fastener-receiving point on the work to fastener-receiving position.

29. A machine for use in making boxes comprising, in combination, endless work-forwarding means; fastener-setting mechanism; and means to cause relative progression between said mechanism and the work in steps of controlled length to locate fasteners at selected points on the work, comprising an adjustable pattern of feed members for a unit of work, having a fixed ratio of movement with the work-forwarding means, and a motion-imparting device engaging each of said members successively and advancing the work variable distances corresponding relatively to said pattern.

30. A machine for use in making boxes comprising, in combination, endless work-forwarding means; fastener-setting mechanism; and means to cause relative progression between said mechanism and the work in steps of controlled length to locate fasteners at selected points on the work, comprising an adjustable pattern of feed members for a box blank having a fixed ratio of movement with the work-forwarding means and a motion-imparting device engaging each of said members successively and advancing the work variable distances corresponding relatively to said pattern.

31. A machine for use in making boxes comprising, in combination, endless work-

forwarding means; fastener-setting mechanism; and means to cause relative progression between said mechanism and the work in steps of controlled length to locate fasteners at selected points on the work, comprising an adjustable pattern of feed members for a series of units of work having a fixed ratio of movement with the work-forwarding means and a motion-imparting device engaging each of said members successively and advancing the work variable distances corresponding relatively to said pattern.

32. A machine for use in making boxes comprising, in combination, work-forwarding means; fastener-setting mechanism; and means to cause relative progression between said mechanism and the work in steps of controlled length to locate fasteners at selected points on the work, comprising an adjustable pattern of feed members for a series of box blanks having a fixed ratio of movement with the work-forwarding means and a motion-imparting device engaging each of said members successively and advancing the work variable distances corresponding relatively to said pattern; said machine being adapted to operate without interruption on materials for a plurality of boxes.

32. A machine for use in making boxes comprising, in combination, work-forwarding means; fastener-setting mechanism; and means to cause relative progression between said mechanism and the work in steps of controlled length to locate fasteners at selected points on the work, comprising a pattern of feed members for a unit of work, having a fixed ratio of movement with the work-forwarding means and a motion-imparting device engaging each of said members successively and advancing the work variable distances corresponding relatively to said pattern; said pattern of feed members being constructed and arranged to automatically feed a succession of units of work and locate fasteners in each unit according to said pattern.

34. A machine for use in making boxes comprising, in combination, work-forwarding means; fastener-setting mechanism; and means to cause relative progression between said mechanism and the work in steps of controlled length to locate fasteners at selected points on the work, comprising a pattern of feed members for a box blank, having a fixed ratio of movement with the work-forwarding means and a motion-imparting device engaging each of said members successively and advancing the work variable distances corresponding relatively to said pattern; said pattern of feed members being constructed and arranged to automatically feed a succession of box blanks and locate fasteners in each blank according to said pattern.

35. A machine for use in making boxes comprising, in combination, work-forwarding means; fastener-setting mechanism; and means to cause relative progression between said mechanism and the work in steps of controlled length to locate fasteners at selected points on the work, comprising a pattern of feed members for a series of units of work, having a fixed ratio of movement with the work-forwarding means and a motion-imparting device engaging each of said members successively and advancing the work variable distances corresponding relatively to said pattern; said pattern of feed members being constructed and arranged to automatically feed a succession of series of units of work and locate fasteners in each series according to said pattern.

36. A machine for use in making boxes comprising, in combination, work-forwarding means; fastener-setting mechanism; and means to cause relative progression between said mechanism and the work in steps of controlled length to locate fasteners at selected points on the work, comprising a pattern of feed members for a series of box blanks, having a fixed ratio of movement with the work-forwarding means and a motion-imparting device engaging each of said members successively and advancing the work variable distances corresponding relatively to said pattern; said pattern of feed members being constructed and arranged automatically to feed a succession of series of box blanks and locate fasteners in each series according to said pattern.

37. A machine for use in making boxes comprising, in combination, work-forwarding means; fastener-setting mechanism; and means to cause relative progression between said mechanism and the work in steps of controlled length to locate fasteners at selected points on the work, comprising a feed chain having a fixed ratio of movement with the work-forwarding means and carrying a pattern of feed members for a unit of work and a motion-imparting device propulsively engaging each of said members successively and advancing the work variable distances corresponding relatively to said pattern.

38. A machine for use in making boxes comprising, in combination, work-forwarding means; fastener-setting mechanism; and means to cause relative progression between said mechanism and the work in steps of controlled length to locate fasteners at selected points on the work, comprising a feed chain having a fixed ratio of movement with the work-forwarding means and carrying a pattern of feed members for a box blank and a motion-imparting device propulsively engaging each of said members successively and advancing the work variable distances corresponding relatively to said pattern.

39. A machine for use in making boxes comprising, in combination, work-forwarding means; fastener-setting mechanism; and means to cause relative progression between said mechanism and the work in steps of controlled length to locate fasteners at selected points on the work, comprising a feed chain having a fixed ratio of movement with the work-forwarding means and carrying a pattern of feed members for a series of units of work and a motion-imparting device propulsively engaging each of said members successively and advancing the work variable distances corresponding relatively to said pattern.

40. A machine for use in making boxes comprising, in combination, work-forwarding means; fastener-setting mechanism; and means to cause relative progression between said mechanism and the work in steps of controlled length to locate fasteners at selected points on the work, comprising a feed chain having a fixed ratio of movement with the work-forwarding means and carrying a pattern of feed members for a series of box blanks and a motion-imparting device propulsively engaging each of said members successively and advancing the work variable distances corresponding relatively to said pattern.

41. A machine for use in making boxes comprising, in combination, work-forwarding means; fastener-setting mechanism; and means to cause relative progression between said mechanism and the work in steps of controlled length to locate fasteners at selected points on the work, comprising a feed chain having a fixed ratio of movement with the work-forwarding means and carrying a pattern of feed members for a unit of work and a motion-imparting device propulsively engaging each of said members successively and advancing the work variable distances corresponding relatively to said pattern; said pattern operating automatically to feed a succession of units of work and to locate fasteners in each unit according to said pattern.

42. A machine for use in making boxes comprising, in combination, work-forwarding means; fastener-setting mechanism; and means to cause relative progression between said mechanism and the work in steps of controlled length to locate fasteners at selected points on the work, comprising a feed chain having a fixed ratio of movement with the work-forwarding means and carrying a pattern of feed members for a box blank and a motion-imparting device propulsively engaging each of said members successively and advancing the work variable distances corresponding relatively to said pattern; said pattern operating automatically to feed a succession of box blanks and to locate

fasteners in each blank according to said pattern.

43. A machine for use in making boxes comprising, in combination, work-forwarding means; fastener-setting mechanism; and means to cause relative progression between said mechanism and the work in steps of controlled length to locate fasteners at selected points on the work, comprising a feed chain having a fixed ratio of movement with the work-forwarding means and carrying a pattern of feed members for a series of units of work and a motion-imparting device propulsively engaging each of said members successively and advancing the work variable distances corresponding relatively to said pattern; said pattern operating automatically to feed a succession of series of units of work and to locate fasteners in each series according to said pattern.

44. A machine for use in making boxes comprising, in combination, work-forwarding means; fastener-setting mechanism; and means to cause relative progression between said mechanism and the work in steps of controlled length to locate fasteners at selected points on the work, comprising a feed chain having a fixed ratio of movement with the work-forwarding means and carrying a pattern of feed members for a series of box blanks and a motion-imparting device propulsively engaging each of said members successively and advancing the work variable distances corresponding relatively to said pattern; said pattern operating automatically to feed a succession of series of box blanks and to locate fasteners in each series according to said pattern.

45. A machine for use in making boxes comprising, in combination, work-forwarding means; fastener-setting mechanism; and means to cause relative progression between said mechanism and the work in steps of controlled length to locate fasteners at selected points on the work, comprising a feed chain having connection with the work-forwarding means and correlated in movement therewith; a pattern of feed members carried thereby and a motion-imparting device propulsively engaging each of said feed members successively and advancing the work variable distances corresponding relatively to said pattern.

46. A machine for use in making boxes comprising, in combination, work-forwarding means; binding-wire-applying means including fastener-setting mechanism; and means to cause relative progression between said mechanism and the work in steps of controlled length to locate fasteners at selected points on the work, comprising a pattern of feed members having connection with the work-forwarding means and having a fixed ratio of movement therewith and

a motion-imparting device propulsively engaging each of said feed members successively and advancing the work variable distances corresponding relatively to said pattern.

47. A machine for use in making boxes comprising, in combination, fastener-setting mechanism; means for positioning and forwarding box parts; and means to cause relative progression between said fastener-setting mechanism and the box parts in steps of controlled length to locate fasteners on the work, comprising a pattern of selectively spaced members having a fixed ratio of movement with the work-forwarding means and means propulsively engaging each of said members successively to advance the work variable distances intermittently according to said pattern.

48. In a machine for use in making boxes having relatively movable work-forwarding means and fastener-setting mechanism; a regulable feeding mechanism comprising a feed chain having connection with the work-forwarding means and correlated in movement therewith, whereby movement of said feed chain a certain distance produces a certain movement of the work-forwarding means and means propulsively engaging in succession each of a series of selectively spaced members carried by said feed chain to advance the same variable distances intermittently.

49. In a box blank machine, a work holder comprising a plurality of endless chains; means to drive said chains intermittently, including means to vary the length of said intermittent movement, comprising a reciprocating actuator acting successively on each of a series of adjustable teeth carried by a rotatable element having connection with said chains.

50. A machine for use in making wire-bound boxes comprising, in combination, means for receiving and positioning the box parts; means for applying binding wire to the box parts; and mechanism to cause relative progression between said binding-wire-applying means and said work-positioning means, comprising a series of adjustable members all having connection with one of said means and movable therewith, and an actuator adapted to propulsively engage said members successively; said machine constituting an organization adapted for uninterrupted operation upon materials for a plurality of boxes.

51. A machine for use in making wire-bound boxes comprising, in combination, means to secure binding wire to box parts; work-forwarding and spacing means; and means to cause relative progression between said securing means and the work in steps of controlled length, comprising a series of

adjustable members all having connection with said work-forwarding means and movable therewith, and an actuator adapted to propulsively engage said members successively.

52. A machine for use in making wire-bound boxes comprising, in combination, work-forwarding means; binding-wire-applying means, including fastener-setting mechanism; and a single means for causing a succession of relative step movements between said mechanism and the work, comprising a flexible ratchet driving means having adjustable teeth.

53. A machine for use in making wire-bound boxes comprising, in combination, work-forwarding means; binding-wire-applying means including fastener-setting mechanism; and a single means for causing a succession of relative step movements between said mechanism and the work, comprising flexible driving means having adjustable teeth, and a motion-imparting device adapted to propulsively engage said teeth successively.

54. A machine for use in making wire-bound boxes comprising, in combination, work-forwarding means; fastener-setting mechanism; and a single means for causing a succession of relative step movements between said mechanism and the work, including a ratchet adjustable in circumference.

55. A machine for use in making wire-bound boxes comprising, in combination, work forwarding means; fastener-setting mechanism; and a single means for causing a succession of relative step movements between said mechanism and the work, including a ratchet adjustable in circumference and having adjustable teeth.

56. A machine for use in making wire-bound boxes comprising, in combination, work-forwarding means; fastener-setting mechanism; and a single means for causing a succession of relative step movements between said mechanism and the work, comprising a ratchet consisting of chain links, adjustable teeth secured to said links, and a motion-imparting device adapted to propulsively engage said teeth successively.

57. A machine for use in making wire-bound boxes comprising, in combination, endless work-forwarding means adjustable in length; fastener-setting mechanism; and a single means to cause relative progression therebetween, comprising a flexible ratchet adjustable circumferentially to correspond relatively to the length of said work-forwarding means, a series of adjustable teeth carried thereby, and a motion-imparting device adapted to propulsively engage said teeth successively.

58. A machine for the use in making wire

bound boxes comprising, in combination, endless work-forwarding means adjustable in length; fastener-setting mechanism and means to cause relative progression therebetween, comprising a flexible ratchet having a fixed ratio of movement with said work-forwarding means and being adjustable circumferentially to accommodate adjustments in said work-forwarding means, a series of adjustable teeth carried thereby, and a motion-imparting device adapted to propulsively engage said teeth successively.

59. A machine for use in making wire-bound boxes comprising, in combination, work-forwarding means; fastener-setting mechanism; and ratchet means for causing relative step-by-step progression therebetween, comprising an endless connection adjustable in length and provided with members adjustable to vary their spacing, and a motion-imparting device engaging each of said members in succession to advance said connection according to the spacing of said members.

60. A machine for use in making wire-bound boxes comprising, in combination, work-forwarding means; fastener-setting mechanism; and ratchet means for causing relative step-by-step progression therebetween, comprising an endless connection adjustable in length and provided with a pattern of adjustable members selectively spaced for a unit of work, and a motion-imparting device engaging each of said members in succession a plurality of times to advance each of a plurality of successive units of work according to said pattern without interrupting the operation of the machine.

61. A machine for use in making wire-bound boxes comprising, in combination, work-forwarding means; fastener-setting mechanism; and ratchet means for causing relative step-by-step progression therebetween, comprising an endless connection adjustable in length and provided with a pattern of adjustable members selectively spaced for a series of units of work, and a motion-imparting device engaging each of said members in succession a plurality of times to advance each of a plurality of successive series of units of work according to said pattern without interrupting the operation of the machine.

62. A machine for use in making wire-bound boxes comprising, in combination, work-forwarding means; binding-wire-applying means including fastener-setting mechanism; and means to cause relative step-by-step progression therebetween, comprising ratchet mechanism provided with a succession of detachable teeth whereby said teeth can be increased and decreased in number and whereby the spacing of said teeth

can be varied, and means for successively propulsively engaging each of said teeth to advance the work-forwarding means according to the relative spacing of said teeth.

5 63. Feed mechanism for advancing endless work-forwarding means variable distances intermittently comprising a feed chain syn-

chronized in movement with the endless work-forwarding means and including a series of adjustable members, and means controlled by said adjustable members for driving said feed chain variable distances inter- 10 mittently.

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