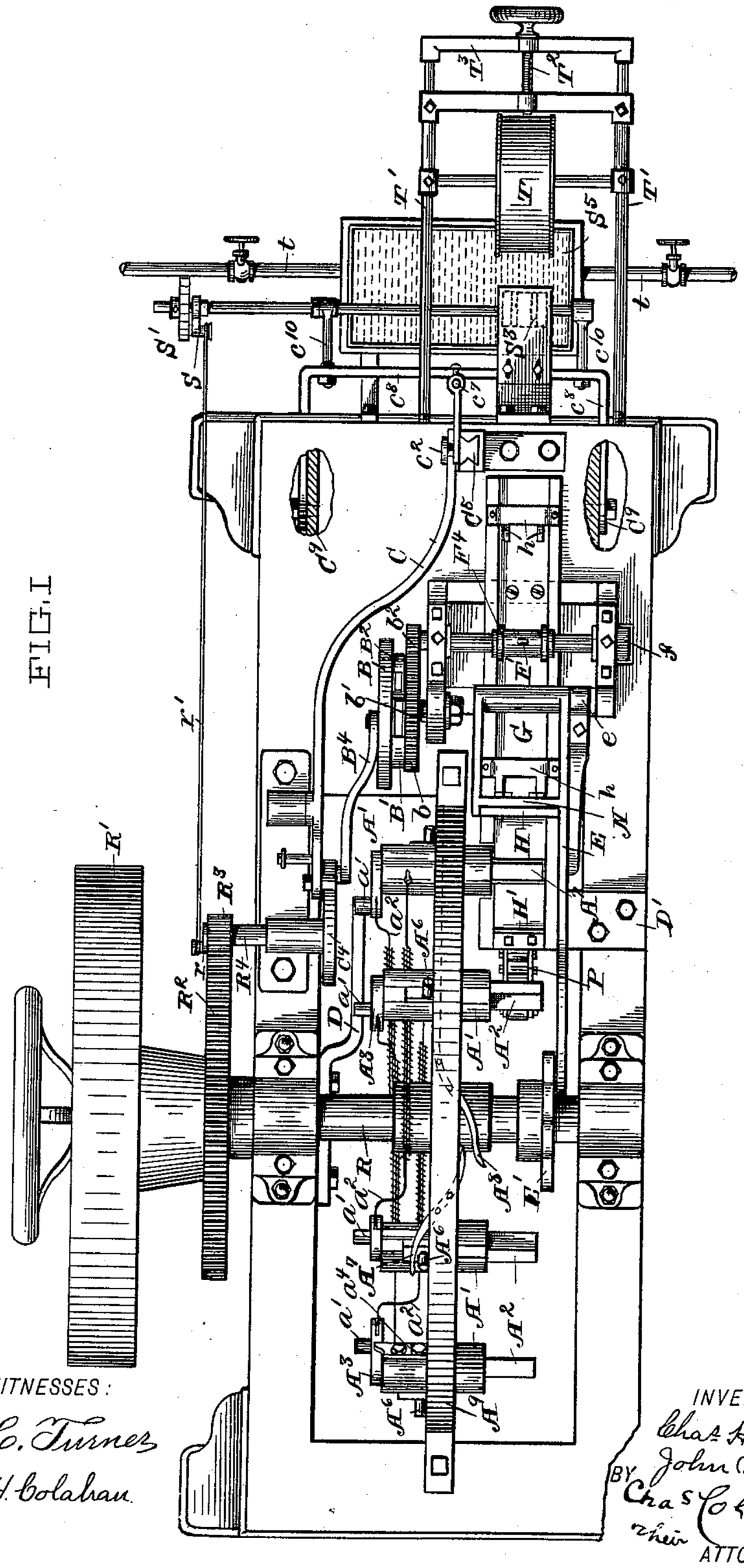
(No Model.) 5 Sheets—Sheet 1.

C. H. PALMER & J. W. DENMEAD.

PAPER BOX MAKING MACHINE.

No. 602,140. Patented Apr. 12, 1898.

FIG. 1



WITNESSES:

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M. H. Colahan.

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BY Chas. Colahan

their ATTORNEY.

(No Model.) 5 Sheets—Sheet 2.

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-FIG. II-

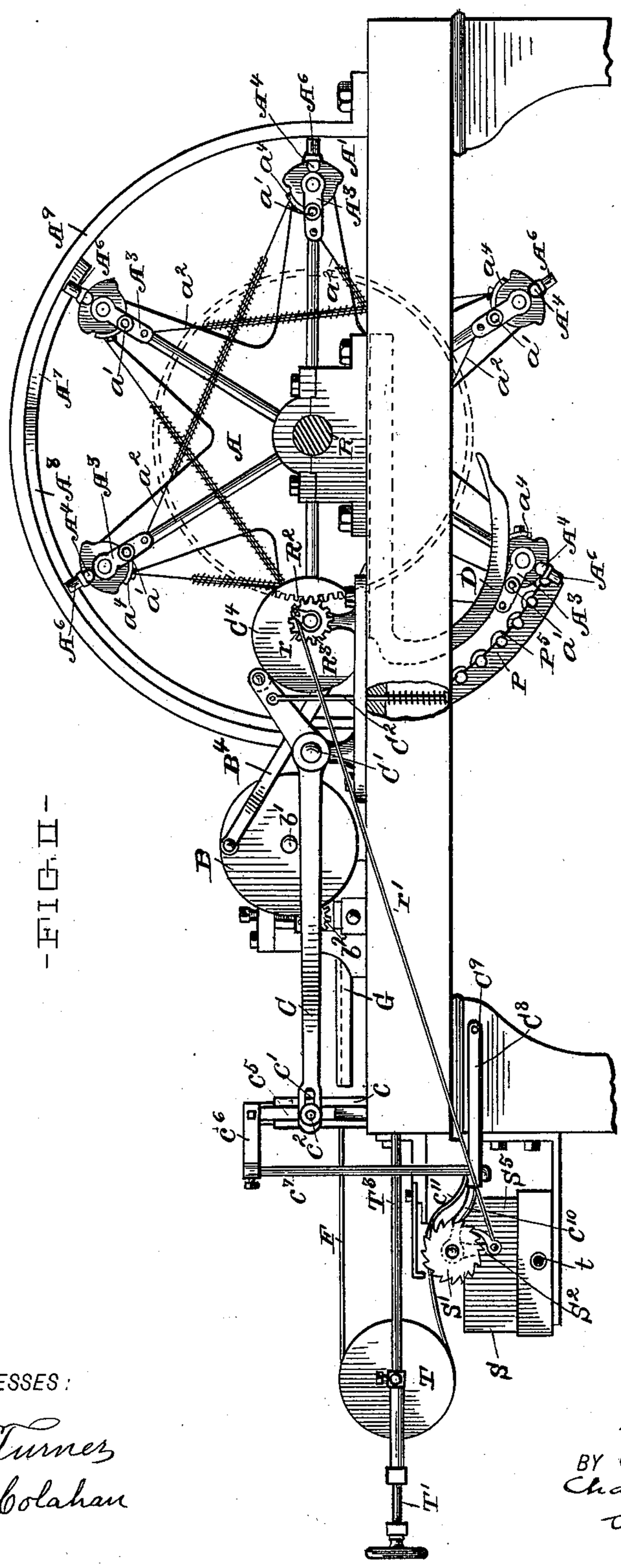

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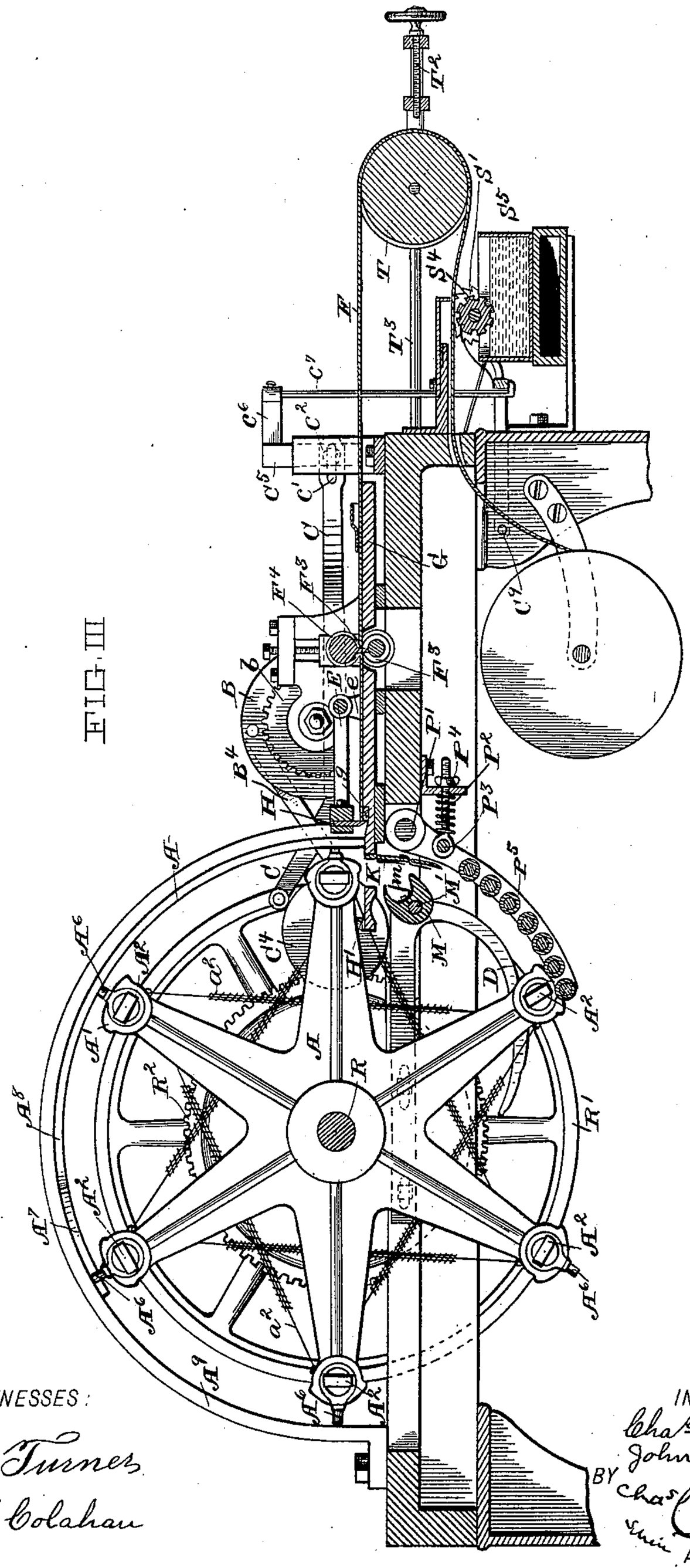
FIG. III



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(No Model.) 5 Sheets—Sheet 4.

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FIG. VIIa

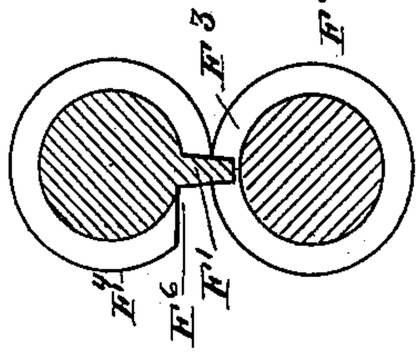


FIG. VII

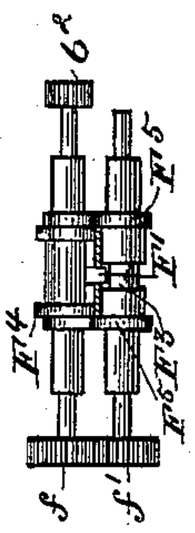


FIG. X

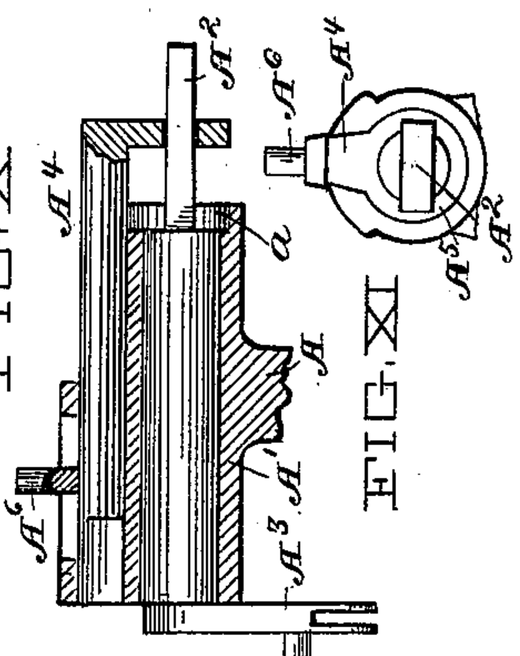


FIG. XI

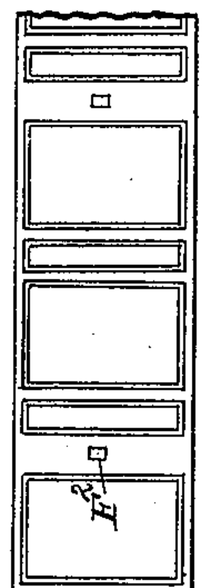


FIG. XIX

FIG. VI

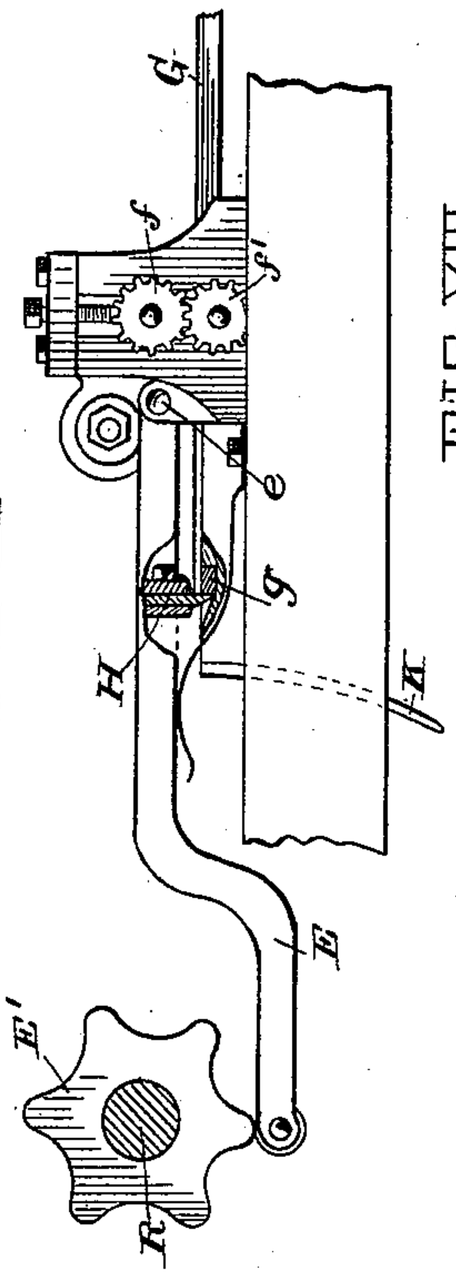


FIG. VIII

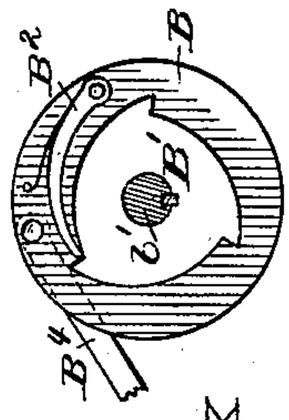


FIG. IX

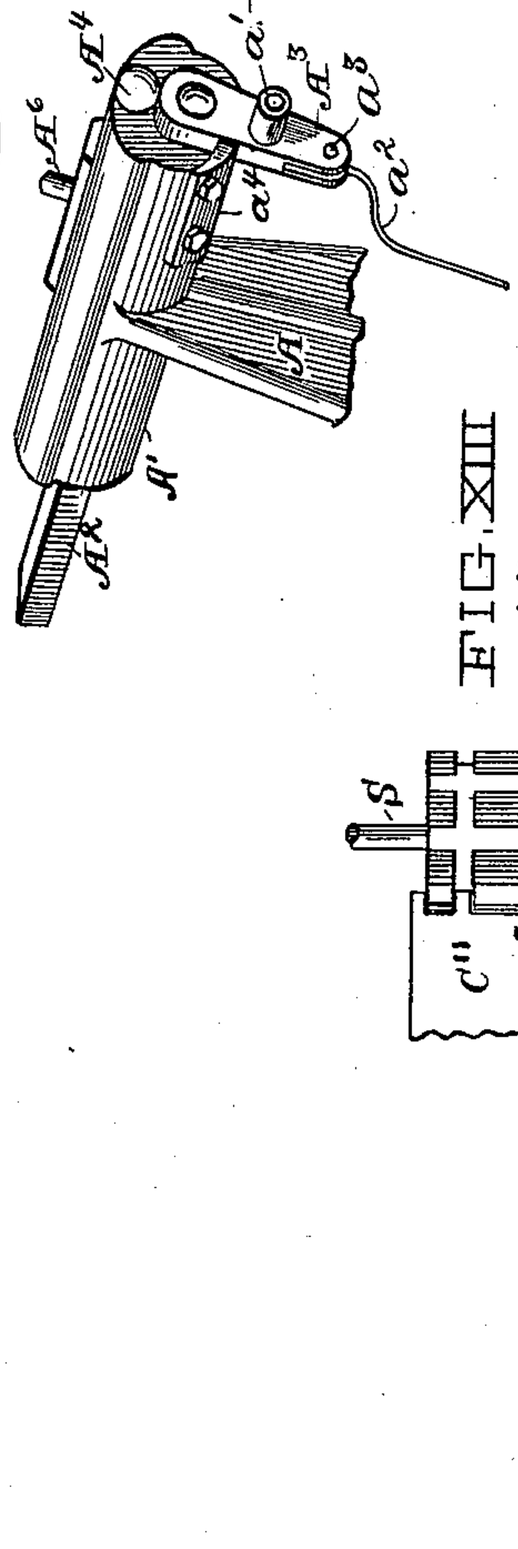


FIG. XIII

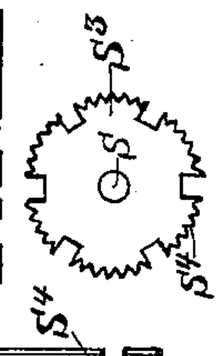


FIG. XII

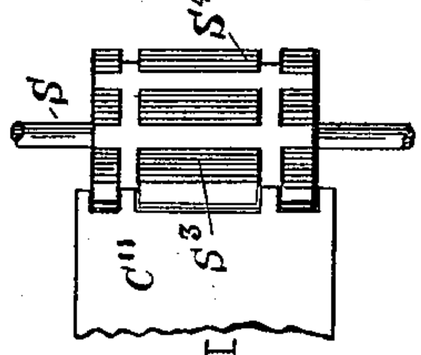


FIG. IV

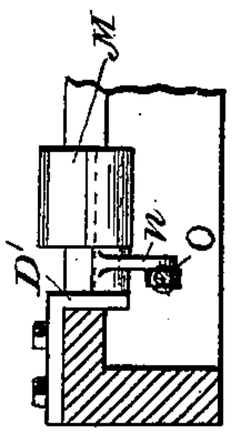
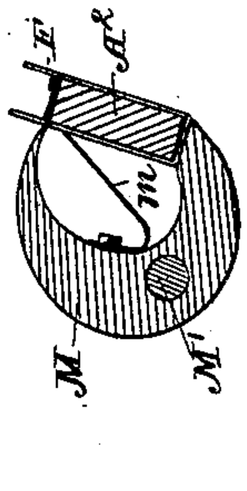


FIG. V



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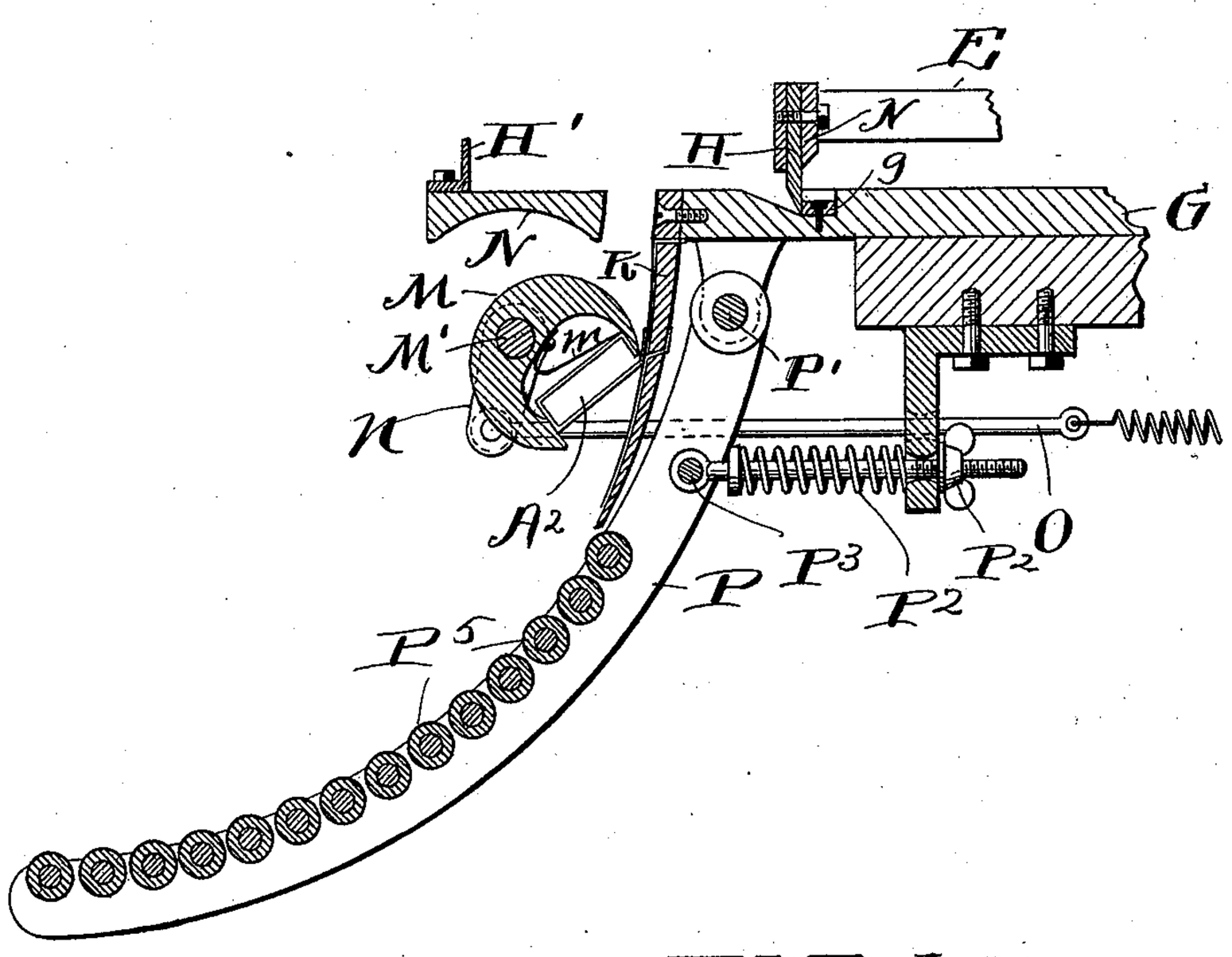

FIG. V^a

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UNITED STATES PATENT OFFICE.

CHARLES HENRY PALMER AND JOHN WILLIAM DENMEAD, OF AKRON, OHIO.

PAPER-BOX-MAKING MACHINE.

SPECIFICATION forming part of Letters Patent No. 602,140, dated April 12, 1898.

Application filed April 19, 1897. Serial No. 632,791. (No model.)

To all whom it may concern:

Be it known that we, CHARLES HENRY PALMER and JOHN WILLIAM DENMEAD, citizens of the United States, residing at Akron, in the county of Summit and State of Ohio, have invented certain new and useful Improvements in Paper-Box-Making Machines; and we do hereby declare the following to be a description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings.

Our invention relates to that class of paper-box-making machinery in which a box or sheath open at one or both ends is made from a continuously-fed strip or ribbon of paper.

In our invention the box is formed by a series of vertically-rotating arms provided with laterally-projecting intermittently rotating and vibrating dies or formers journaled therein. These dies press from the continuous strip of paper a piece that is severed in cooperation with the die-pressure thereon, which piece is partially formed as it is forced by the die through an aperture in the table into a fixed oscillating die former or folder. This die vibrates on its pivot to fold one inner edge of the box over the die journaled in the rotating arm, which die then revolves against a spring secured beneath the aperture in the table to fold over the other part that is glued of the same edge of the box. The die, with the folded box thereon, then presses against a series of rollers secured to a curved spring-pressure arm that is elastically held in position concentric with the onward movement of the die. The die is caused to revolve by means of its crank, friction-roller, and cam-track, the paper having had the glue placed thereon at intervals to secure the adhesion of the parts so folded. As the arms are rotated successively the completed box or sheath is pushed off therefrom by a sliding discharge-ring encircling the die and actuated by a cam-track, and the arms continue in their rotation, carrying the strip of paper to be folded over the dies again down through the aperture in the table, that is made with rigid walls to aid in the successive formation of boxes. The paper is perforated at proper intervals that it may be intermittently regulated as it is fed continuously forward to the knife by properly geared or actuated feed-rolls, the upper one of which is provided with a projecting feed-regulating tooth that enters the perforation in the strip moving within a circular aperture F^3 in the lower presser-roller, over which the paper passes between the flanges of two rolls that hold it firmly in place as it is presented to the knife that severs therefrom the portion from which the box is made, as hereinafter described. The glue is applied by means of a fluted roller revolving in a tank of hot glue and provided with intermittent raised surfaces that are alternately brought in contact with the paper at regular intervals to apply the glue at the proper place. An adjustable guide-roll receives the paper from the glue-roll, over which it passes as it enters the machine. This adjustable guide-roll is caused to increase or decrease the distance of travel of the material after the glue has been applied to assist its partial drying or hardening to render its adhesive quality certain.

In the drawings, Figure 1 represents a plan view of our machine. Fig. 2 is a side elevation taken from the right-hand side of the machine. Fig. 3 is a side elevation on the opposite side, partly in section. Fig. 4 is a side view of the oscillating die or former; Fig. 5, a sectional view of the same. Fig. 5^a is a detail sectional view of the table with its aperture and the pressure and folding devices. Fig. 6 shows the knife-lever and its actuating star-wheel. Fig. 7 shows the feed-rolls in elevation. Fig. 7^a is a sectional view of feed-rolls. Fig. 8 is a detail view of their intermittent actuating mechanism. Fig. 9 is a view in perspective showing a section of the rotating arm and the die journaled therein, the vibrating crank secured on the end of the same, its adjustable stop secured on the rotating arm, and the spring-rod and friction-roller, that imparts the vibrating action to the die. Fig. 10 is a sectional view of the same, also showing the box-discharging ring and its actuating arm and pin that pushes the box from the die when completed; Fig. 11, an end view of the same; Fig. 12, a plan view of the

fluted gluing-roll and its scraping spring-cleaner. Fig. 13 is an end view of the gluing-roll; Fig. 14, a plan view of a piece of the paper strip or material from which the box is formed, showing the figured surface and the controlling-aperture that regulates its feeding into the box-making machine.

In the drawings a main driving-shaft R, actuated by a belt-pulley R′, causes a gear-wheel R^2 to revolve and impart motion to the pinion R^3 on a parallel shaft R^4, having keyed thereon a cam-wheel C^4, that carries a crank-pin that actuates a pitman B^4, the other end of which is secured by a crank-pin to a pawl-bearing plate B, which is loosely journaled on its shaft b' and provided with a pawl B^2 by the side of the ratcheted plate B′, that is keyed thereon and imparts an intermittent movement to the gear-wheel. The pawl and ratchet may be disconnected by raising the pawl and the gear of the feed-rollers rotated forward or back to secure their adjustment in connection with the feed-tooth F′ of the feed-roll and the perforated figured box-making strip F. This gear-wheel b imparts an intermittent motion to the feed-roll pinion b^2, that actuates the gear-wheels $f f'$ of the feed-rollers and causes the paper or material F, from which the box is to be formed, to be fed forward. The upper feed-roll carries flanges F^4, that press upon the paper strip, and the feed-flanges F^5 upon the lower feed-roll serve as guides for the edges of the paper strip, and at one part the upper flange F^4 is cut away, as at F^6, to free the pressure of the flanges of the roller as it revolves, affording a free movement forward of the strip by the feed-regulating tooth F′, that enters the aperture F^2 in the paper. This regulation is important to regulate and control the paper to be cut in proper relation to the position of its figured surface. The knife H is attached to the plate N, that is secured to the knife-arm E, which is pivoted at its rear end at e above the horizontal plane of the table and provided with a knife near the center of the pivoted arm, which arm is extended to a point below the table and is actuated by the star-wheel E′ upon the main shaft to press down upon the knife-arm below the plane of the table, and thus secure a right-angle cut upon the strip of paper from which the box is to be formed. The pivoted rotating die A^2, journaled in the arm A, presses the box-blank down through the aperture in the table, the fixed walls of the aperture forming the lower edge and two sides, (see Fig. 5^a,) and thus the partially-formed box is brought in contact with the lower jaw of the fixed oscillating die or former M and its spring-pressure plate m, secured therein. This oscillating die or former M is pivoted at M′ beneath the aperture in the table and held to its normal position by means of its crank-arm n, secured to its pivot-journal and its spring O. The edge of the die A^2, over which the first fold is made, has its plane slightly below the edge on the opposite side. This die or former M will be oscillated and close the inner edge of the box over the upper edge of the rotating vibrating die A^2.

The arm K is secured to the side of the aperture in the table and provided with spring-pressure plates against which one side of the die presses to fold that side of the box, as shown in Fig. 5^a.

Arm P is pivoted at one side of arm K beneath the table and is provided with friction-rollers and a spring-pressure rod P^2 and thumb-set-screw nut p^4 to regulate its pressure under the stress of the dies A^2 of the rotating arms that are caused to revolve by means of their crank-arms A^3 and friction-roller a' being brought in contact with the cam-track D. A spring-rod a^2, pivoted at a^3 to said crank-arm, will pull the same to its normal position as it continues its forward travel by the rotation of arm A and passes over cam-track D.

The oscillating former M has a crank-arm n, to which is secured a holding spring-rod O, that causes it to return to its normal position after it is released from the pressure of the rotating die A^2.

The spring-rod a^2, pivoted to the crank-arm at a^3, will cause the die A^2 to return to its normal position, and when the arm is rotating to its upper point the discharging-arm A^4, with ring A^5, is actuated by its pin A^6, which is brought in contact with the cam-track A^7 and caused to push the box from the die, when the cam-track A^8, which tracks are secured to the arched bar A^9, will force the discharging-arm back, so that its ring will be within the groove a and the die left free to form another box as it is continued in its rotation.

The device for placing the glue upon the material as it enters the machine consists of a revolving glue-roller S^3, provided with alternate fluted flat surfaces S^4 and a scraper C^{11}. This glue-roller is journaled on a shaft S, that is provided at its outer end with a ratchet-wheel S′, secured thereon, and a loosely-supported pawl and crank-arm S^2, provided with a pawl that is moved by the rod r', that is actuated by the crank r, secured on the side of the pinion R^3. This mechanism admits the adjustment of the pawl and ratchet to regulate the position of the roller in its relation to its actuating-rod and imparts to the gluing-roller an intermittent rotary movement to place the glue as it is hot at regular intervals upon the corrugated surfaces of the gluing-roller, that has a vertical movement imparted to it to apply the glue to the material of which the box is to be formed.

The glue-roller shaft is journaled upon the arms C^{10}, that are secured within a vertically-vibrating frame C^8, that is pivoted on each side of the machine at C^9 C^9. This frame has

an intermittent vertical movement imparted to it by means of a vertical rod C^7, that is secured to the arm C^6, that is secured to its supporting actuating-arm C^5, that slides in its guiding-standard *c*, secured to the table. This arm is actuated by means of a pivoted lever C, provided with a slotted end *c'* and a securing-pin c^2. This lever vibrates upon its axle C', as its other end is caused to rise by the cam-wheel C^4, revolving against a friction-roller against the strain of a returning spring-rod C^2. The vibration of this pivoted lever C imparts an intermittent vertical movement to the rod C^7, that hooks beneath the vibrating frame C^8 and imparts an intermittent vertical movement to the glue-roller, causing it to be raised and brought in contact with the strip of box material and apply the glue at the desired point.

The guiding-roll T, secured to its adjustable frame, slides upon its supporting-bars T', and by means of its adjusting-screw T^2 in the outer bar T^3 the guiding-roll may be moved to or from the gluing-roll to any distance required to permit the hardening or setting of the glue on the material as it passes to the machine.

t is the steam-pipe for keeping the glue in the reservoir S^5 in proper condition by heat conveyed to its steam-chamber beneath the glue.

In the continuous operation of the machine the printed and perforated strip (shown in Fig. 14) is fed forward into the machine, passing over the gluing-roller to receive the glue on its under side and over the guiding-roll, which reverses its direction and brings the glue on the upper side. The strip then passes under the spring-pressure fingers *h* to the feed-rolls between the strip-guiding flanges F^5, so that the intermittently-feed-regulating tooth F' enters the aperture F^2 in the material as it is fed into the machine by the pressure of the feeding-flanges F^5 upon the strip as it passes over the lower roller. The strip moves forward beneath the knife and over the die-aperture in the table to the stop H', when the knife is caused to descend and cut off the piece from which the box is to be formed, at which moment one of the arms conveying the rotating die A^2 presses the same downwardly through the aperture in the table against the spring-pressure plate K, secured beneath the aperture in the table, and folds the box-blank over three sides of the die. The die moves into contact with the lower projecting jaw of the oscillating folding-die M and its spring-pressure plate *m*, and the continued forward movement of the rotating arm and its die will cause the oscillating die to vibrate on its pivot, and its upper jaw will fold one projecting side flap of the box over the die journaled in the rotating arm as it revolves. As it continues its movement over the series of rollers on the spring-pressed arm the box is caused to assume an inverted position as its die is reversed by means of its crank-arm A^3, that comes in contact with the cam-track D, secured to the frame, and thus the other projecting side flap of the box is folded over, and the glue which has been applied on this side causes the adhesion of the parts thus folded. As the crank-arm passes off of the track the spring-rod a^2, pivoted to the crank a^3 and secured beneath the second following arm, will pull on the crank, causing it to revolve and restore the die to its normal position. The adjustable stop a^4 is to limit the movement of the crank and maintain it in position as it travels over the cam-track D. As the vertically-rotating arm A revolves with its die, bearing the completed box, the cam-track A^7 will contact with the pin A^6 and move its discharging-arm A^4 with its ring A^5 and cause the discharge of the box from the die into a suitable receptacle provided for this purpose, but not shown in the drawings, and as the rotating arm moves on the box-discharging device is retracted to its normal position by means of the cam-track A^8 and the arm continues to revolve in its successive operation.

The material or strip of paper from which the boxes are formed may be of any proper kind applicable therefor, whether it is perforated or not or whether there are one or more perforations, so far as the operation of the box-forming dies is concerned; but our invention is more particularly designed to form boxes from material the surface of which is figured or printed in any design or color which is calculated to appear in uniform proper position as may be desired on the outside of the box, which we accomplish by means of the perforation in the paper for the purpose of controlling and regulating its feed and placement in the process of cutting and forming the box, substantially as shown and described.

It is well known that a very slight variation in the feed or moving forward of the strip is liable to cause considerable displacement of the figured surface thereon in a series of operations, and we find it necessary to maintain the proper place of each individual printed or figured piece of paper from which the box is formed in order to secure the uniform locality of the colors or designs upon the completed box.

The adjustment of the device that applies the glue is important to enable the placement of the glue at the proper relative point in connection with the printing and folding devices.

In our machine we contemplate the use of interchangeable dies for making different sizes and shapes of boxes.

Having thus described our invention, what we claim, and desire to secure by Letters Patent, is—

1. In a box-making machine that forms the box from a printed or figured strip of paper, a table provided with an aperture having rigid walls that form two sides of the box, the vertically-rotating arms A, the horizontally-revolving box-forming dies journaled therein, the folding oscillating die for folding one edge of the box over the die journaled in the rotating arm as it moves downward, combined with the stationary cam-track and the crank-arms of the die journaled in the rotating arm, to secure the proper action of the dies to fold the other glued part of the box over against the pressure-spring located beneath the table, and said pressure-spring, substantially as shown and described.

2. In a box-making machine, the vertically-rotating arms and their box-forming dies in combination with the oscillating folding-die and its spring-pressure plate that folds over one edge of the box, and the spring-pressure arm, substantially as shown and described.

3. In a box-making machine the vertically-rotating arms and revolving dies, actuated by their crank-arms, the cam-track, the oscillating folding-die and spring-pressure arm, to form the box, combined with the box-discharging arm and its cam-track that removes the completed box from the dies of the revolving arm in its continuous rotation substantially as shown and described.

4. In a box-making machine the combination of the vertically-rotating arms and revolving die, the fixed oscillating folding-die M and its spring-pressure plate *m* that is caused to oscillate on its pivot M′ and fold over the top edge of the box on the rotating die as it is brought in contact therewith, and its spring O and crank *n* that cause it to rock back to its normal position substantially as shown and described.

5. In a box-making machine the intermittent feed-rollers and their pressure flanges or surface provided with an intermittent releasing-notch, one of said rollers being provided with a feed-regulating tooth to admit the free movement of the paper, whereby the paper is fed forward by the feed-regulating tooth independent of the feeding-flanges substantially as shown and described.

6. In a paper-box-making machine the pawl-bearing plate B loosely journaled on its shaft *b*′, the ratchet-plate B′ keyed to said shaft, the geared wheel *b*, the pinion b^2, the feed-roll shaft and its adjusting-tooth F′ and the knife, whereby the material may be regulated and properly timed in feeding a printed and perforated strip of paper to the cutting-knife substantially as shown and described.

7. In a box-making machine for making a box from a continuous printed or figured paper strip provided with regulating feed apertures or notches at regular intervals, the combination of the feed-rollers, the feed-regulating tooth carried by one of the rollers operating to intermittently adjust the forward movement of the paper to secure the proper placement of the figure thereon in relation to the box-forming dies, as the paper is fed forward in an intermittent movement in the formation of boxes, substantially as shown and described.

8. In a box-making machine the mechanism for feeding the printed strip having the aperture F^2 for regulating its feed, comprising the rollers having the feed-tooth F′ and the notched flanges to admit a free movement and adjustment of the printed strip forward in combination with the knife H operating substantially as shown and described.

9. In a box-making machine the vertically-moving frame, the intermittently-revolving glue-roller S^3 supported and journaled thereon, the glue-tank in which the roller revolves and provided with its fluted gluing-surface S^4, means for intermittently raising the frame vertically to cause the surface S^4 to place the glue upon the strip of paper that passes over it, substantially as shown and described.

10. In a box-making machine the glue-roller S^3, its intermittent fluted or corrugated gluing-surfaces S^4 said roller being journaled within the vertically-vibrating frame C^8, the glue-tank, means for intermittently rotating the roller in the tank, and means for vibrating the frame for applying the glue at certain intervals to the paper as it passes over it, substantially as shown and described.

11. The glue-roller shaft S, its ratchet-wheel S′ secured thereto, its pawl and crank-arm S^2 loosely journaled thereon, its rod *r*′, actuated by the pivot-pin *r* secured to the continuously-rotating pinion R^3, secured to the shaft R^4, combined with cam-wheel C^4 that causes the lever C to vibrate on its axle C′ and impart a vertical vibratory movement to the glue-roller-supporting frame, substantially as shown and described.

12. The glue-roller-supporting arms C^8, their vertically-vibrating rod C^7, the vibrating lever C and its cam-wheel C^4, connections intermediate the rod c^7 and the lever C, whereby an intermittent vertical action is imparted to the gluing-roll substantially as shown and described.

13. In a box-making machine the combination of the vibrating lever E that is pivoted at *e* and provided with the knife H secured to the center of the pivoted arm which is extended to a point below the table, the main actuating-shaft R and the star-wheel E′ arranged to press down upon the arm E below the plane of the table and thus secure a right-angle cut upon the strip of paper from which the box is to be formed substantially as shown and described.

14. In a box-making machine that forms the box from a continuous strip of paper, hav-

ing the printed or figured surface thereon, and provided with adjusting apertures or notches therein, the intermittent rotating and vertically-vibrating glue-roll, the guiding-roll T, the feed-rolls and their guiding-flanges F^5, the feeding pressure-flanges F^4, the adjusting-notch F^6, and feed-regulating tooth F', the spring holding-fingers *h*, *h*, the knife H, and the stop H', in combination with the rotating box-forming dies, substantially as shown and described.

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

CHARLES HENRY PALMER.
JOHN WILLIAM DENMEAD.

Witnesses as to Chas. H. Palmer:
WM. PIERCE,
S. MCCREADY.
Witnesses as to John W. Denmead:
M. H. COLAHAN,
CHARLES COLAHAN.