(No Model.) 7 Sheets—Sheet 1.

W. WOMERSLEY, G. SAGUE & M. A. CLAPP.

PAPER FEEDING MACHINE.

No. 516,325. Patented Mar. 13, 1894.

Fig. 1.

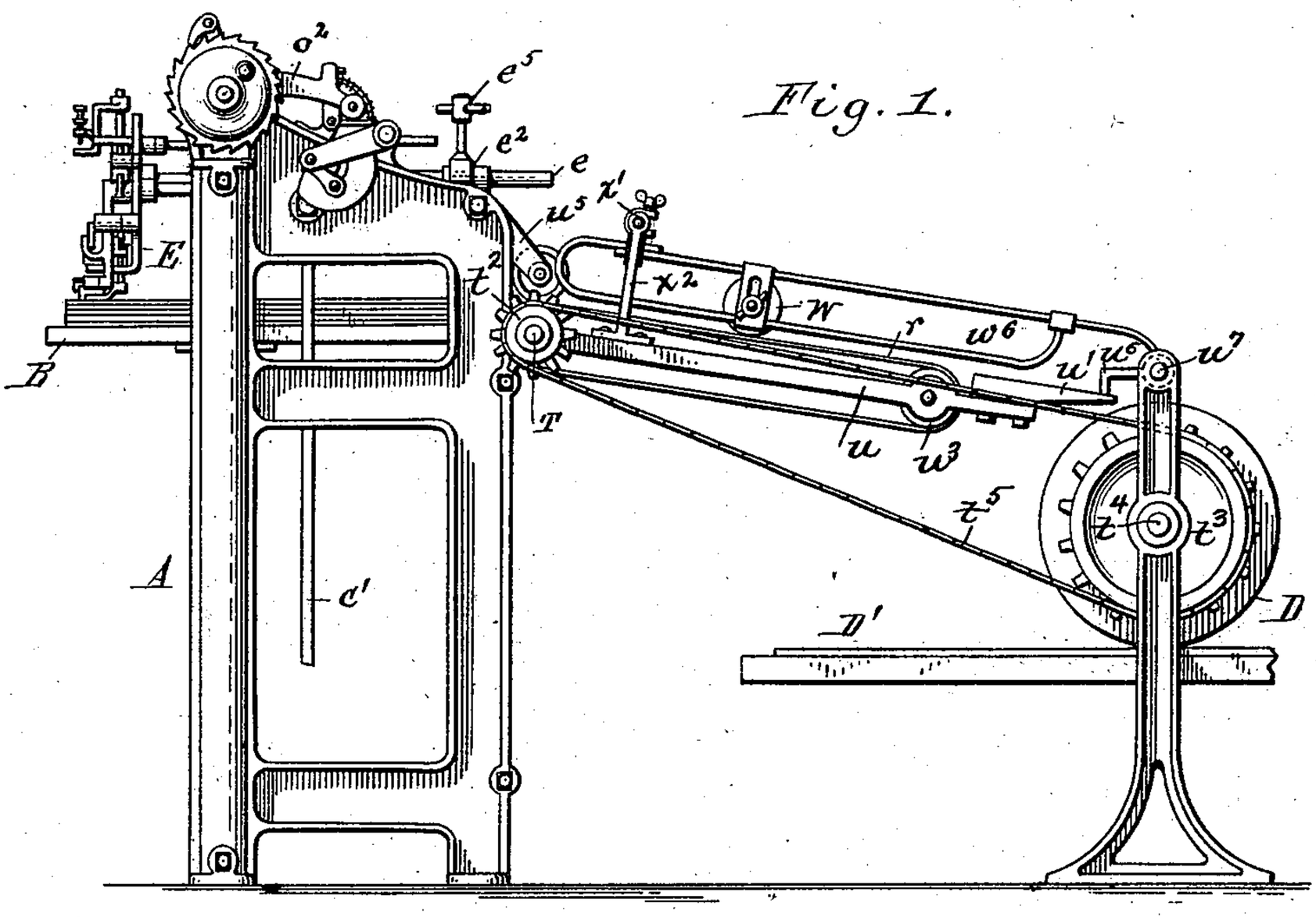
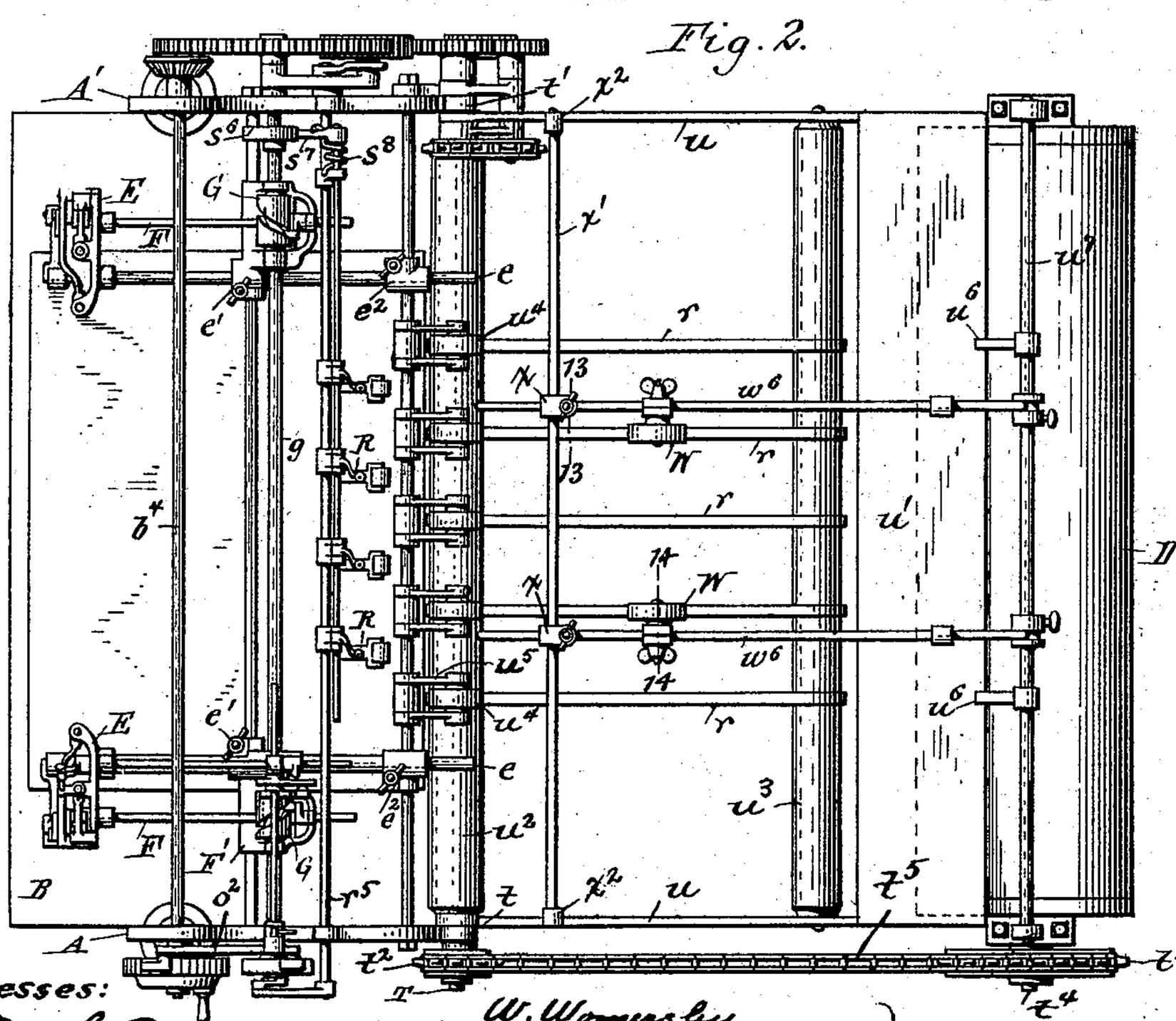


Fig. 2.



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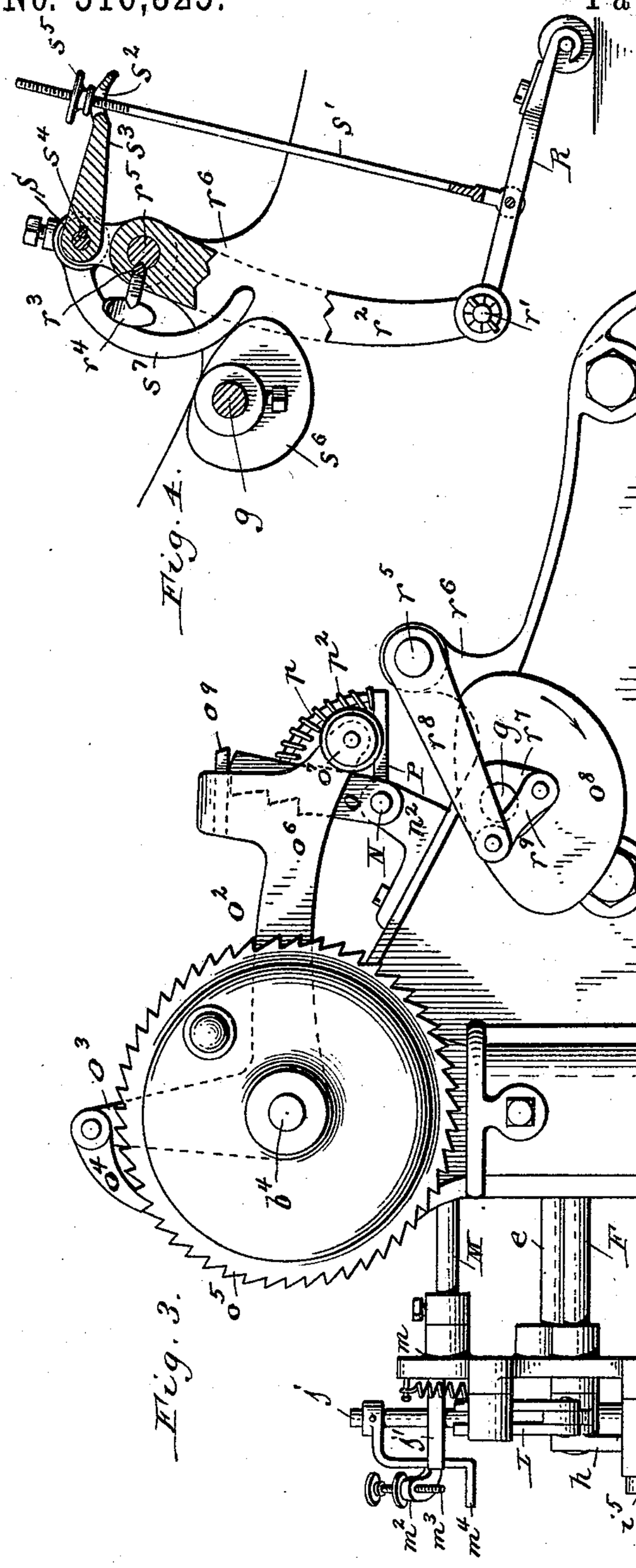

Fig. 4.

Fig. 3.

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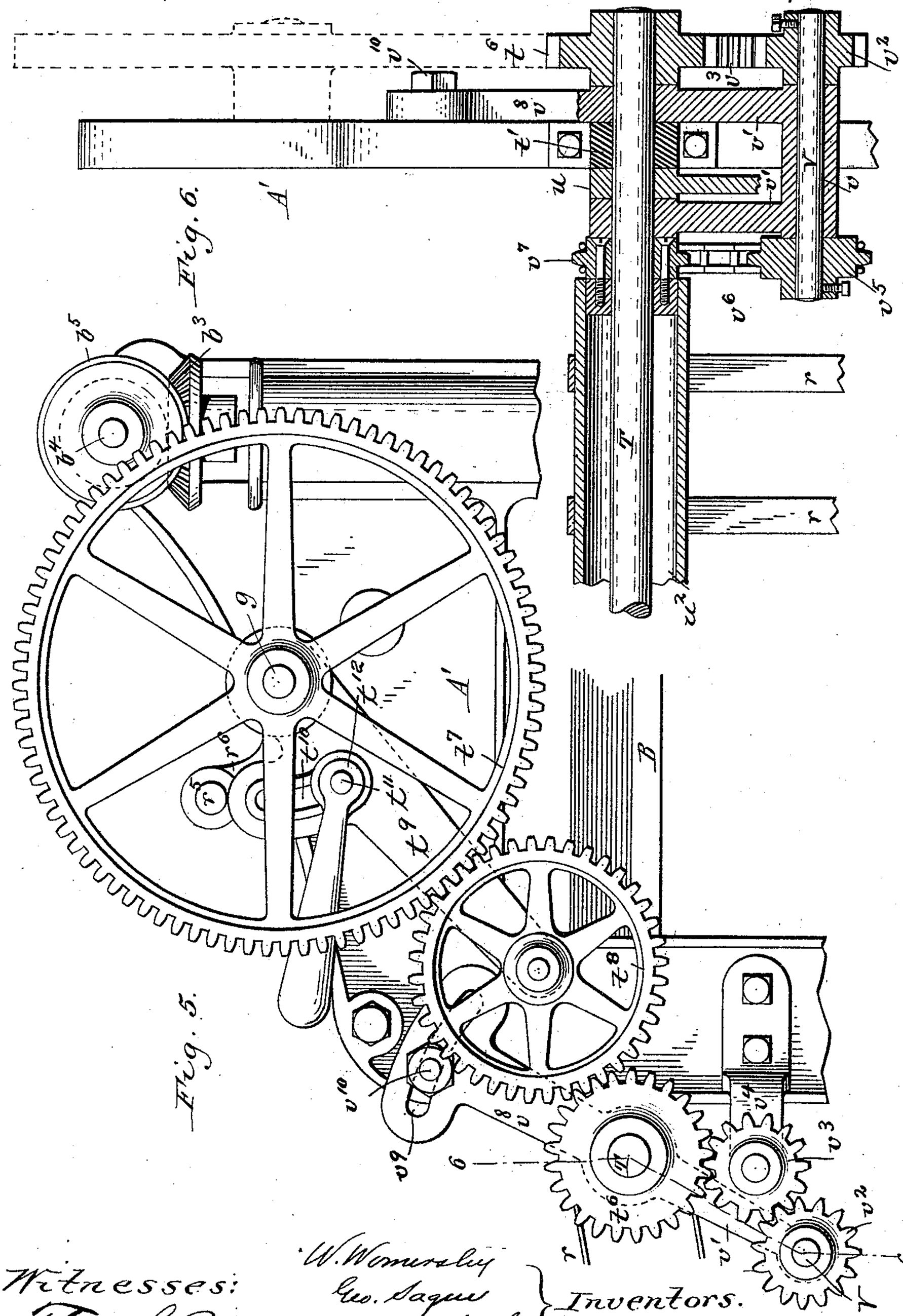

Fig. 6.

Fig. 5.

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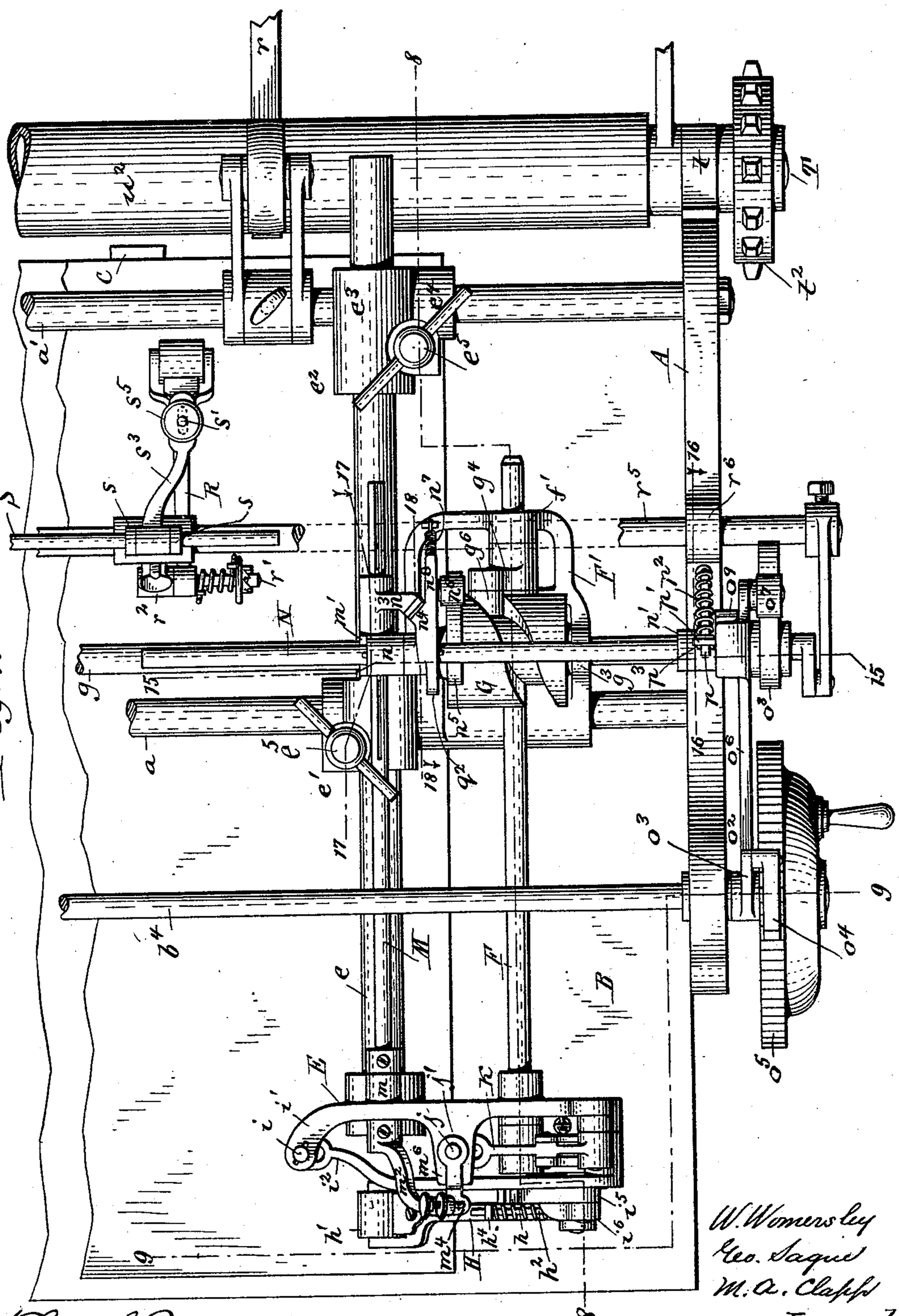
Fig. 7.



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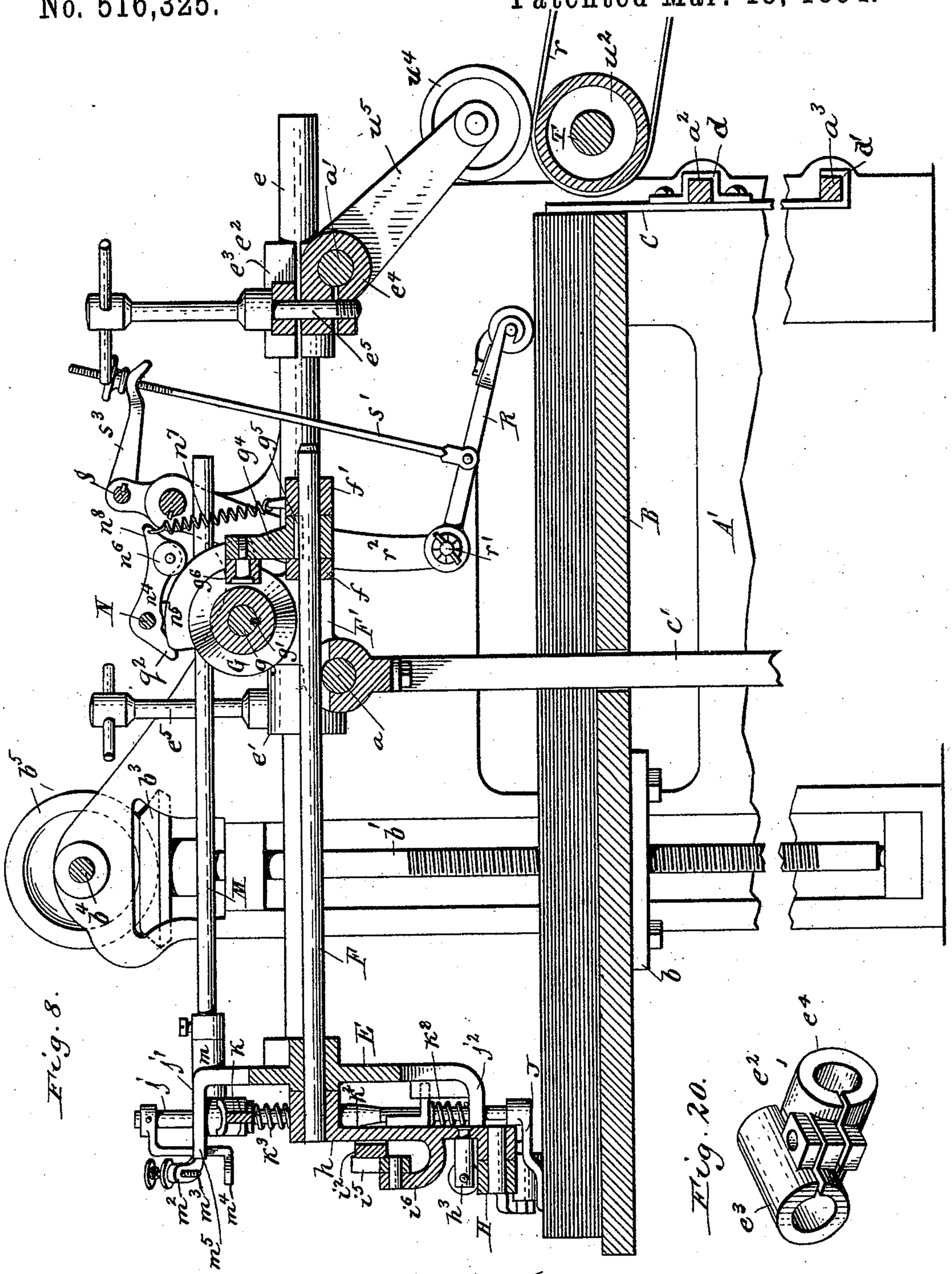

Fig. 8.

Fig. 20.

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Fig. 9.

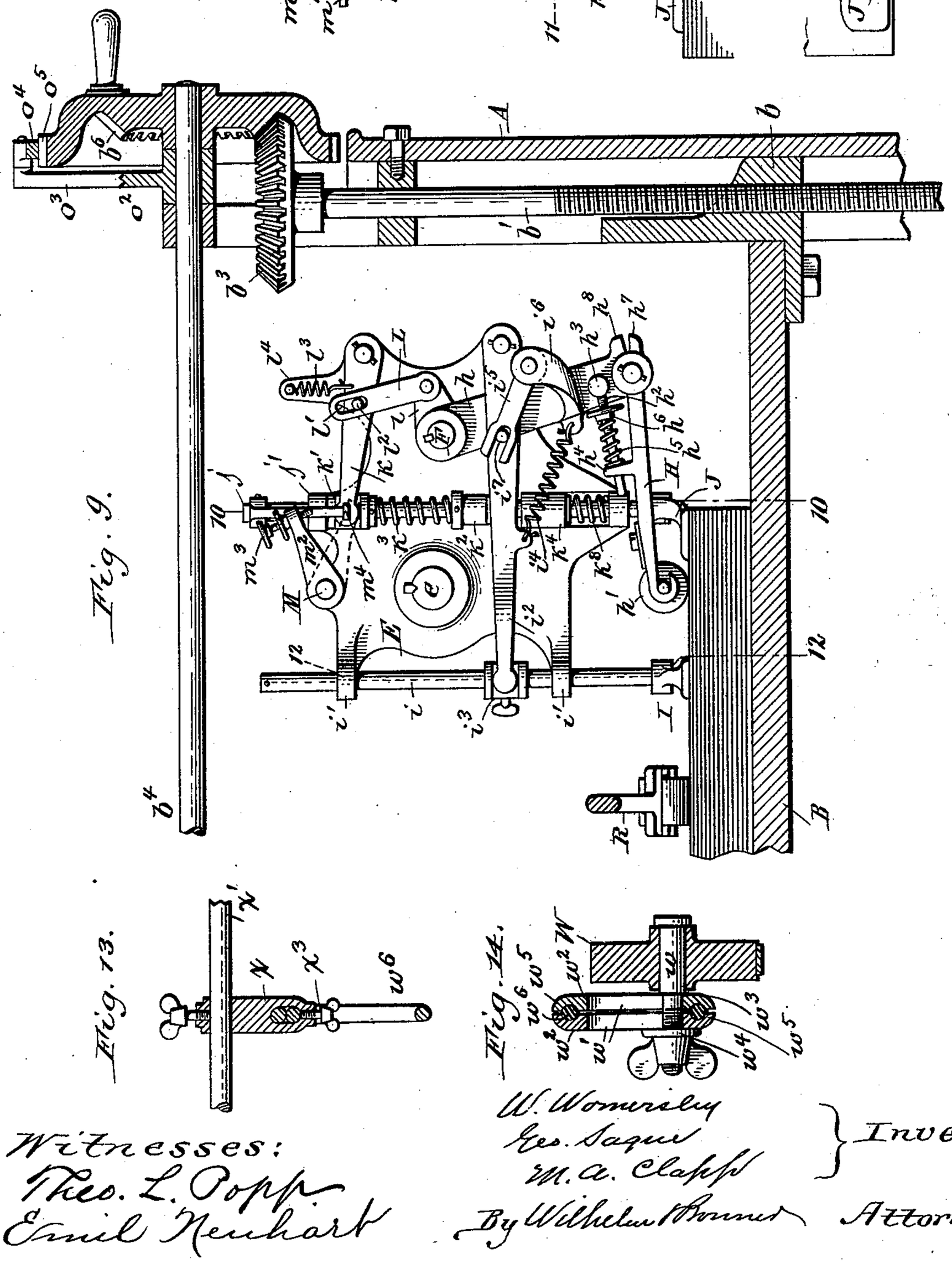

Fig. 10.

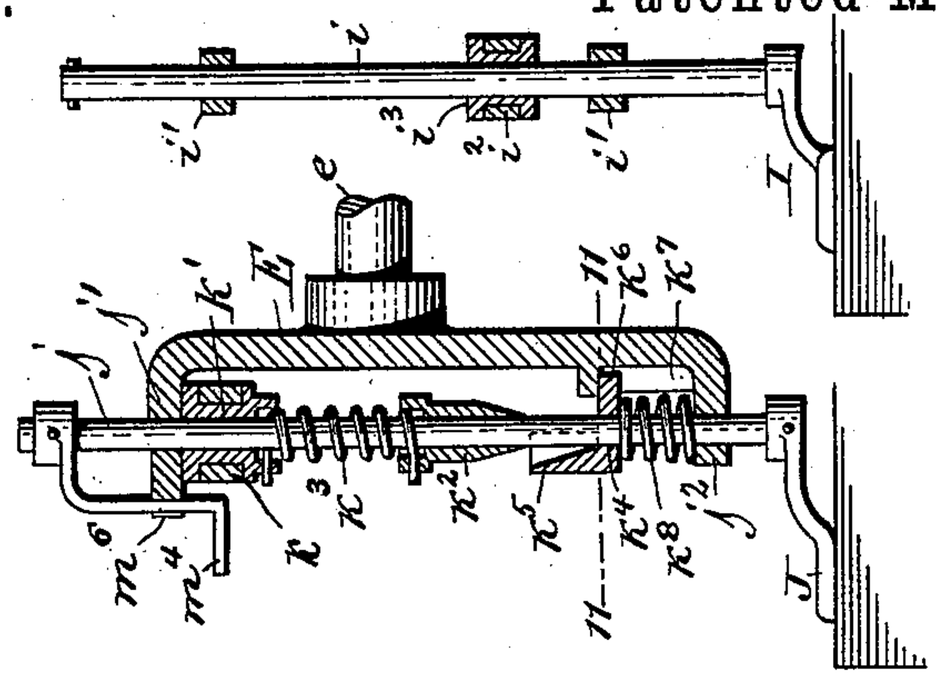

Fig. 11.

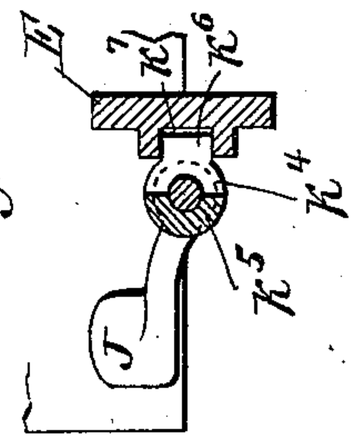

Fig. 13.

Fig. 14.

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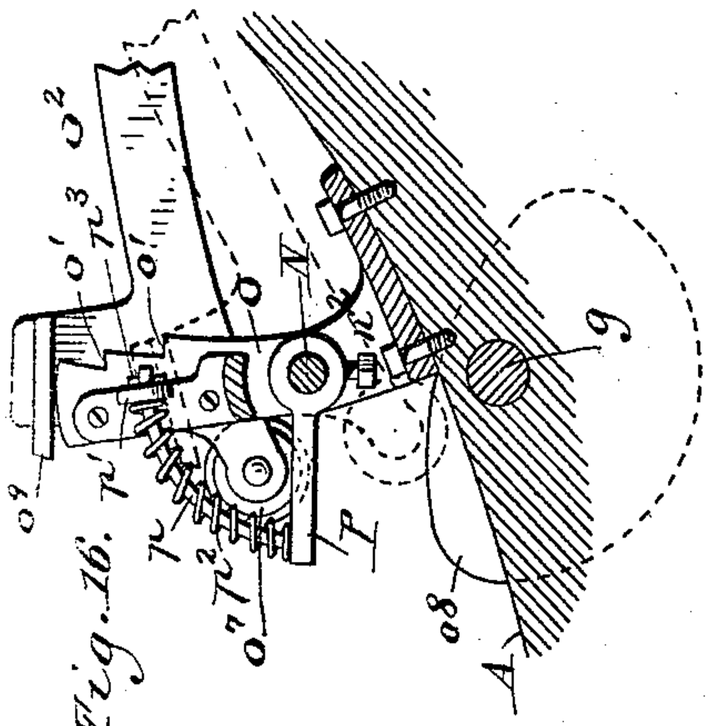

Fig. 16.

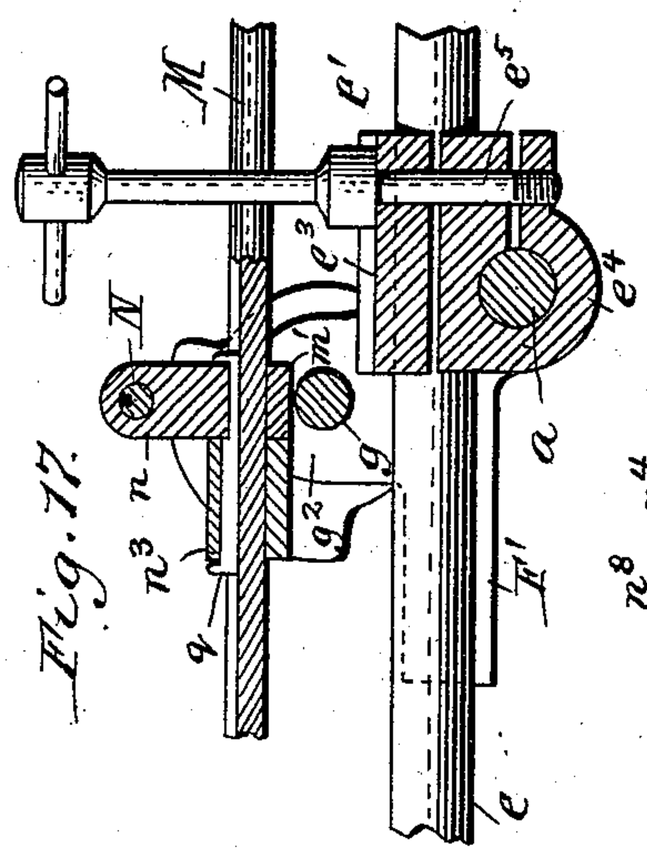

Fig. 17.

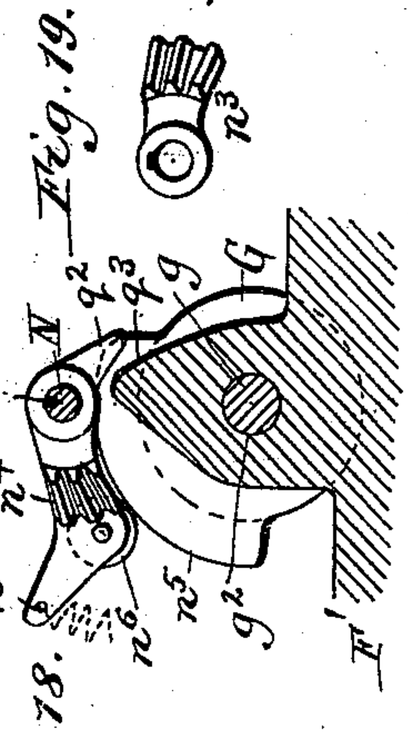

Fig. 19.

Fig. 18.

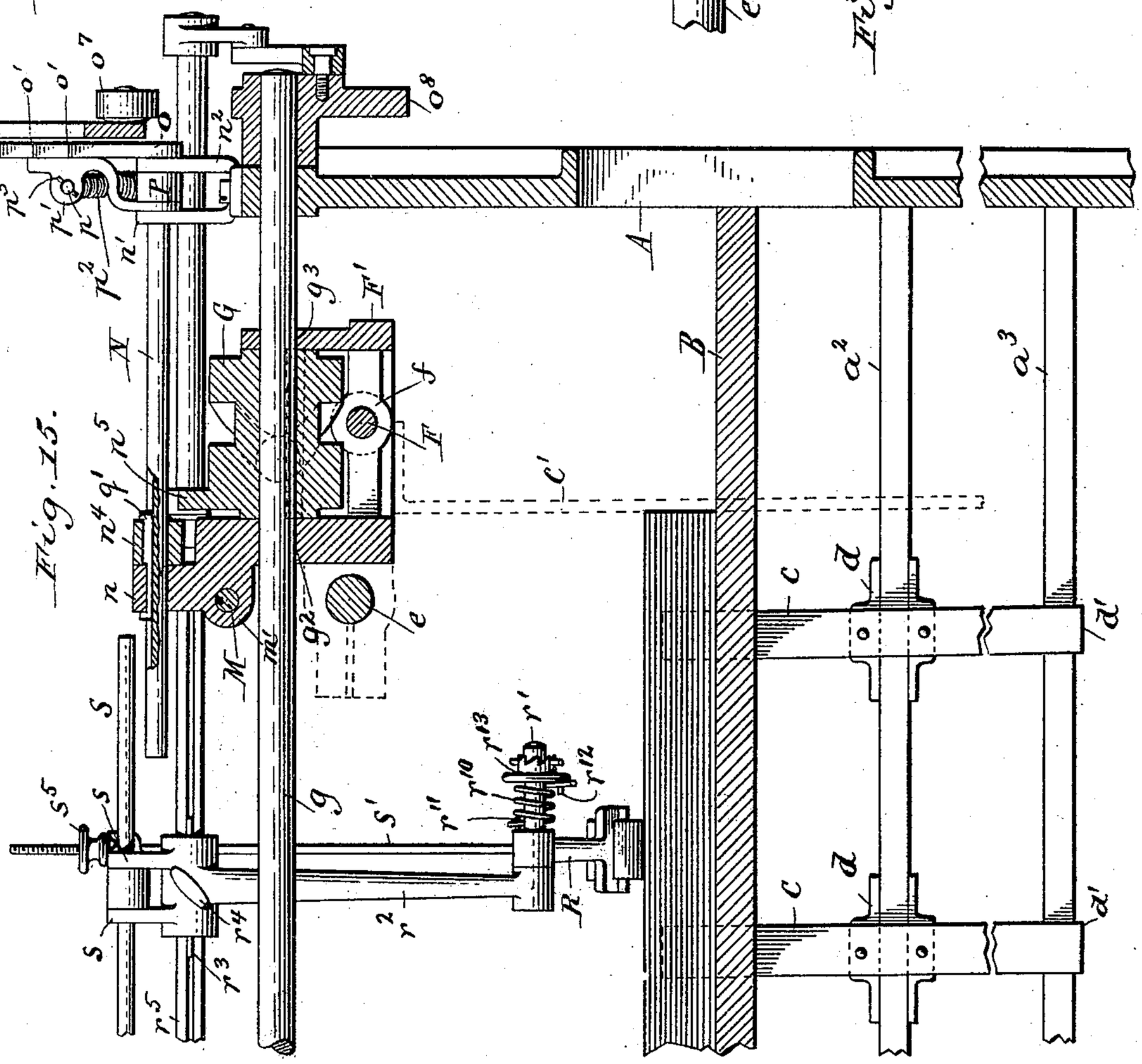

Fig. 15.

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UNITED STATES PATENT OFFICE.

WILLIAM WOMERSLEY, GEORGE SAGUE, AND MORTIMER A. CLAPP, OF POUGHKEEPSIE, ASSIGNORS TO D. H. BURRELL & CO., OF LITTLE FALLS, NEW YORK.

PAPER-FEEDING MACHINE.

SPECIFICATION forming part of Letters Patent No. 516,325, dated March 13, 1894.

Application filed December 12, 1892. Serial No. 454,904. (No model.)

To all whom it may concern:

Be it known that we, WILLIAM WOMERSLEY, GEORGE SAGUE, and MORTIMER A. CLAPP, citizens of the United States, residing at Poughkeepsie, in the county of Dutchess and State of New York, have invented new and useful Improvements in Paper-Feeding Machines, of which the following is specification.

This invention relates to paper feeding machines which feed sheets of paper successively from a pile to a printing press, ruling, folding, calendering or other machines in which sheet paper is operated upon.

The objects of this invention are to render the machine suitable for use in connection with a printing press when the space is extremely limited; to improve the buckling mechanism by which the top sheet is loosened and the mechanism by which the feed table is raised automatically, in such manner that the pile of paper is not crowded out of its normal position by the action of these devices and to improve the machine in various details of construction.

In the accompanying drawings consisting of seven sheets:—Figure 1 is a side elevation of our improved paper feeder attached to a printing press. Fig. 2 is a top plan view thereof. Both of these figures are drawn to a reduced scale. Fig. 3 is a fragmentary side elevation of the upper portion of the paper feeder, viewed from that end of the machine on which the mechanism is arranged which raises the feed table. Fig. 4 is a sectional elevation of one of the feeding fingers and connecting parts. Fig. 5 is a side elevation of the paper feeder viewed from the driving side of the machine. Fig. 6 is a vertical transverse section in line 6—6, Fig. 5. Fig. 7 is a fragmentary top plan view of the paper feeder showing that side of the machine on which the mechanism is arranged by which the feed table is raised. Fig. 8 is a longitudinal sectional elevation in line 8—8 Fig. 7. Fig. 9 is a vertical transverse section in line 9—9 Fig. 7. Fig. 10 is a sectional elevation of the holding down finger and connecting parts, the section being taken in line 10—10—Fig. 9. Fig. 11 is a horizontal section in line 11—11 Fig. 10. Fig. 12 is a sectional elevation of the gage foot taken in line 12—12— Fig. 9. Fig. 13 is a vertical transverse section, on an enlarged scale, of one of the hangers by which the frame of the pressure roller is supported, the section being taken in line 13—13— Fig. 2. Fig. 14 is a vertical transverse section, on an enlarged scale, of one of the pressure rollers and supporting bars, the section being taken in line 14—14— Fig. 2. Fig. 15 is a vertical transverse section in line 15—15— Fig. 7. Figs. 16, 17 and 18 are fragmentary longitudinal sections in lines 16—16, 17—17—, and 18—18, Fig. 7 respectively. Fig. 19 is a face view of one of the segmental gears whereby motion is transmitted to the feed regulator. Fig. 20 is a perspective view of one of the rear clamps which connect the longitudinal rod with the transverse rod on which the upper guide rollers are hung.

Like letters of reference refer to like parts in the several figures.

A A′, represent the upright side frames of the machine which are connected at their upper portions by front and rear cross rods $a\,a'$, and at their rear ends by upper and lower cross stays $a^2\,a^3$, respectively.

B represents the vertically movable feed table, upon which the pile of paper is placed, and which is provided with laterally projecting screw nuts $b\ b$ which are guided in upright ways formed on the side frames.

$b'\ b'$ represent the vertical feed screws which work in the screw nuts $b\ b$ of the feed table. The feed screws are provided at their upper ends with bevel wheels b^3 which are connected by a horizontal transverse shaft b^4 journaled at the upper ends of the side frames and having bevel wheels $b^5\ b^6$ which mesh with the wheels of the feed screws so as to actuate both feed screws simultaneously.

C represents upright front guides which engage against the front side of the pile of sheets, and C′ are side guides which engage against the sides of the pile of sheets.

As represented in Figs. 1 and 2 the paper feeder is connected with a printing press having a revolving impression cylinder D, and a

horizontally reciprocating type bed D′. In a press of this kind the bed is usually inclosed on both sides, the inclosure not being shown in the drawings, and the bed is therefore inaccessible from the sides and only its front end is open to permit of making the type forms ready on the reciprocating bed. In order to afford access to the front end of the press through the lower part of the paper feeder, the front guides C are movably supported on the cross stays a^2 a^3 in such manner that they can be moved laterally out of the way. For this purpose the guides are provided with loops d embracing the upper cross stay a^2 and with hooks d' formed on the lower ends of the guides and embracing the lower cross stay a^3 as represented in Figs. 8, and 15.

E E, Figs. 7, 8, and 9, represent two movable heads carrying the buckling mechanism, one of which is arranged on each side of the machine so as to buckle the sheet simultaneously from opposite sides. These two heads are arranged upon the front ends of the longitudinally adjustable rods e which latter are secured with their rear portions to the cross rods a a' by front and rear clamps e' e^2. Each of these clamps consists of a longitudinal sleeve e^3 which receives the longitudinal supporting rod e and a transverse sleeve e^4 arranged below the longitudinal sleeve and receiving the transverse rod, the front transverse sleeve receiving the transverse rod a and the rear transverse sleeve the transverse rod a'. The upper sleeve is split on one side of the longitudinal rod and the lower sleeve is split on one side of the transverse rod, and both sleeves of the same clamp are tightened upon their respective rods by vertical hand clamping screws e^5. Upon loosening the hand screws e^5 the buckling mechanism can be adjusted longitudinally in the machine by sliding the rod e in the clamps and the buckling mechanism can also be adjusted transversely in the machine by sliding the clamps on the cross rods a a' so that by these two adjustments, which are effected at right angles to each other, the entire buckling mechanism can be adjusted to the corner of the pile of sheets on the table.

F F represent longitudinal rock shafts whereby motion is imparted to each buckling mechanism and which are journaled with their front ends in the carrying heads E and with their rear ends in bearings f f' formed in carrying frames F′ which latter are preferably formed integrally with the front clamps e' as shown in Figs. 7, 8, and 15.

G, G, represent two groove cams which are mounted upon a transverse counter shaft g journaled near its ends in the side frames. Each of these groove cams is secured to the counter shaft by a feather g' which compels the cam to turn with the counter shaft but permits it to slide lengthwise on the same. The groove cam is compelled to move transversely in the machine with the carrying frame by bearings g^2 g^3 formed on the carrying frame and supporting the counter shaft on opposite sides of the groove cam.

g^4 represent rock arms secured with their lower ends to the rock shafts F between the bearings f f' by feathers g^5 and provided at their upper free ends with anti-friction rollers g^6 which engage with the grooves of the cams G. The grooves in the latter are reversed as represented in Fig. 2, so that upon turning the counter shaft an oscillating motion, in opposite directions, is imparted to the rock arms and shafts F, g^4.

H, Figs. 3, 7, 8 and 9 represents the buckling finger pivoted to the lower end of a depending rock arm h and provided at its free end with a buckling roller h' which rests upon the pile of paper. The upper end of the depending rock arm is secured to the front end of the rock shaft F so that a forward and backward movement is imparted to the buckling finger. The roller of the buckling finger is journaled in the bifurcated front end of the finger in the usual manner so that it is held against turning during the forward movement of the buckling finger, so as to buckle the sheet, and allowed to revolve during the backward stroke of the buckling finger.

h^2 represents a tension rod secured with one end to a swivel post h^3 pivoted on the lower portion of the depending rock arm h and passing with its opposite free end loosely through a perforated ear h^4 formed in the upper side of the buckling finger.

h^5 represents a spiral spring surrounding the tension rod between the ear h^4 and a thumb screw h^6 arranged upon the tension rod. By shifting the thumb screw upon the tension rod the pressure of the buckling roller upon the sheet can be regulated.

h^7, Figs. 3 and 9, is a rearwardly projecting nose formed on the buckling finger on one side of its pivot and adapted to engage against the under side of a nose h^8 formed on the depending rock arm h whereby the buckling finger is raised from the sheet during the last portion of its inward or forward movement. In the outer position of the rock arm represented in Fig. 9, the nose of the rock arm, stands above the nose of the buckling finger. As the rock arm swings inwardly its nose approaches the nose of the finger and finally presses down upon the nose of the finger and raises the inner end of the finger and its roller from the paper.

I represents the holding down finger, arranged a short distance in front of the buckling finger and against which the sheet is buckled by the forward movement of the buckling finger. The holding down finger has a vertical movement toward and from the surface of the pile of paper and is provided with actuating mechanism whereby it is held down on the paper during the operation of buckling, and lifted therefrom just before the advancing buckling finger reaches it, so as to allow the latter to pass underneath. The

holding down finger is secured to the lower end of an upright rod i which slides vertically in perforated lugs i' formed on the carrying head E. i^2 represents a horizontal rock arm which is pivoted with its outer end to the carrying head while its inner end is bifurcated and engages with sockets or shoulders formed on a sleeve i^3 secured to the rod of the holding down finger. The latter is yieldingly held in a depressed position by a spring i^4 attached with its ends to the horizontal rock arm i^2 and the depending rock arm carrying the buckling finger.

i^5 represents a link whereby motion is transmitted from the rock arm of the buckling finger to the holding down finger. This link is pivoted with one end to a forwardly and upwardly projecting lug i^6 formed on the depending rock arm h and provided at its opposite end with a bifurcation which receives a pin i^7 formed on the horizontal rock arm i^2. During the last portion of the forward stroke of the buckling finger the lower end of the bifurcation in the link i^5 strikes the pin i^7, swings the horizontal rock arm i^2 upwardly and thereby raises the holding down finger from the pile.

J represents a vertically movable gage foot which bears upon the corner of the pile of paper and which performs the double function of holding the pile in place while the top sheet is being removed, and of regulating the upward feed motion of the pile supporting table. This gage foot is provided with a vertical stem or rod j, which slides in perforated ears j' j^2 formed respectively at the upper and lower ends of the carrying head E. During the forward movement of the buckling finger the gage foot rests loosely upon the sheet so as to allow the advancing buckling finger to draw the sheet from underneath the gage foot and after the sheet has been withdrawn from underneath the gage foot the latter is pressed upon the pile.

K is a horizontal rock arm pivoted with its outer end to the carrying head and provided with a bifurcated inner end which engages with sockets or shoulders formed on a sleeve K'. The latter slides lengthwise on the rod of the gage foot below the upper ear j'.

K^2 represents a clutch sleeve arranged upon the gage foot rod and yieldingly connected with the sleeve k' by a spiral spring k^3 surrounding the gage foot rod. The lower portion of this sleeve tapers downwardly.

k^4 represents a clutch plate surrounding the lower portion of the gage foot rod above the ear j^2 and provided with an upwardly extending lip k^5 which latter is inclined on its rear side. In the normal position of the clutch plate it is free to move lengthwise upon the gage foot rod but upon tilting the plate it binds against the gage foot rod and is held immovably thereon. The clutch plate is provided with a rearwardly projecting lug k^6 which engages with a vertical guide groove or way k^7 formed in the carrying head, whereby the clutch plate is held against turning and its upward movement is limited, as represented in Figs. 10 and 11.

k^8 represents a lower spring surrounding the gage foot rod and bearing with its ends against the ear j^2 and the lower side of the clutch plate whereby the latter is raised until the lug k^6 strikes the upper end of the groove k^7. During the first portion of the downward movement of the sleeve k' the upper spring k^3 is free from strain and causes the conical sleeve k^2 to move downwardly with the sleeve k' until the conical sleeve engages with the inclined lip of the clutch plate. When this takes place the conical sleeve presses the upper end of the inclined lip forwardly, whereby the clutch plate is slightly tilted upon the rod and bound or tightened on the same, thereby holding the clutch plate and conical sleeve against downward movement on the gage foot rod. This causes the final portion of the downward movement of the sleeve k' to compress and strain the upper spring k^3 which pressure is transmitted to the gage foot. During the first portion of the upward movement of the upper sleeve k' it travels alone until the pressure is entirely removed from the conical sleeve and during the final portion of its upward movement the conical sleeve is raised and disengaged from the lip of the clutch plate which loosens the latter on the gage foot rod. After the clutch plate has been loosened from the gage foot rod the gage foot again rests loosely upon the pile and the gage foot rod is permitted to slide downwardly through the clutch plate to the extent of the thickness of the sheet which has been removed from the top of the pile.

L represents a link pivoted with its lower end to a short arm l formed on the depending rock arm h at right angles thereto. The upper end of this link is provided with a longitudinal slot l' which receives a pin l^2 arranged on the rock arm k. During the forward movement of the buckling finger the link L is carried downwardly and when the sheet has been drawn from underneath the gage foot the upper end of the slot in the link L strikes the pin l^2 and carries the rock arm k and sleeve k' downwardly thereby applying pressure upon the gage foot. During the return stroke of the buckling finger the rock arm k is raised by a spring l^3 secured with its ends to the rock arm k and an upwardly projecting lug l^4 formed on the head.

The mechanism whereby the feed table is raised automatically, is constructed as follows and as most clearly shown in Figs. 3, 7, 8, 9, 15, 16, 17, 18, and 19: M represents a longitudinal rock shaft journaled in bearings m m' formed, respectively, in the carrying head and frame, and provided in front of the carrying head with a rock finger m^2. The free end of the rock finger is provided with an adjusting screw m^3 which is adapted to bear upon a horizontal gage arm m^4 secured to the upper end of the gage foot rod. This gage

arm is guided in its vertical movement with the gage foot by a bifurcated jaw m^6 formed on the upper ear j' of the carrying head. N represents a rock shaft arranged transversely in the machine above the longitudinal shaft M, and journaled in a bearing n formed on the inner side of the carrying frame F′ and bearings n' n^2 secured to the top of the side frame of the machine. The longitudinal rock shaft M is provided in rear of the bearing m' with a segmental gear n^3 which meshes with a similar segmental gear n^4 on the transverse rock shaft N. The teeth of these segmental gears are arranged on a skew bevel owing to the difference in the planes of the longitudinal and transverse rock shafts M N. n^5 represents a peripheral cam formed on the inner portion of the groove cam and bearing against a roller n^6 pivoted to the free end of the segmental gear n^4 whereby the rock finger is raised from the gage arm. When the peripheral cam has passed the roller n^6 the segmental gear n^4 is drawn downwardly by a spring n^7 secured with its ends to the carrying frame F′ and a rearwardly projecting nose n^8 formed on the segmental gear n^4 which causes the rock finger to descend until it strikes the gage arm. O represents an upright stop arm which is mounted upon the outer end of the transverse shaft N and which is provided on its front side with a vertical series of ledges or stops o'. o^2 represents an elbow lever pivoted on the shaft b^4 and provided on its upwardly projecting arm o^3 with a pawl o^4 which engages with a ratchet rim o^5 formed on the periphery of the bevel wheel b^6. The lower rearwardly projecting arm o^6 of the elbow lever o^2 is provided with a roller o^7 adapted to bear against a cam o^8 secured to the end of the counter shaft g. This arm o^6 is also provided with a bearing piece o^9 which overhangs the stop arm and is adapted to engage with one of the ledges of the latter. The revolving cam o^8 always raises the rear arm of the elbow lever to the same point for the purpose of rotating the ratchet rim o^5, but the downward movement of the elbow lever is variable and is controlled by the position of the stop arm. When the latter is in its rearmost position the rear arm of the elbow lever is permitted to drop to its fullest extent causing the elbow lever to be subsequently raised a full stroke by the cam o^8. When the stop arm is moved forwardly the bearing piece of the elbow lever strikes one of the ledges on the stop arm and reduces the backward movement of the elbow lever so that the latter will be moved forwardly only a part of its fullest stroke by the subsequent rotation of the cam o^8. After each time that the elbow lever has been raised by the cam o^8 the peripheral cam n^5 rocks the transverse shaft N and moves the stop arm forwardly underneath the bearing piece of the elbow lever but the return or rearward movement of the stop arm is controlled by the rock finger of the longitudinal rock shaft M which bears on the gage arm of the gage foot. In the normal position of the pile of paper the descent of the rock finger is so small that the stop arm is moved rearwardly only sufficiently to permit its highest ledge to be presented to the bearing piece of the elbow lever so that the cam o^8 will not move the elbow lever forward. When a sufficient number of sheets have been fed from the pile so that its surface is below the proper position, the rock finger descends a greater distance which causes the stop arm to move rearwardly a corresponding distance and present a lower ledge to the bearing piece so that the backward throw of the elbow lever is increased. As the feed table is gradually raised the downward movement of the rock finger is again gradually reduced until the surface of the paper is in its normal position. If the feed table is lowered to renew the supply of paper when the rock finger and elbow lever are in their lowest positions as indicated by the dotted lines Figs. 9 and 16, the subsequent raising of the feed table likewise raises the rock finger and causes the stop arm to press against the bearing piece of the elbow lever through the medium of the rock shafts M N and gage foot.

In order to prevent breakage and permit the rock finger to rise when the parts are in this position a yielding connection is formed between the transverse rock shaft N and the stop arm which is constructed as follows:— P represents a carrying arm which is secured to the transverse rock shaft N between the bearings n' n^2. The free end of this carrying arm is provided with a segmental guide rod p which slides through a perforated ear p' secured to the inner side of the stop arm. The stop arm is mounted loosely on the transverse shaft N and the carrying arm is yieldingly held away from the stop arm by a spiral spring p^2 which surrounds the segmental guide rod and bears with its ends against the carrying arm and the rear side of the ear of the stop arm. The expansion of the spring p^2 is limited by a pin p^3 arranged in the segmental rod and bearing against the front side of the ear on the stop arm. A sufficient tension is placed upon the spring p^2 to hold the stop arm and carrying arm sufficiently rigid upon each other under ordinary conditions, but when the rock finger is raised, while the forward movement of the stop arm is prevented by the bearing piece of the elbow lever, the spring p^2 is compressed which prevents any of the parts from being broken. As soon as the elbow lever is raised during its next forward throw the spring p^2 expands and returns the stop arm to its normal position. The segmental gear n^3 is secured to the longitudinal shaft M, so as to turn with the same, and to the carrying frame F′, so as to be held against lengthwise movement on said shaft, by a feather q. This feather is of the same construction as that shown and described in Letters Patent No. 434,649, dated August 19, 1890, granted to W. Womersley to

which reference may be had for a more complete description thereof. The segmental gear n^4 is secured to the transverse shaft N, so as to turn therewith, and to the carrying frame, so as to move transversely therewith, by a feather q'. The feather q' is constructed the same as the feather q. q^2 represents a nose formed on the front portion of the segmental gear n^4 and adapted to bear against a stop q^3 formed on the front side of the bearing g^2 whereby the segmental gears are limited in their upward movement and thereby prevented from becoming disengaged.

R, Figs. 4, 7, 8 and 15 represents the feeding fingers whereby the top sheet is removed from the pile to the tapes r which deliver it to the printing press or other machine. The free front end of each feeding finger is provided with a roller similar to the buckling finger. The feeding finger is pivoted with its rear end to an arbor r' arranged on the lower end of a depending rock arm r^2. This rock arm is adjustably secured by a feather r^3 and set screw r^4 to a transverse rock shaft r^5 journaled in bearings r^6 formed in the upper ends of the side frames. A rocking motion is imparted to this shaft by a crank r^7 secured to the adjacent end of the counter shaft and connected with a rock arm r^8 of the transverse shaft r^5 by a link r^9 as represented in Fig. 3. Pressure is applied to each feed finger by a spiral spring r^{10} surrounding the arbor r' and bearing with its ends against a pin r^{11} arranged on the feeding finger and a pin r^{12} arranged on a sleeve r^{13} secured to the outer end of the arbor.

S represents a lifting shaft arranged over the feed finger shaft and journaled in bifurcated bearings s formed at the upper ends of each depending rock arm r^2.

s' represents a lifting rod pivoted with its lower end to the feeding finger and passing loosely with its upper end through a longitudinal slot s^2 formed in the rear end of a lifting arm s^3. The latter is secured by a feather s^4 to the lifting shaft between the bifurcated bearings s which compels the lifting arm to rock with the lifting shaft and also move lengthwise upon the same upon shifting the feeding fingers transversely in the machine.

s^5 is a thumb nut applied to the upper screw threaded end of the lifting rod and bearing against the upper side of the lifting arm. A rocking motion is imparted to the lifting shaft in one direction by means of a cam s^6 on the shaft g and which engages against a rock arm s^7 secured to the end of the lifting shaft, and in the opposite direction by a spring s^8. During the forward movement of the feeding fingers they are in contact with the surface of the pile and push the top sheet from the pile. At the end of the forward stroke the feeding fingers are raised quickly in nearly a vertical line by the cam s^6 so as to offer no resistance to the sheet which is being carried off the pile. The feeding fingers are held in this raised position until they arrive at the end of their backward movement when the cam s^6 again lowers them upon the pile of paper. Heretofore this feeding finger has been raised by the mechanism shown in Letters Patent, No. 434,649, dated August 19, 1890, but in that mechanism a lifting rod is guided in a lug, on the depending rock arm, and is liable to be cramped or eventually bent or broken by the action of the lifting plate engaging against the hook shaped upper end of the lifting rod. In our improved construction this difficulty is avoided.

T represents the main driving shaft of the paper feeder which is journaled in bearings t t' arranged on the rear ends of the side frames, and t^2 is a sprocket wheel which is secured to one end of said shaft and to which motion is transmitted from a sprocket wheel t^3 mounted on the printing press shaft t^4 by a chain belt t^5, as shown in Figs. 1 and 2.

t^6 represents a gear wheel secured to the opposite end of the driving shaft and which transmits motion to the gear wheel t^7 on the end of the counter shaft g, by means of an intermediate gear wheel t^8. The intermediate gear wheel t^8 is mounted on an adjustable arm t^9 which latter is pivoted on the main frame concentric with the counter shaft g and provided with a concentric slot t^{10}. t^{11} represents a screw-threaded stud arranged on the main frame and passing through the slot t^{10} of the adjustable arm, and t^{12} is a clamping nut which is arranged on said stud and which bears against the arm t^9 for holding it in its adjusted position. The adjustable arm t^9 permits the gear wheel t^8 to be shifted concentrically with reference to the gear wheel t^7 thereby allowing the gear wheel t^6 to be changed for a larger or smaller wheel in order to increase or decrease the speed of the buckling mechanism.

u represents the longitudinal side bars of the tape frame which are pivoted with their front ends upon the driving shaft T, and are connected at their rear ends by a transverse feed board u'. u^2 represents a receiving roller which is mounted loosely upon the driving shaft so as to revolve thereon. The tapes pass with their receiving portions around the receiving roller, thence rearwardly with their upper portions and around a delivery roller u^3 arranged adjacent to the feed board and journaled in bearings formed in the side bars u.

u^4 represents guide wheels which are hung upon the front cross rod a' by arms u^5 and which rest upon the tapes as they pass around the receiving roller. When the sheet has been deposited by the feeding fingers upon the tapes the latter carry the sheet forwardly until it strikes the front registering guides u^6. These front guides are hung upon a cross bar u^7 of the printing press or any other suitable part of the press frame.

When the paper feeder is arranged at a considerable distance from the printing press, a

long tape mechanism can be employed which runs comparatively slow and allows ample time for registering the sheet before it is carried into the printing press; but where economy in room is a necessity the paper feeder must be arranged closer to the printing press, thereby necessitating shortening of the tape mechanism.

In order to gain sufficient time to register the sheet upon the tapes and deliver it to the press before another sheet is discharged upon the tapes, the speed of the latter must be increased in proportion to the decrease in the distance between the feeder and the press. This increased speed of the tapes is effected by rotating the receiving tape roller faster than the shaft on which it is mounted, by the following mechanism:—V represents a short counter shaft which is journaled in a movable bearing v provided with arms v', hung upon the driving shaft T so as to swing concentric therewith. The outer end of this counter shaft is provided with a small gear wheel v^2 which is driven from the larger gear wheel t^6, on the adjacent end of the driving shaft, by an intermediate gear wheel v^3, which latter meshes with both gear wheels v^2, and t^6, and is journaled upon a bracket v^4, secured to the side frame. The inner end of the counter shaft V is provided with a sprocket wheel v^5 which transmits motion to the receiving roller u^2 by a chain belt v^6, running around the sprocket wheel v^5 on the counter shaft, and a similar sprocket wheel v^7 secured to the adjacent end of the receiving roller of the tapes. The gear wheel v^2 at the outer end of the counter shaft can be changed for one of larger or smaller size, according to the increase in speed it is desired to give to the tapes with reference to the driving shaft. Upon changing the gears on the counter shaft, the latter is swung toward or from the intermediate gear wheel v^3, concentric with the driving shaft, thereby avoiding disturbance of any other parts of the driving mechanism. One of the arms v' is provided with an upwardly extending adjusting bar v^8 having a slot v^9, curved concentric with the driving shaft. The counter shaft is secured in its adjusted position by a clamping bolt v^{10} arranged upon the main frame and passing through the slot v^9 of the adjusting bar v^8.

In order to increase the frictional contact between the sheets of paper and the tapes upon which they rest, when no upper tapes are used, we employ the following mechanism, which is represented in Figs. 1, 2, 13, and 14: W represents two pressure rollers which bear upon the carrying portions of the tapes between the receiving and delivery rollers. As the sheet is carried forward by the tapes, it is pressed down upon the latter, thereby, increasing the frictional contact between the tapes and the sheet and enabling the latter to be carried forwardly more positively. The pressure rollers also prevent the sheet from backing up upon striking the front guides, thereby registering the sheets more accurately. Each of the pressure rollers is journaled upon an arbor w having a contracted shank which passes through slots w' formed in two clamping plates w^2. The arbor is held in position by a shoulder w^3 bearing against one of the clamping plates and a thumb nut w^4 arranged upon the shank and bearing against the other plate. The clamping plates are provided on their upper and lower ends with jaws w^5 which are clamped against opposite sides of the upper and lower bars of the supporting frame w^6. The pressure rollers can be adjusted vertically by raising or lowering the shanks of the arbors in the slots of the clamping plates, and can also be adjusted lengthwise of the tapes by shifting the clamping plates lengthwise upon the supporting frame. The thumb nut w^4 serves the double purpose of holding the clamping plates upon the supporting frame and holding the pressure rollers upon the clamping plates. X represents hangers which support the front portions of each frame and which are secured with their upper ends to a cross-rod x'. The latter is supported at its ends upon standards x^2 secured to the side bars of the tape frame. The lower portion of each hanger is provided with an opening in which the front portions of the two bars, constituting each supporting frame, are secured. The ends of the two bars are arranged one upon the other in the cavity formed in the lower portion of the hanger and are clamped therein by a thumb screw x^3. The rear end of the lower bar is curved upwardly and secured to the upper bar and the latter is supported on the cross rod of the printing press.

We claim as our invention—

1. The combination with the vertically movable holding down finger and the buckling finger, of an actuating rock shaft, an arm mounted on said rock shaft and connected with the buckling finger, and an arm actuating the holding down finger and connected with the arm of the buckling finger, substantially as set forth.

2. The combination with the vertically movable gage foot and the buckling finger, of an actuating rock shaft, an arm mounted on the rock shaft and connected with the buckling finger, and an arm actuating the gage foot and connected with said rock shaft, substantially as set forth.

3. The combination with the vertically movable holding down finger, the vertically movable gage foot and the buckling finger, of an actuating rock shaft, an arm attached to said rock shaft and carrying the buckling finger, an arm actuating the holding down finger and connected with the arm of the buckling finger, and an arm actuating the gage foot and connected with said rock shaft, substantially as set forth.

4. The combination with the vertically movable holding down finger and its horizontal actuating arm, of an actuating rock shaft, a

depending arm attached thereto, a buckling finger attached to said depending arm, and a link pivoted with its outer end to said depending arm and having at its inner end an elongated opening which engages with a pin on the actuating arm of the holding down finger, substantially as set forth.

5. The combination with the actuating rock shaft, of a depending arm secured thereto and provided at its lower end with an outwardly projecting nose, and a buckling finger attached to the lower end of said arm and provided on the outer side of its pivot with a similar nose, which noses come in contact during the last portion of the inward movement of the buckling finger, whereby the inner end of the latter is raised from the paper, substantially as set forth.

6. The combination with the gage foot and the vertically moving arm by which it is actuated, of a clutch connecting said arm with the gage foot and moving loosely on the gage foot during the first part of its downward movement and engaging with the gage foot during the latter part of its downward movement, substantially as set forth.

7. The combination with the gage foot and the vertically moving arm by which it is actuated, of a clutch mounted on the gage foot and engaging with the same during the latter part of the downward movement of the actuating arm, and a spring interposed between the clutch and the actuating arm, substantially as set forth.

8. The combination with the gage foot provided with a vertical stem and the actuating arm, of a tapering clutch sleeve mounted on said stem, a spring connecting said sleeve with the actuating arm, a clutch plate mounted loosely on the lower part of said stem and provided with an inclined lip adapted to engage with said sleeve and a spring supporting said clutch plate, substantially as set forth.

9. The combination with the carrying head, of the gage foot provided with a vertical stem sliding in said head, the actuating arm and the clutch connecting the arm with said stem, a gage arm secured to the upper end of said stem, a rock shaft provided with a rock finger adapted to touch said gage arm, and the mechanism connecting said rock shaft with the actuating mechanism of the lifting screw of the feed table, substantially as set forth.

10. The combination with the vertically movable feed table, its feed screws, and the ratchet wheel and elbow lever whereby the feed screws are actuated, of a movable stop arm provided with ledges at different elevations adapted to arrest the backward movement of the elbow lever at different points, thereby regulating its stroke, a gage foot bearing upon the pile, and mechanism whereby the gage foot controls the movement of said stop arm, substantially as set forth.

11. The combination with the vertically movable feed table, its feed screws, and the ratchet wheel and elbow lever whereby the feed screws are actuated, of a movable stop arm provided with ledges at different elevations adapted to arrest the backward movement of the elbow lever at different points, a transverse rock shaft on which the stop arm is mounted, a cam imparting a uniform forward throw to said shaft, a longitudinal rock shaft geared with said transverse rock shaft, and a gage foot resting upon the pile and regulating automatically the return throw of both rock shafts and of the stop arm, substantially as set forth.

12. The combination with an elbow lever whereby the feed screws are actuated and the stop arm provided with ledges at different elevations, the gage foot, the holding down finger and the buckling finger, of a transverse counter shaft whereby these parts are actuated, a longitudinal rock shaft driven from said transverse counter shaft by a cam and connected at its front end with the buckling finger, the holding down finger and the gage foot, a longitudinal rock shaft receiving its forward motion by a cam on said transverse counter shaft and having its backward motion automatically controlled by the gage foot, and a transverse rock shaft geared with said automatically-controlled longitudinal rock shaft and carrying said stop arm, substantially as set forth.

13. The combination with the elbow lever whereby the feed screws are actuated and its stop arm provided with ledges at different elevations, of a rock shaft whereby said stop arm is oscillated, and a flexible connection interposed between said stop arm and the actuating shaft, substantially as set forth.

14. The combination with the stop arm, of an actuating rock shaft on which the stop arm is loosely mounted, an actuating arm rigidly secured to said shaft, and a spring and rod connecting said actuating arm with the loosely mounted stop arm, substantially as set forth.

15. The combination with the feeding finger and its actuating rock shaft, of a depending arm secured to said rock shaft and carrying the feeding-finger and provided above the rock shaft with a bifurcated bearing, a lifting rock shaft journaled in said bearing, a lifting finger mounted on the lifting rock shaft in said bifurcated bearing, and a rod connecting said lifting finger with the feeding finger, substantially as set forth.

16. The combination with the mechanism whereby the sheets of paper are successively fed from the pile and the main driving shaft of said mechanism, of a tape roller mounted loosely on said driving shaft, and a multiplying gear connecting said driving shaft with said tape roller, substantially as set forth.

17. The combination with the main driving shaft and the tape roller mounted loosely upon the same, of a counter shaft, bearings hung upon the driving shaft and supporting said counter shaft, gearing connecting said counter shaft with the tape roller, a driving

wheel secured to the driving shaft, a pinion secured to the counter shaft, and an idler interposed between the driving wheel and the pinion, substantially as set forth.

18. The combination with the delivery tapes, of longitudinal frames arranged above the tapes, clamping plates made longitudinally adjustable upon said frames, and pressure rollers mounted on arbors which are made vertically adjustable on the clamping plates, substantially as set forth.

19. The combination with a delivery tape and the longitudinal supporting frame composed of an upper and a lower bar, of two clamping plates bearing against opposite sides of each bar and provided with vertical slots, a screw arbor passing through said slots and tightening the clamping plates upon the frame bars and a pressure roller pivoted on said arbor and bearing against said tape, substantially as set forth.

Witness our hands this 6th day of December, 1892.

WILLIAM WOMERSLEY.
GEORGE SAGUE.
MORTIMER A. CLAPP.

Witnesses:
JOHN A. CALDWELL,
LOUISE H. STAFFORD.