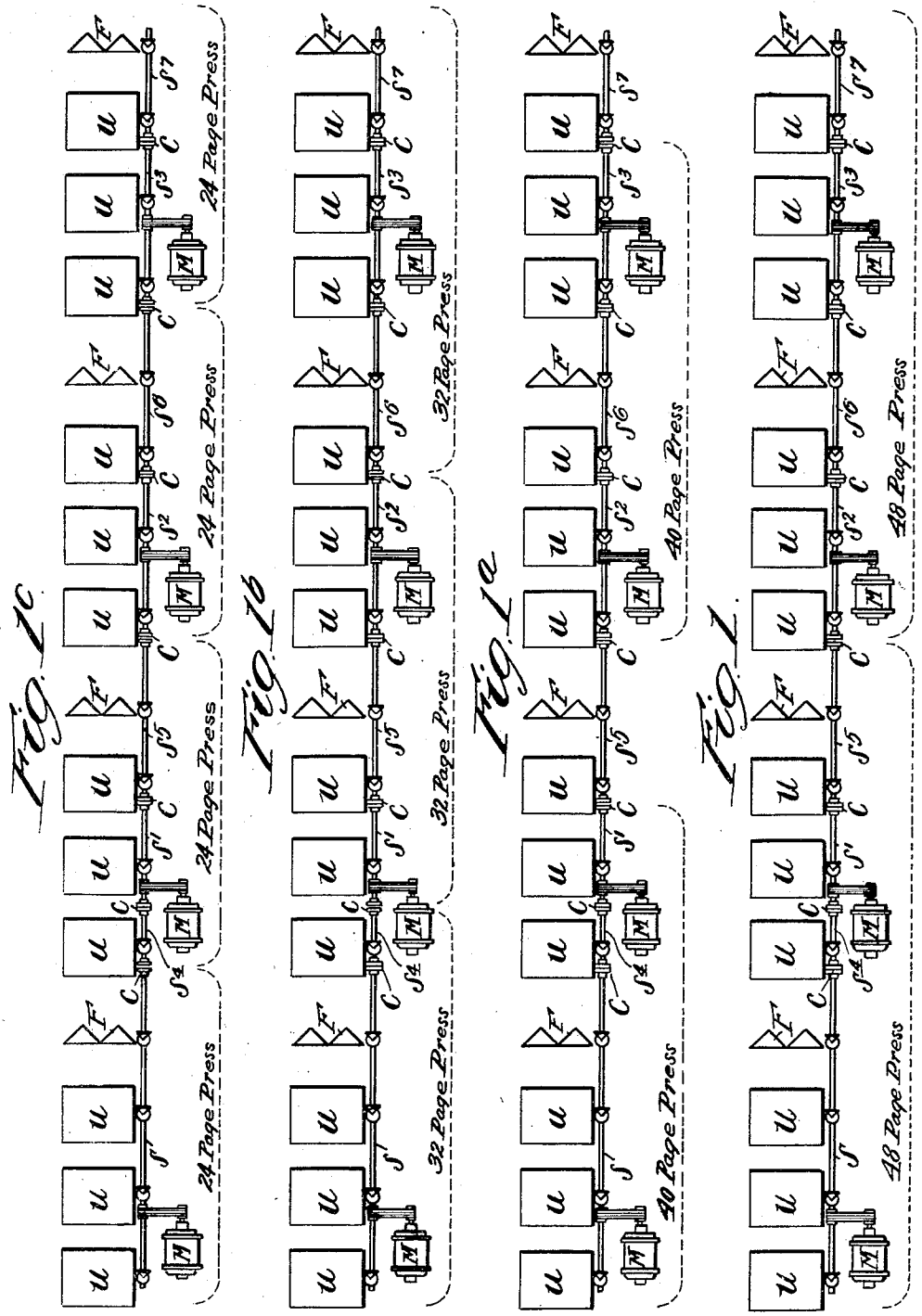
March 8, 1932. H. A. W. WOOD 1,848,591

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Witness
C. F. Wesson

Inventor
Henry A. Wise Wood
By attorneys
Coudert Frey & Hartley

March 8, 1932. H. A. W. WOOD 1,848,591

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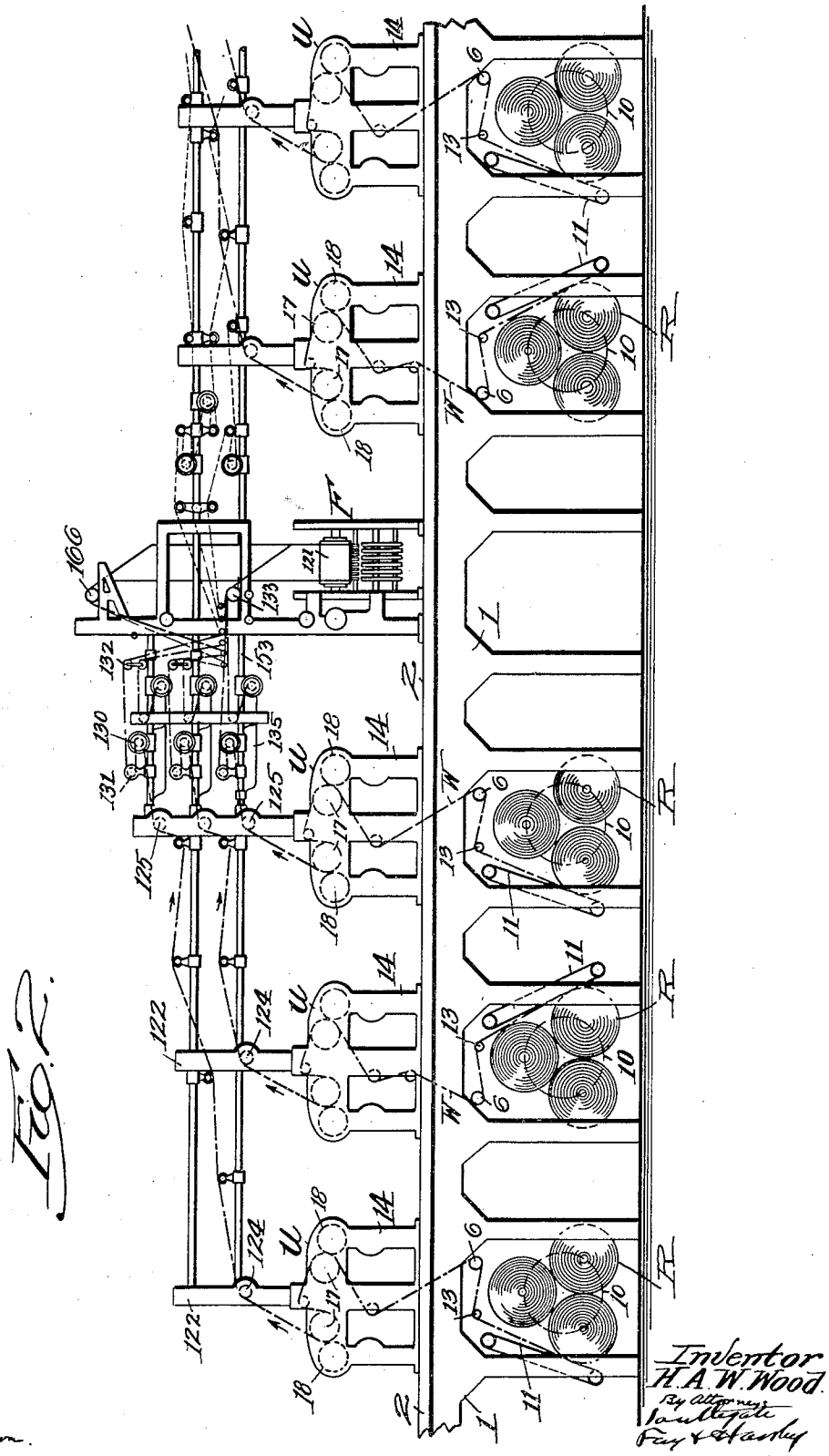


Fig. 2.

Witness
C. F. Mason.

Inventor
H. A. W. Wood
By Attorneys
Lauterbach
Fay & Hartley

March 8, 1932. H. A. W. WOOD 1,848,591

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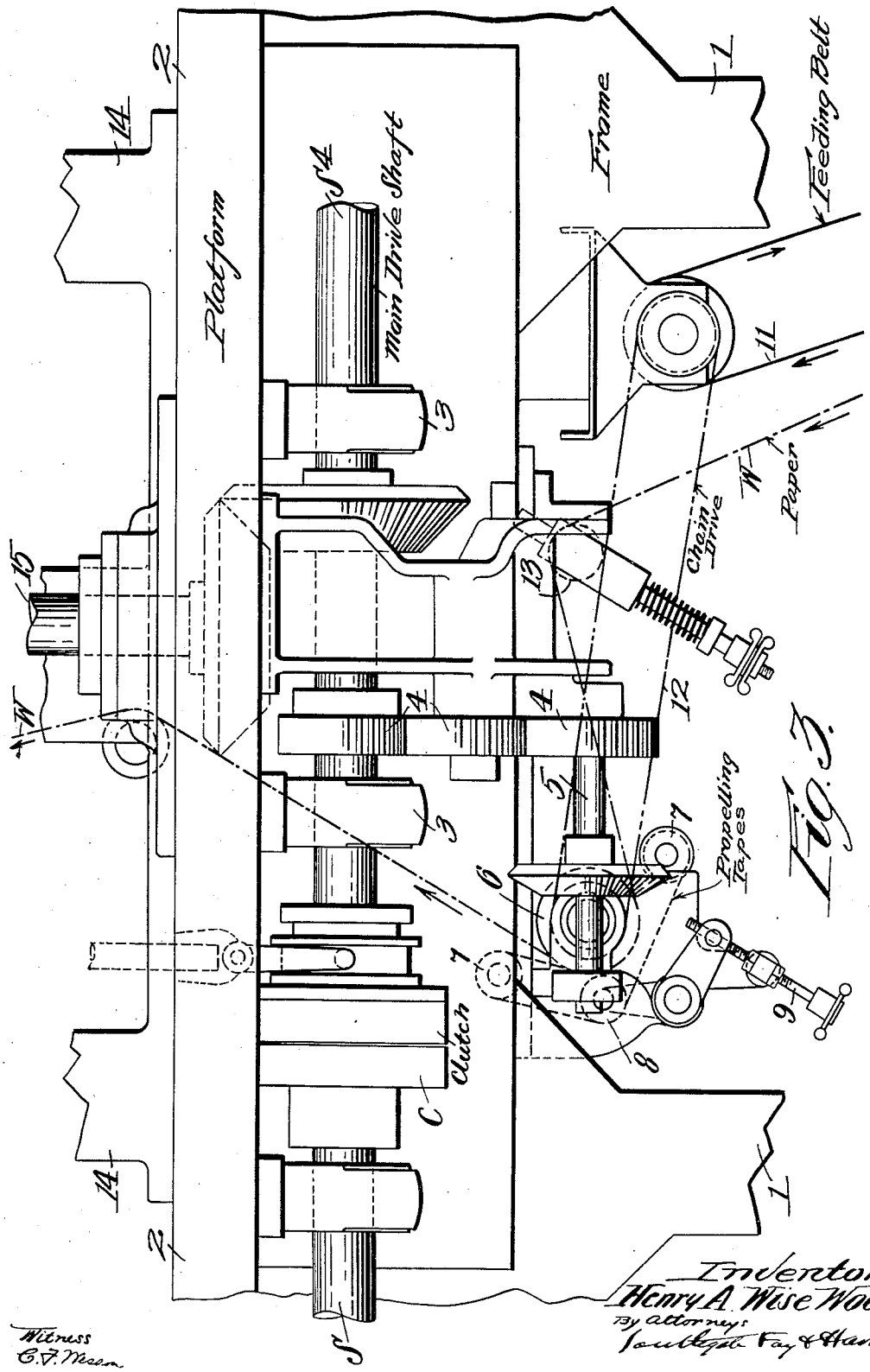


Fig. 3.

March 8, 1932. H. A. W. WOOD 1,848,591

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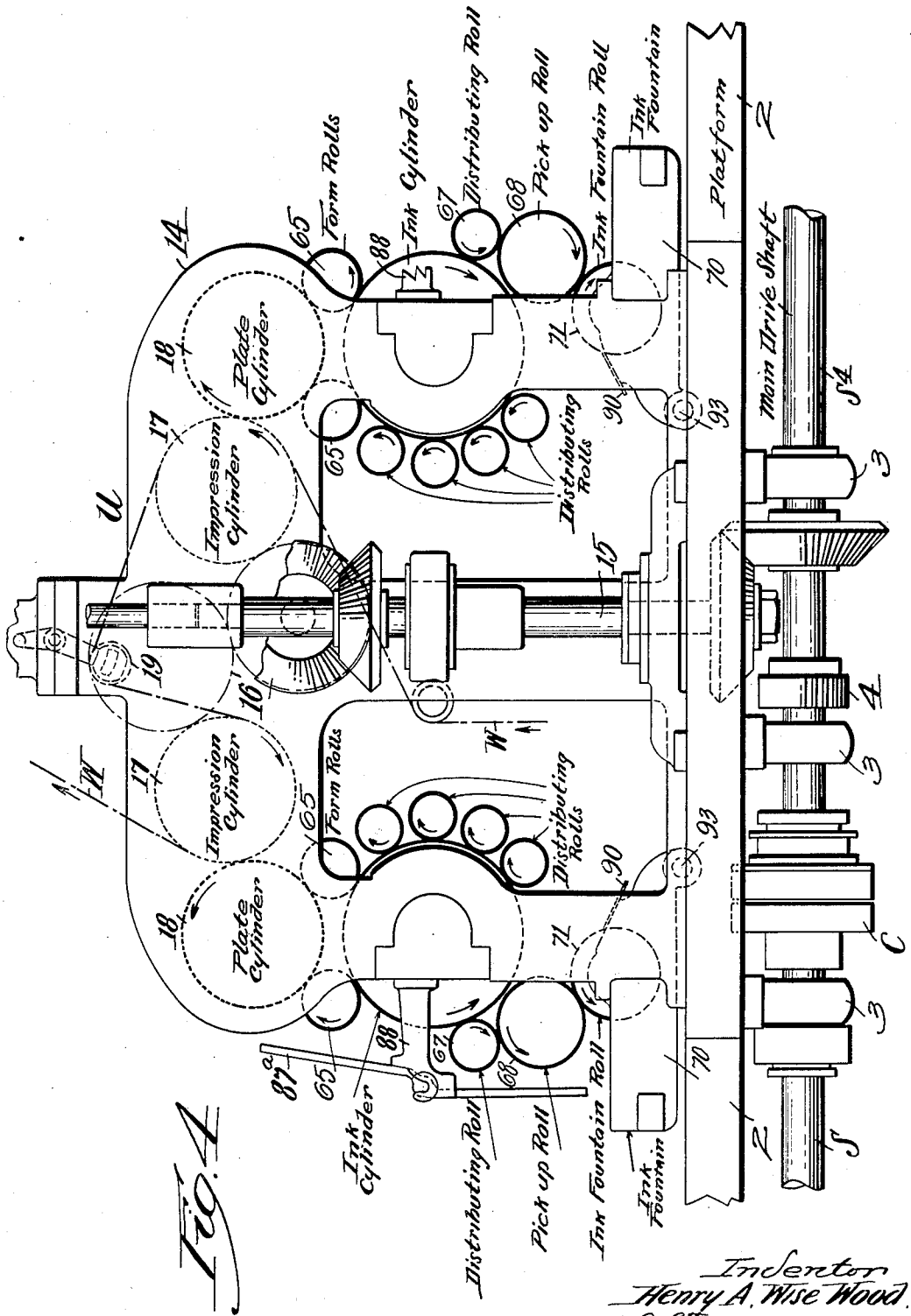


Fig. 4

Witness
C. F. Nesson.

Inventor
Henry A. Wise Wood
By attorneys
Soulsby & Fay & Hanley

March 8, 1932. H. A. W. WOOD 1,848,591

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Fig. 5.

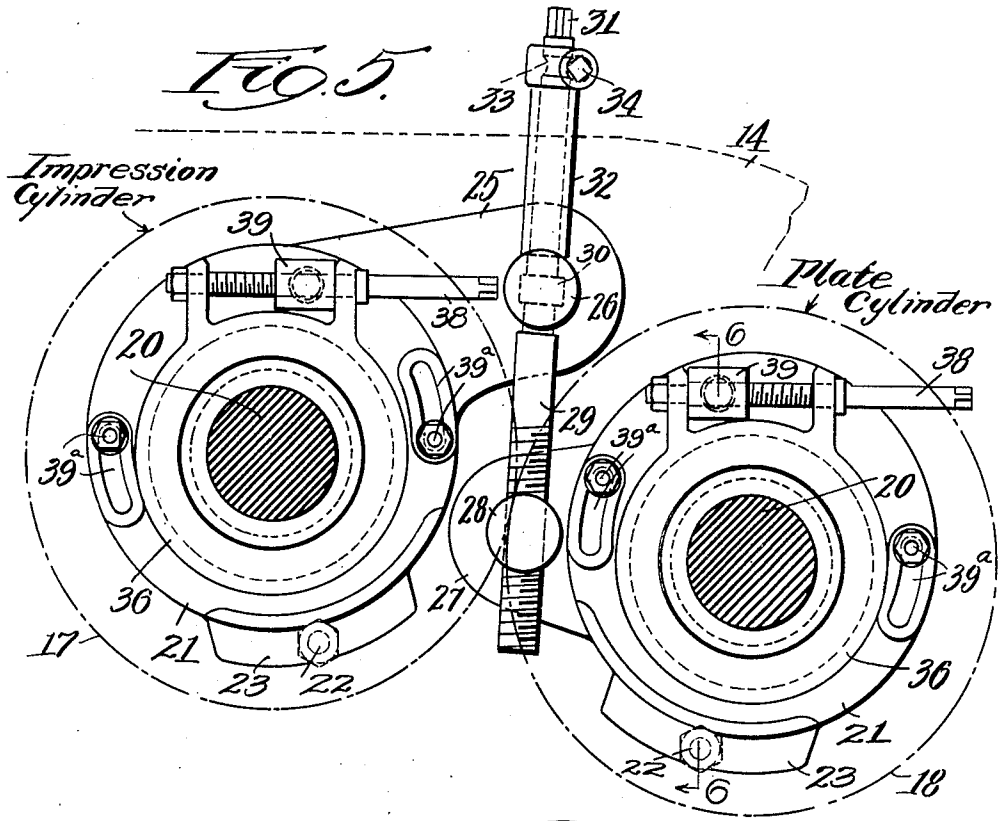
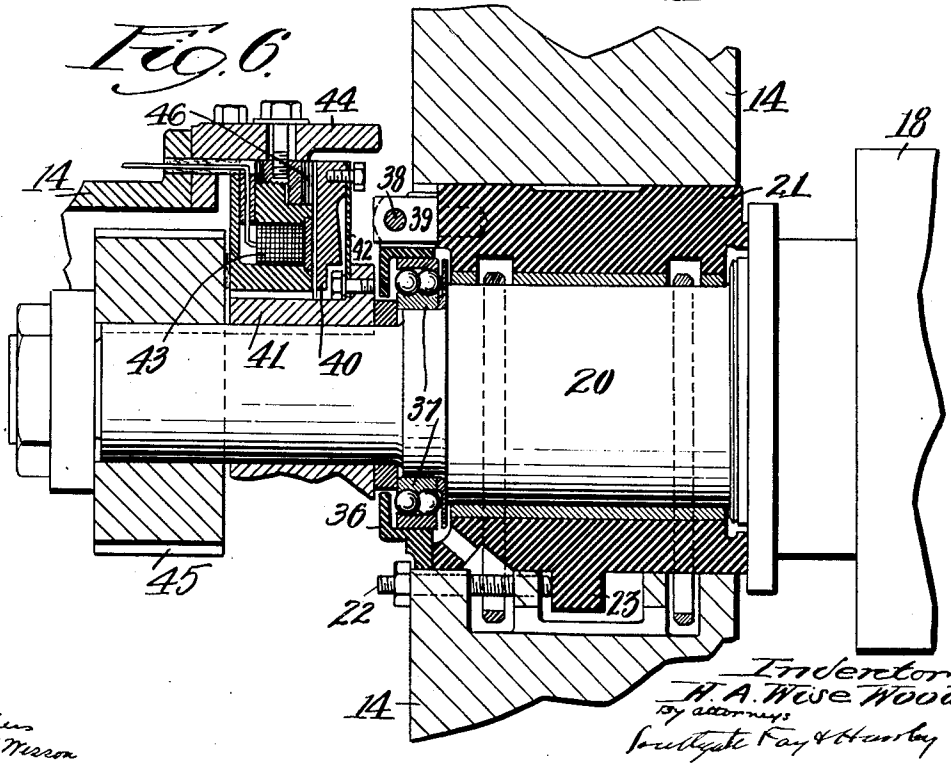


Fig. 6.



Witness
C. F. Myers

Inventor.
H. A. Wise Wood
By attorneys
Southgate Fay & Hamlen

March 8, 1932. H. A. W. WOOD 1,848,591

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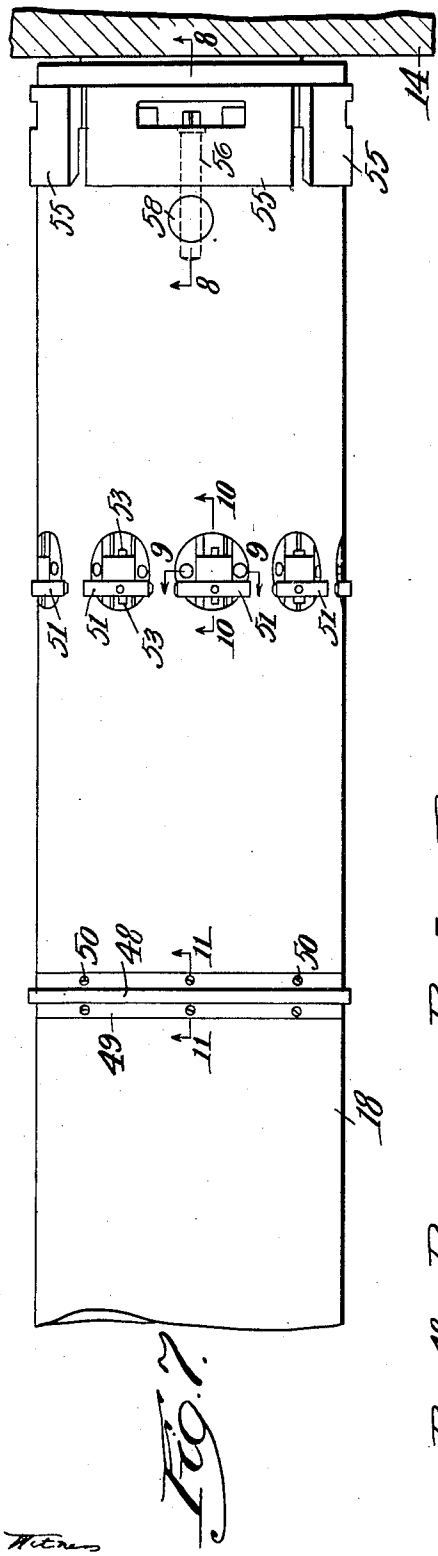


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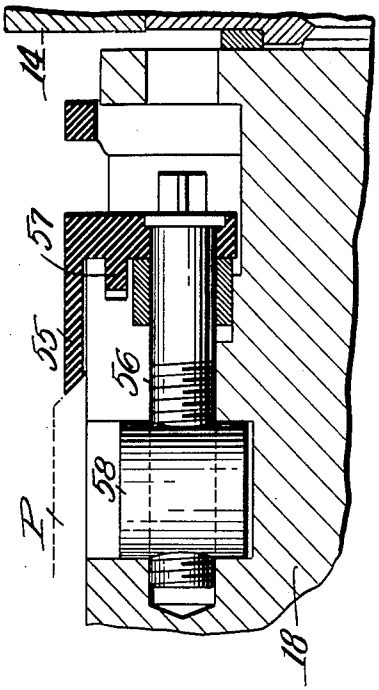


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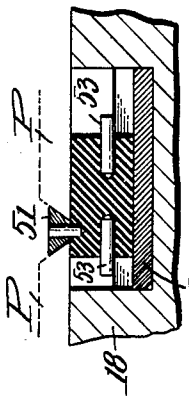


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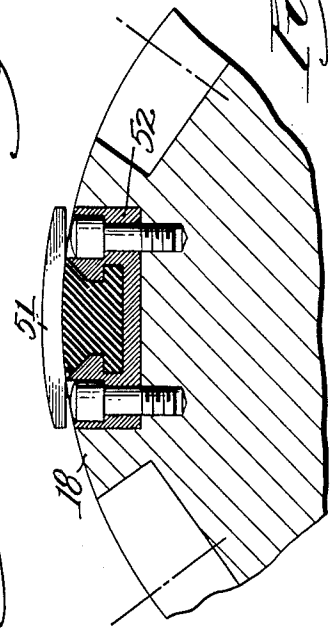


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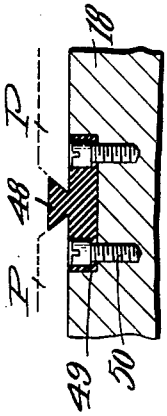


Fig. 11.

Witness
C. F. Nissen

Inventor
Henry A. Wise Wood
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Southgate Fay & Hanley

March 8, 1932. H. A. W. WOOD 1,848,591

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Filed May 26, 1926 29 Sheets-Sheet 7

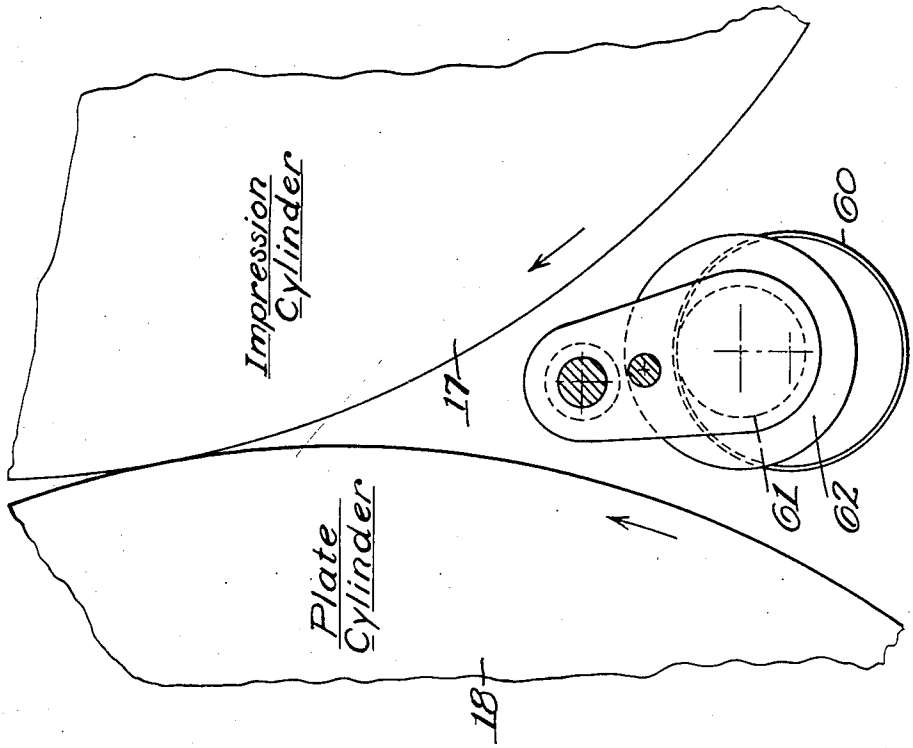


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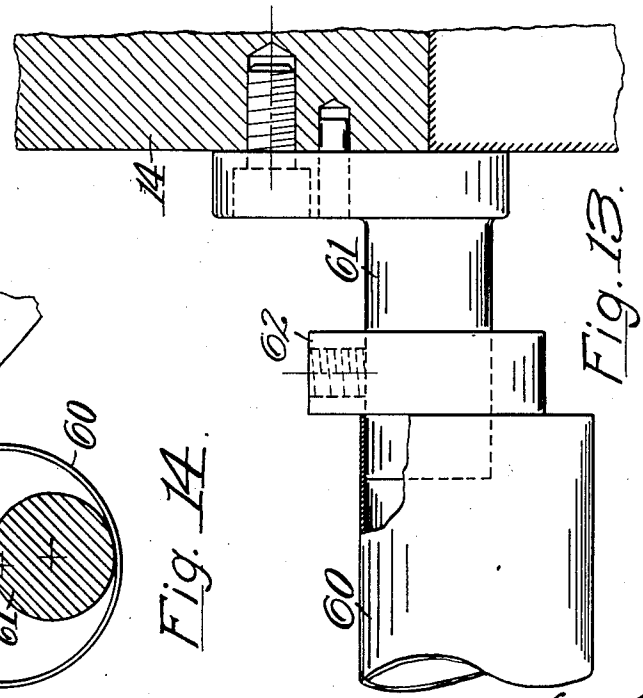


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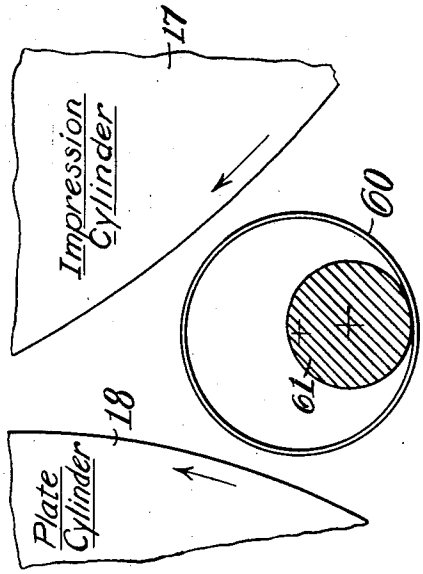


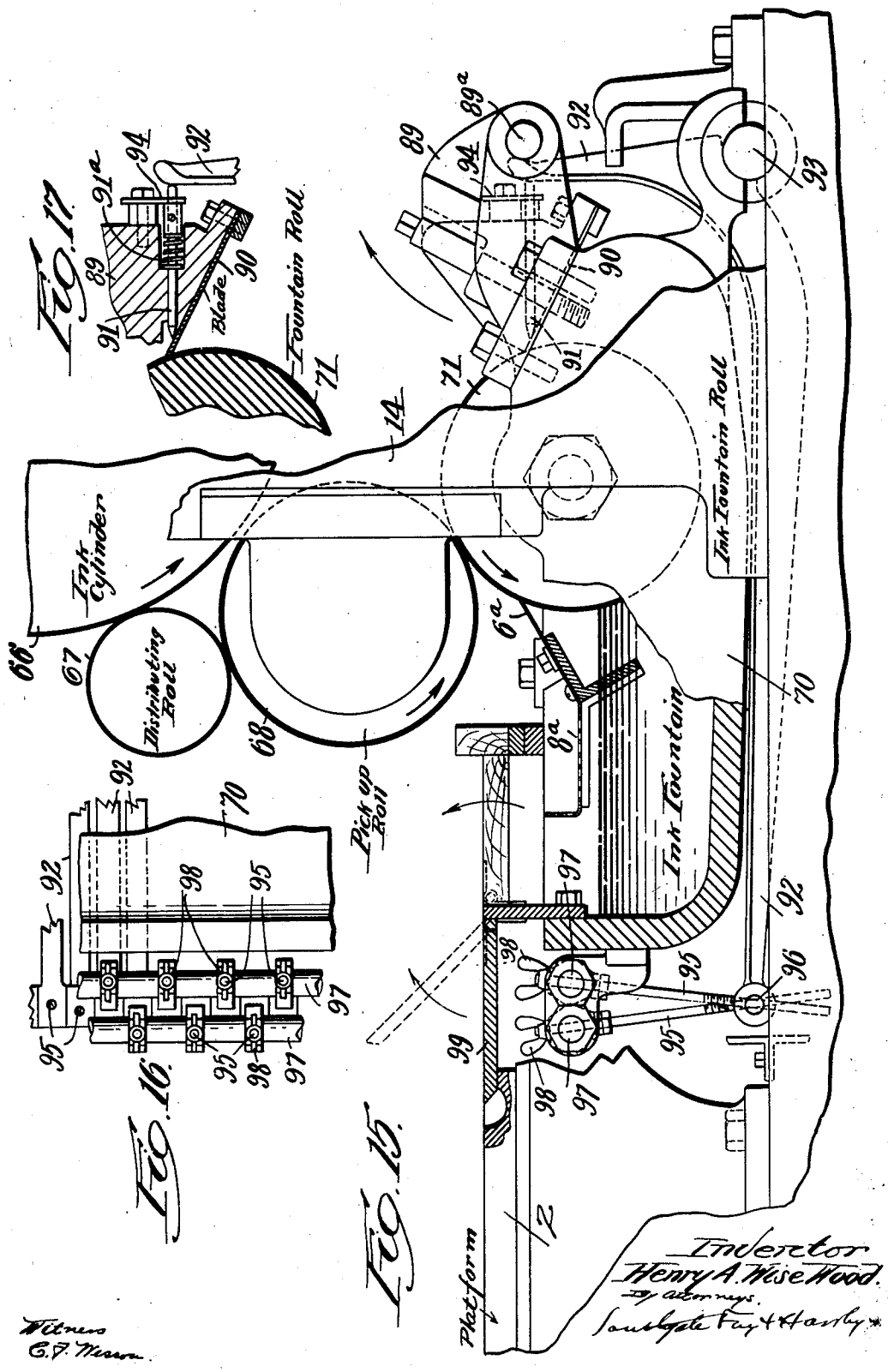
Fig. 14.

Inventor
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By Attorneys
Southgate Fay & Hamby.

March 8, 1932. H. A. W. WOOD 1,848,591

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Witness
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Inventor
Henry A. Wise Wood.
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Southgate Fay & Hanby.

March 8, 1932. H. A. W. WOOD 1,848,591

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Filed May 26, 1926 29 Sheets-Sheet 9

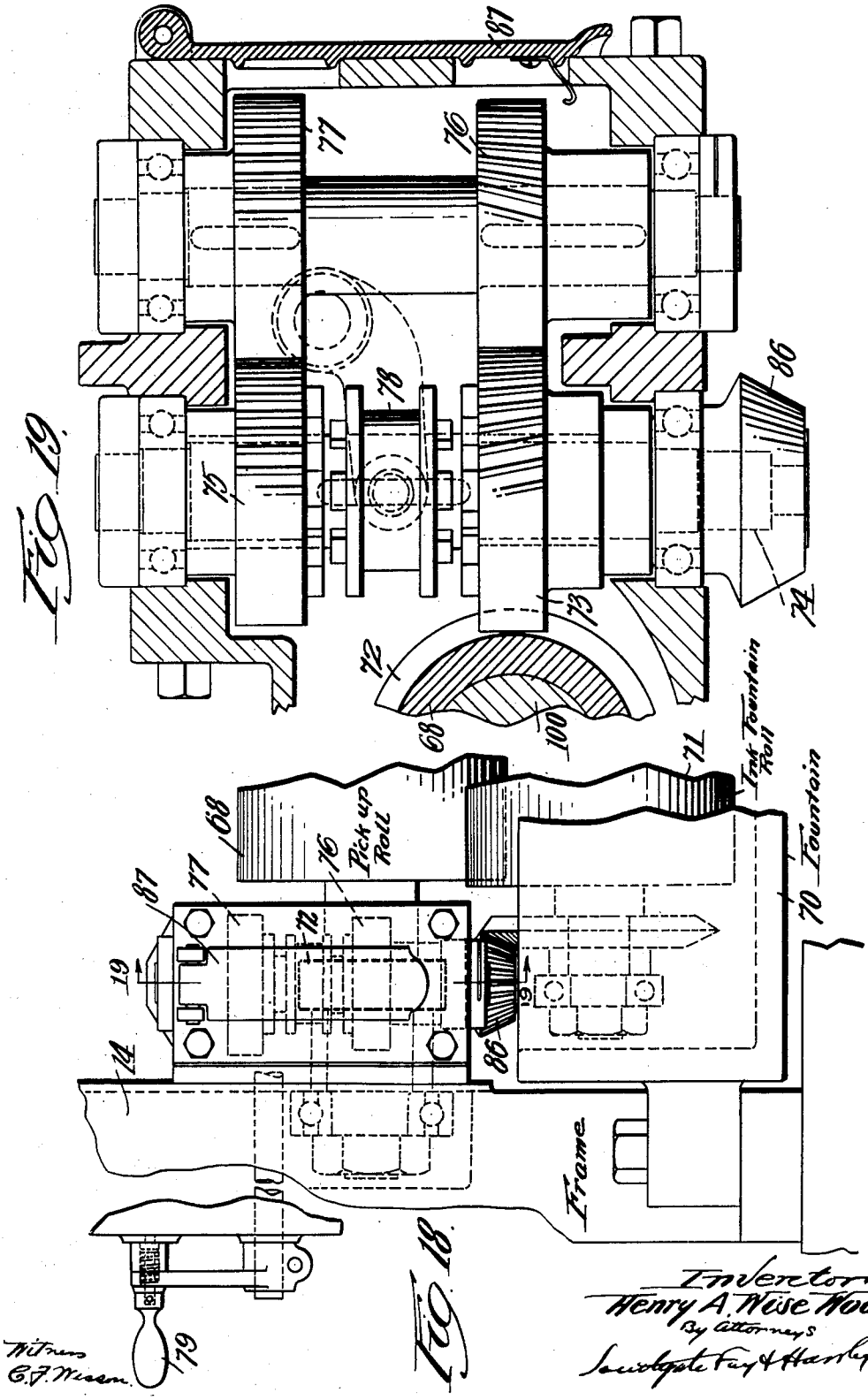


Fig. 18.

Fig. 19.

Witness
C. J. Nissen.

Inventor.
Henry A. Wise Wood
By Attorneys
Lowdale Fay & Hartley

March 8, 1932. H. A. W. WOOD 1,848,591

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Fig. 22.

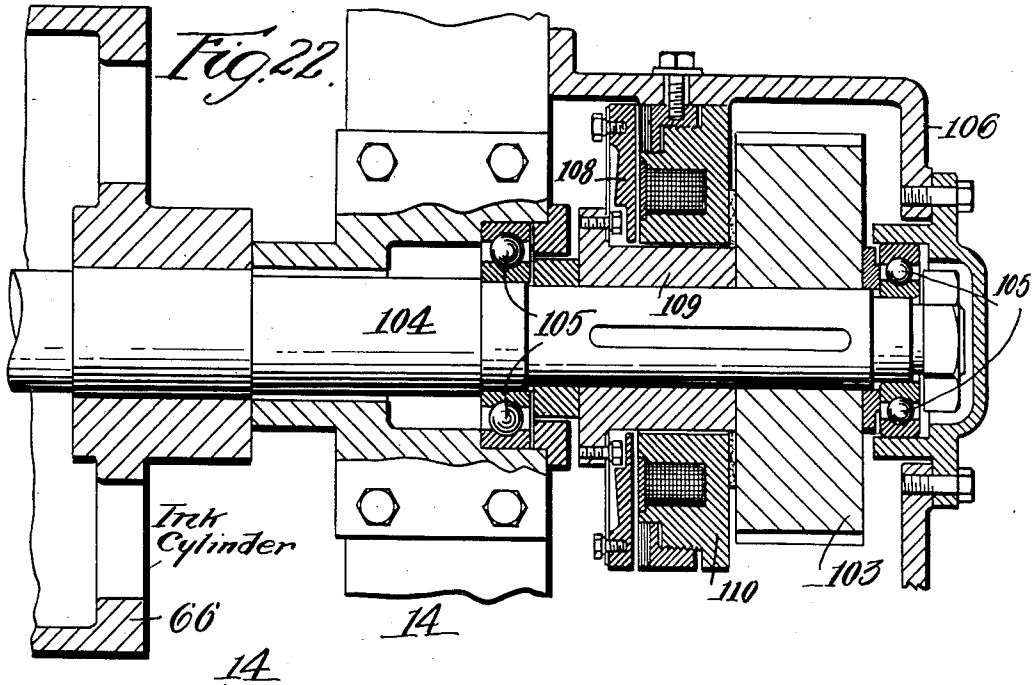


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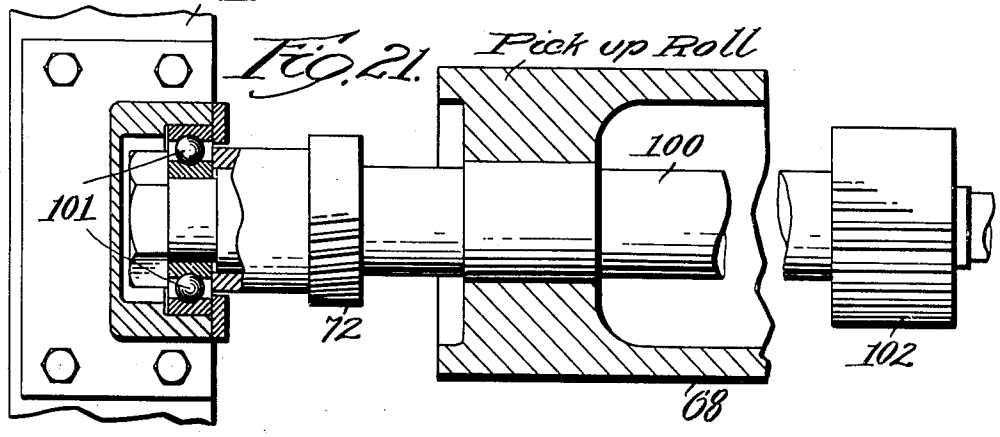
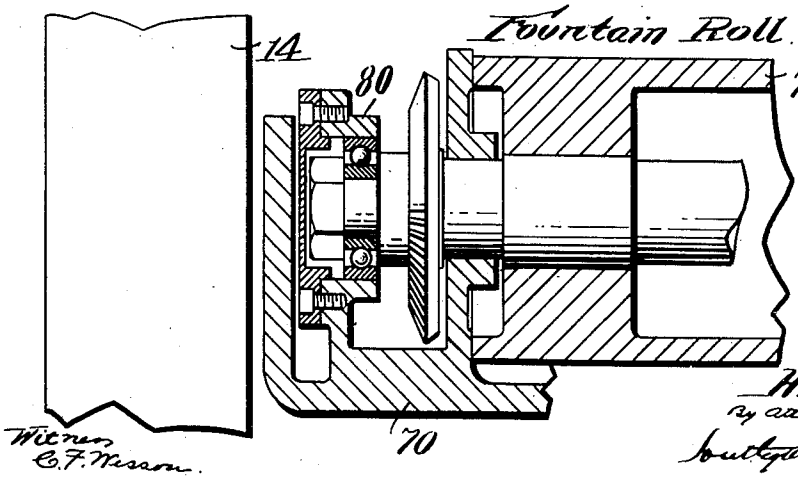


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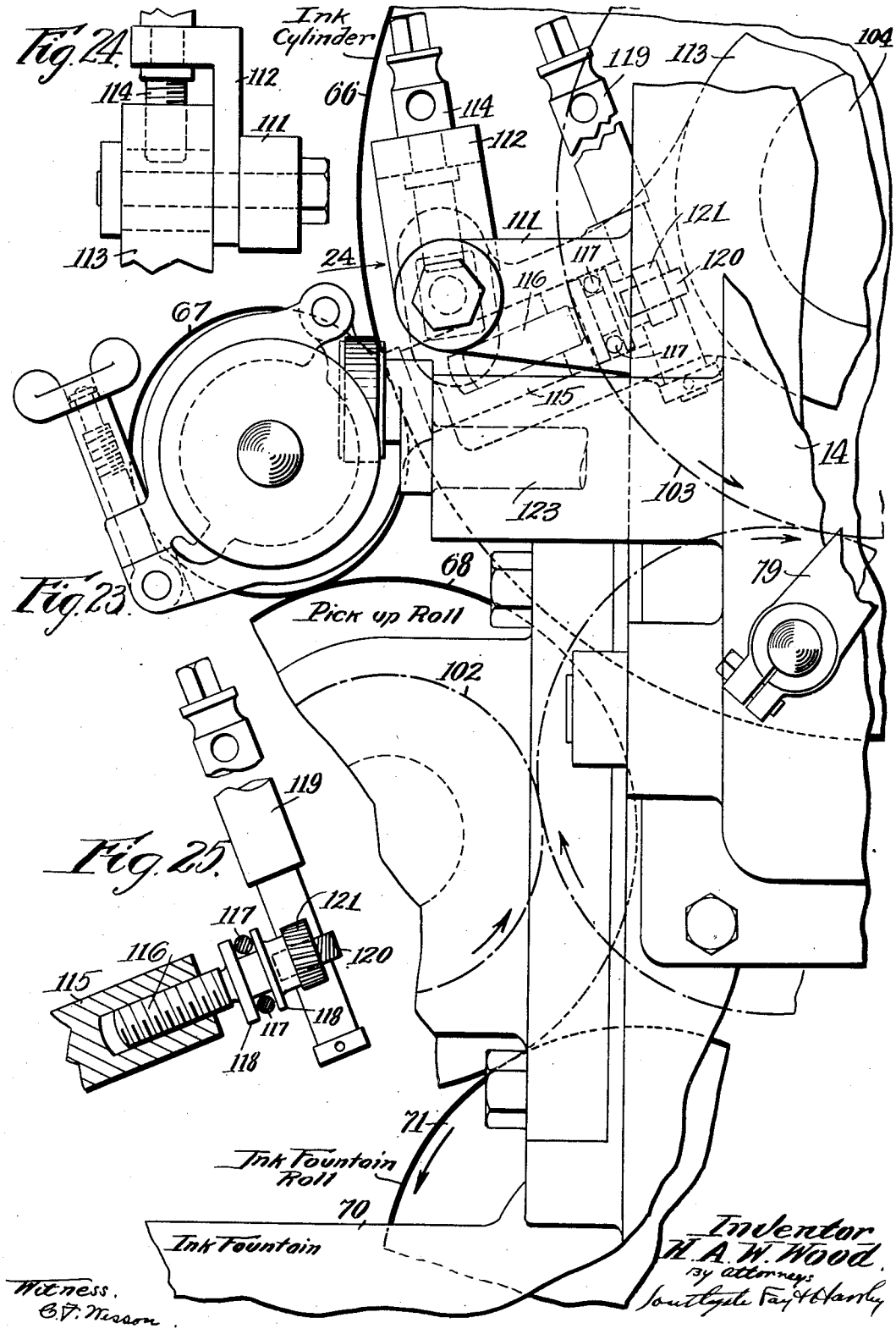
Witness
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Inventor
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By attorneys
Coudert Fay & Harby

March 8, 1932. H. A. W. WOOD 1,848,591

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March 8, 1932. H. A. W. WOOD 1,848,591

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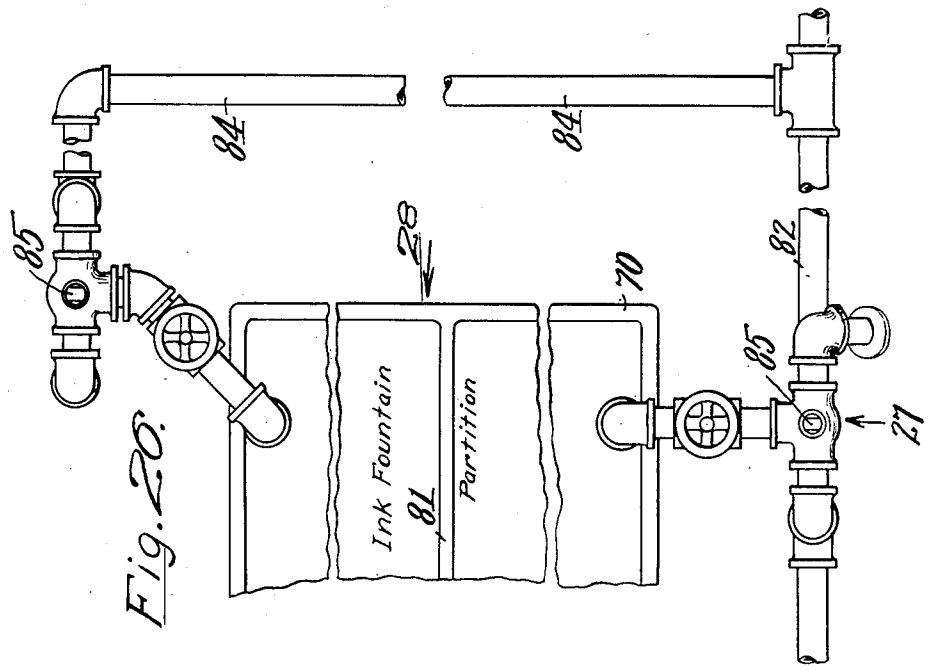


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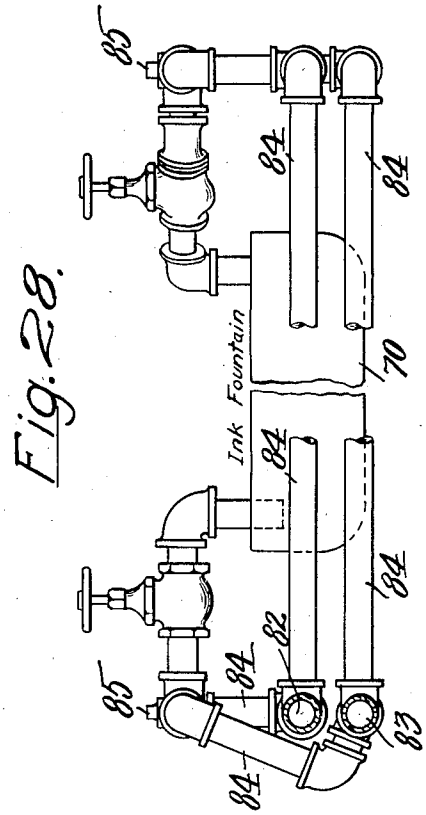


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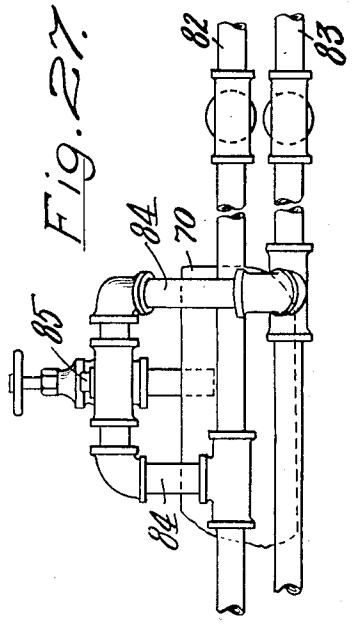


Fig. 27.

Witness
C. F. Mason.

Inventor
Henry A. Wise Wood
By attorneys
Southgate Fay & Hartley

March 8, 1932. H. A. W. WOOD 1,848,591

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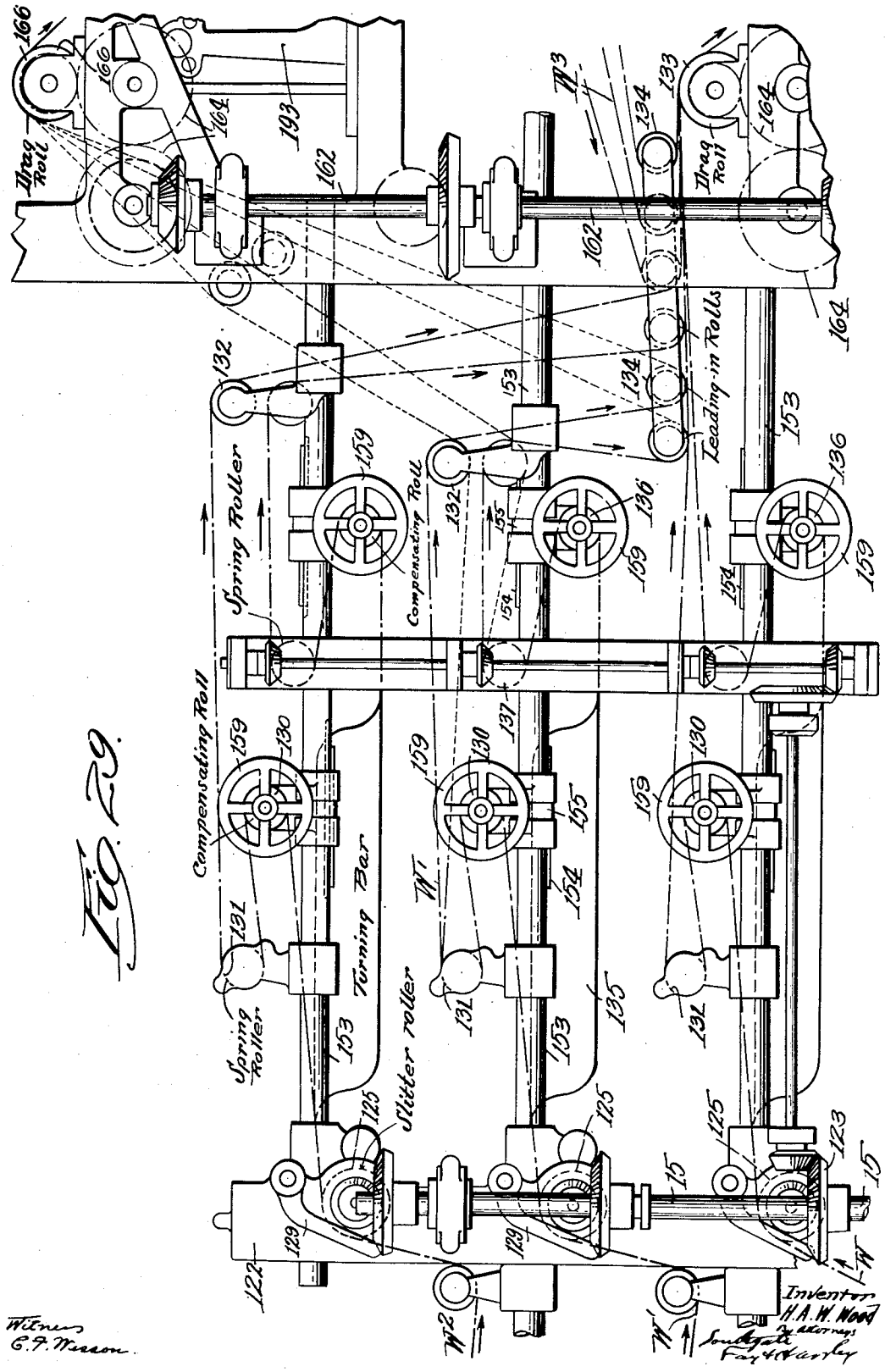
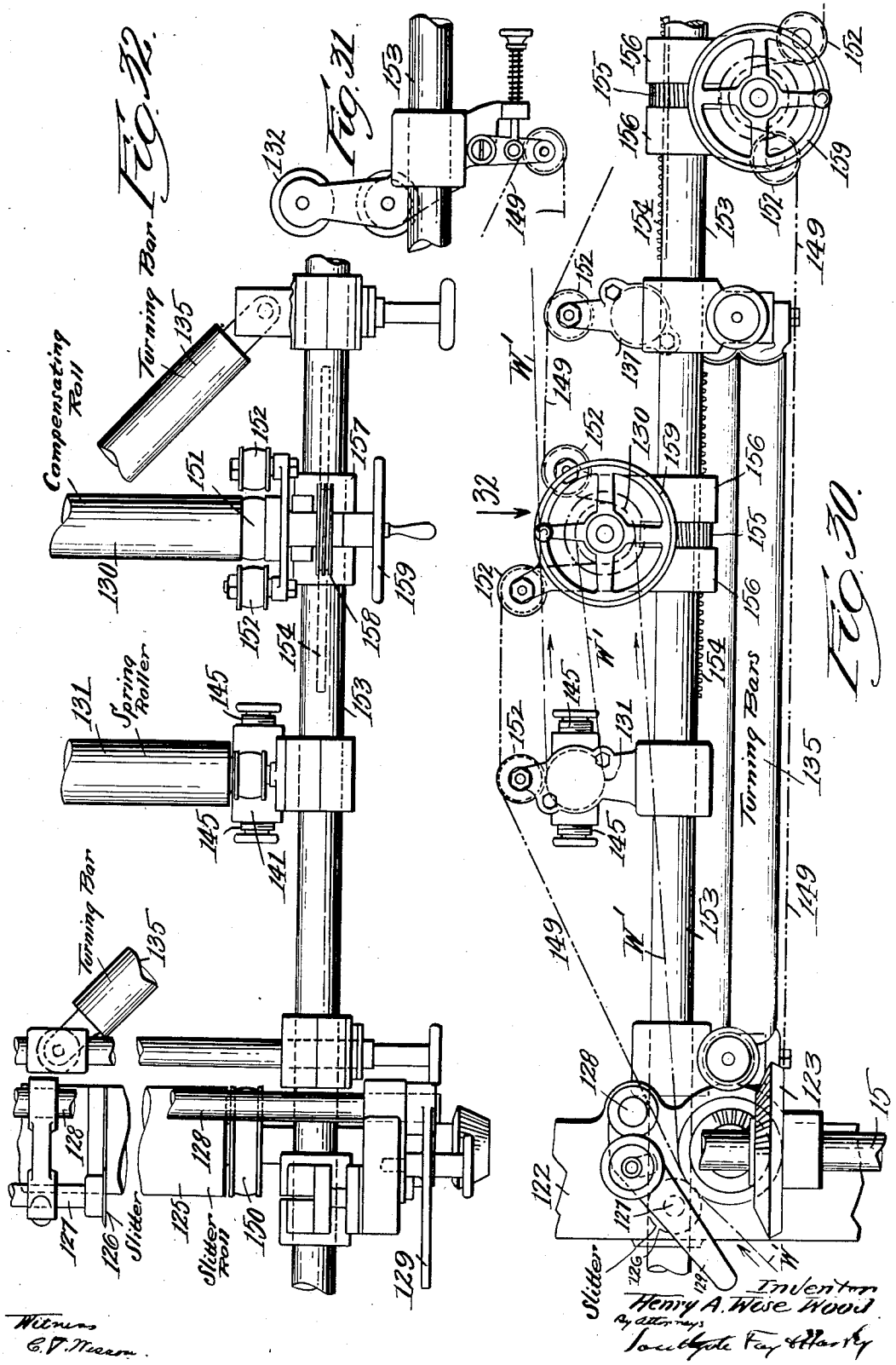


Fig. 29.

March 8, 1932. H. A. W. WOOD 1,848,591

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March 8, 1932. H. A. W. WOOD 1,848,591

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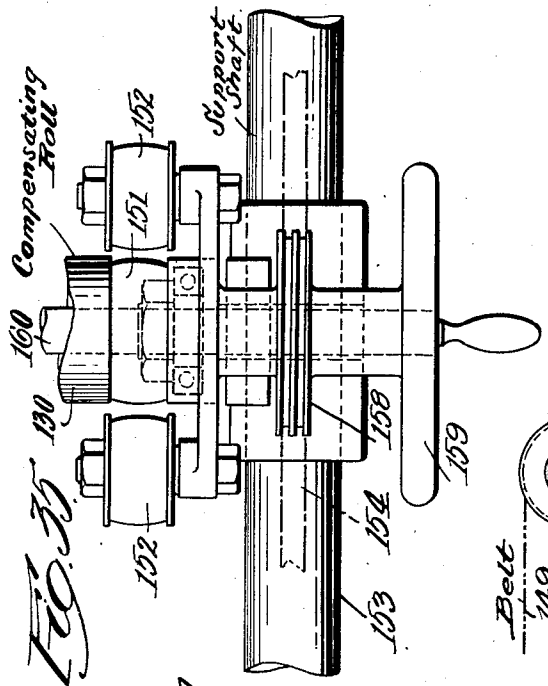


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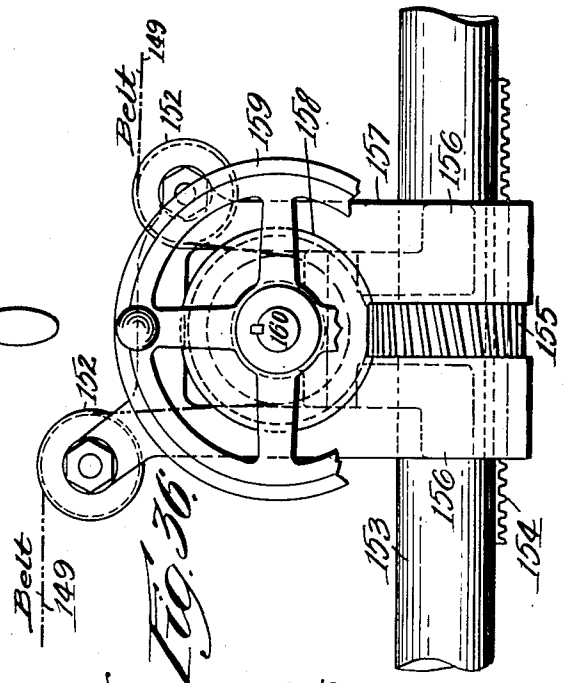


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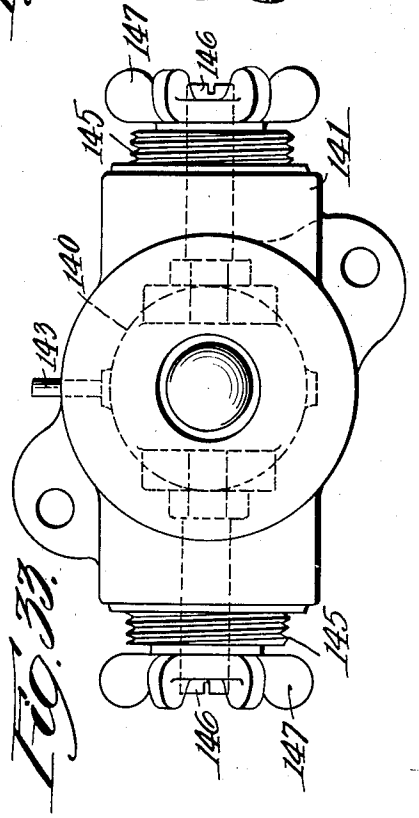


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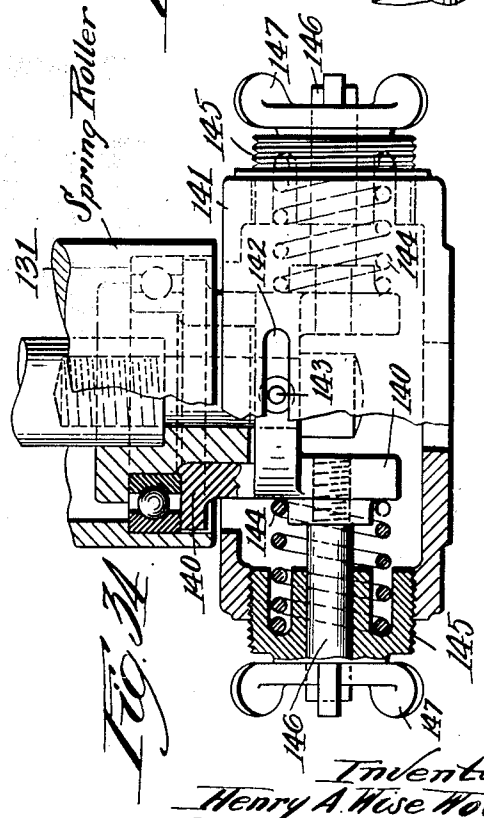


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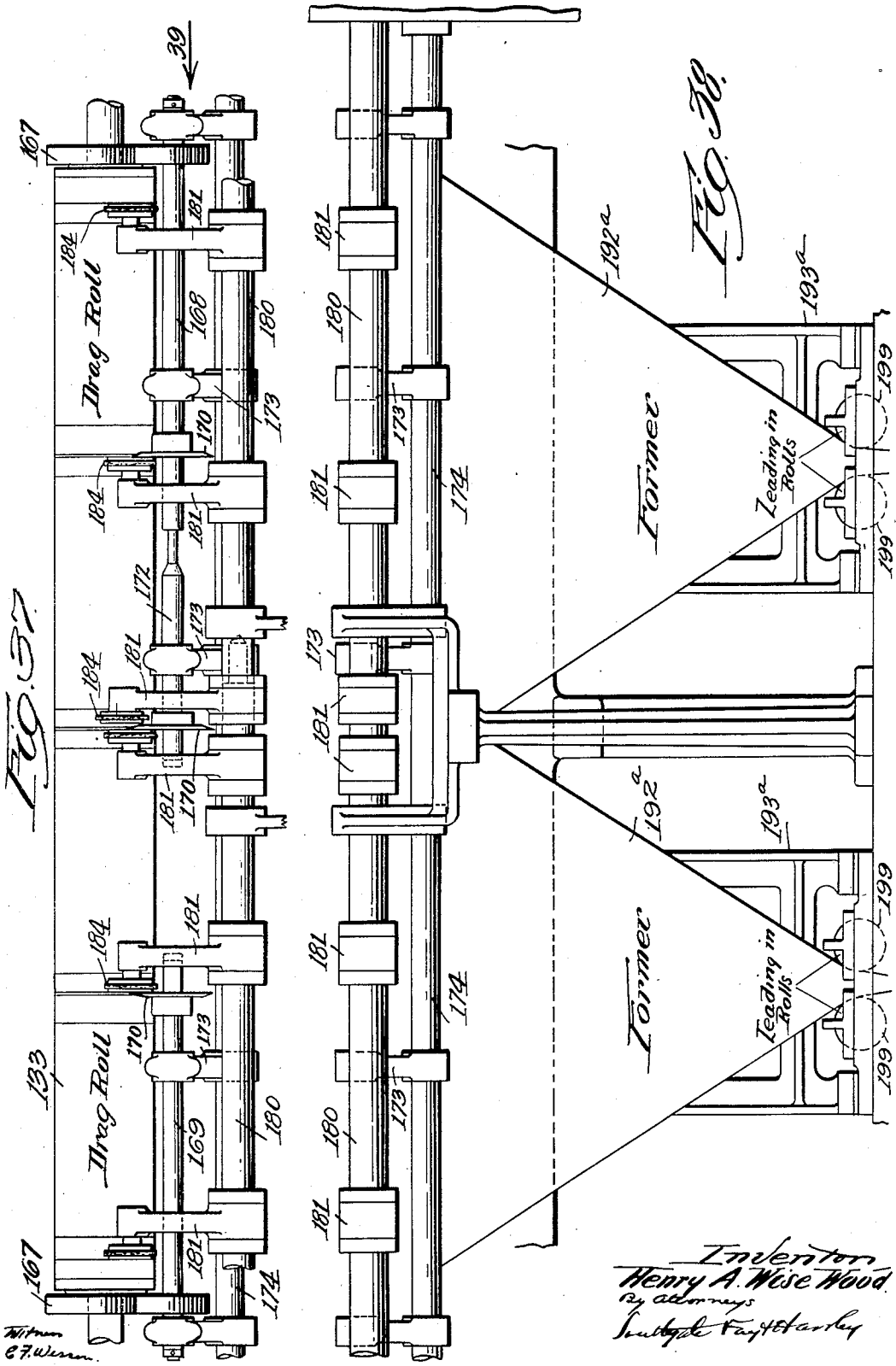
Witness
C. F. Wesson

Inventor
Henry A. Wise Wood
By attorneys
Landgate Fay & Hartley

March 8, 1932. H. A. W. WOOD 1,848,591

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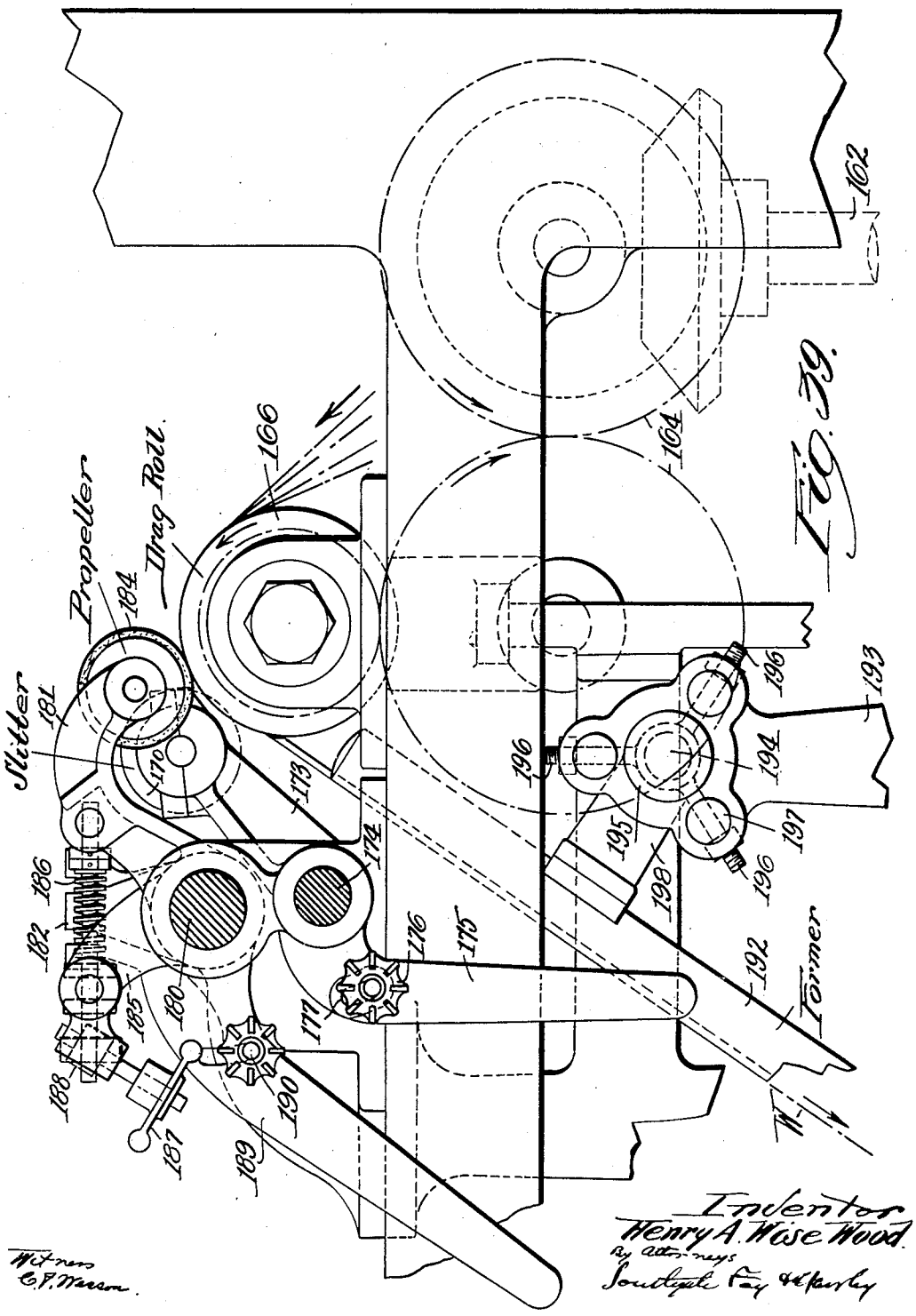


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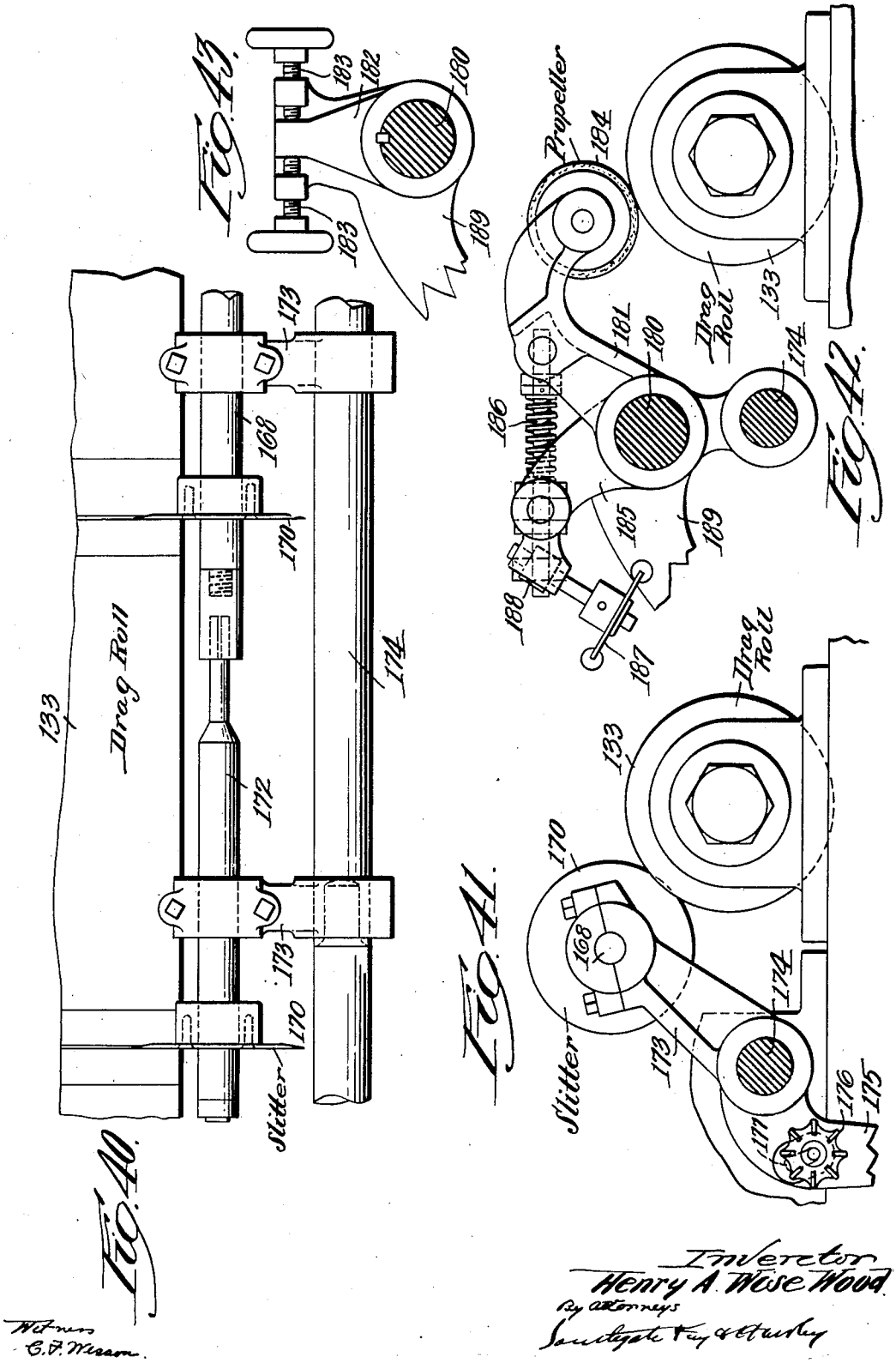
Witness
C. F. Mason.

Inventor
Henry A. Wise Wood
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Southgate Fay & Hopkins

March 8, 1932. H. A. W. WOOD 1,848,591

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Witness
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Sandlyste Kay & Hurley

March 8, 1932. H. A. W. WOOD 1,848,591

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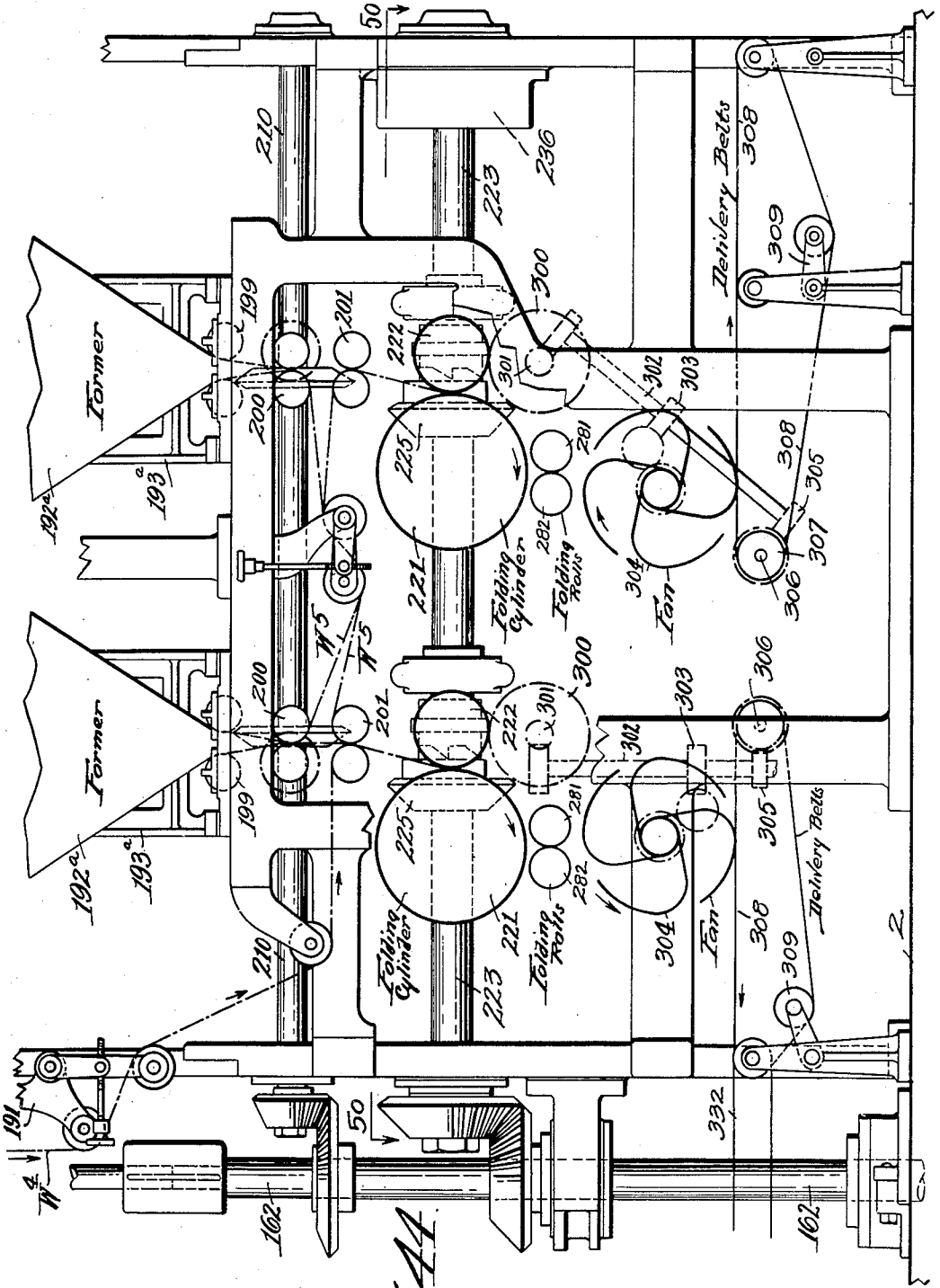


Fig. 44.

Witness
G. F. Mason.

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Henry A. Wise Wood
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Southgate Fay & Hartley

March 8, 1932. H. A. W. WOOD 1,848,591

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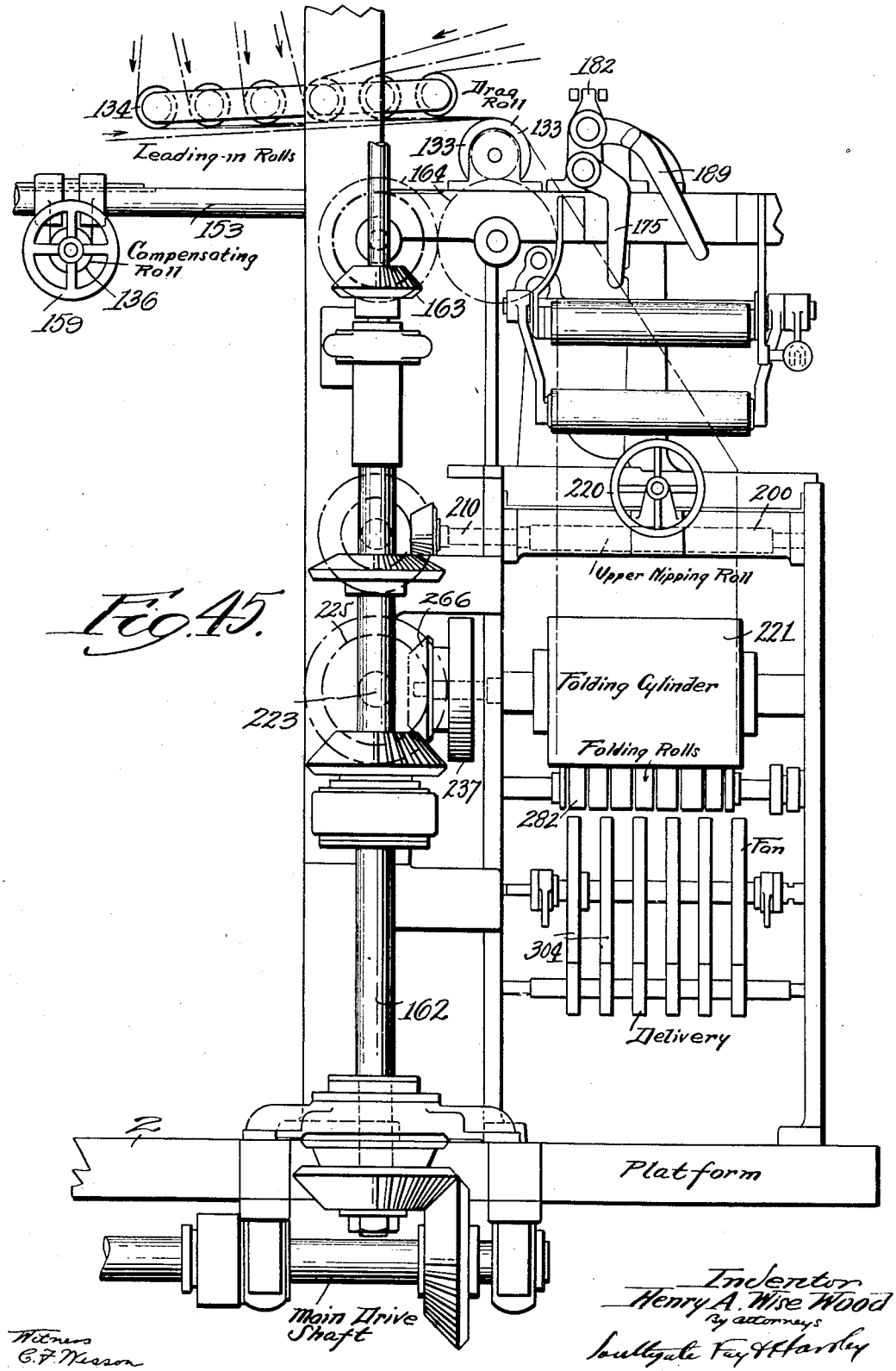


Fig. 45.

Witness
C. F. Nesson

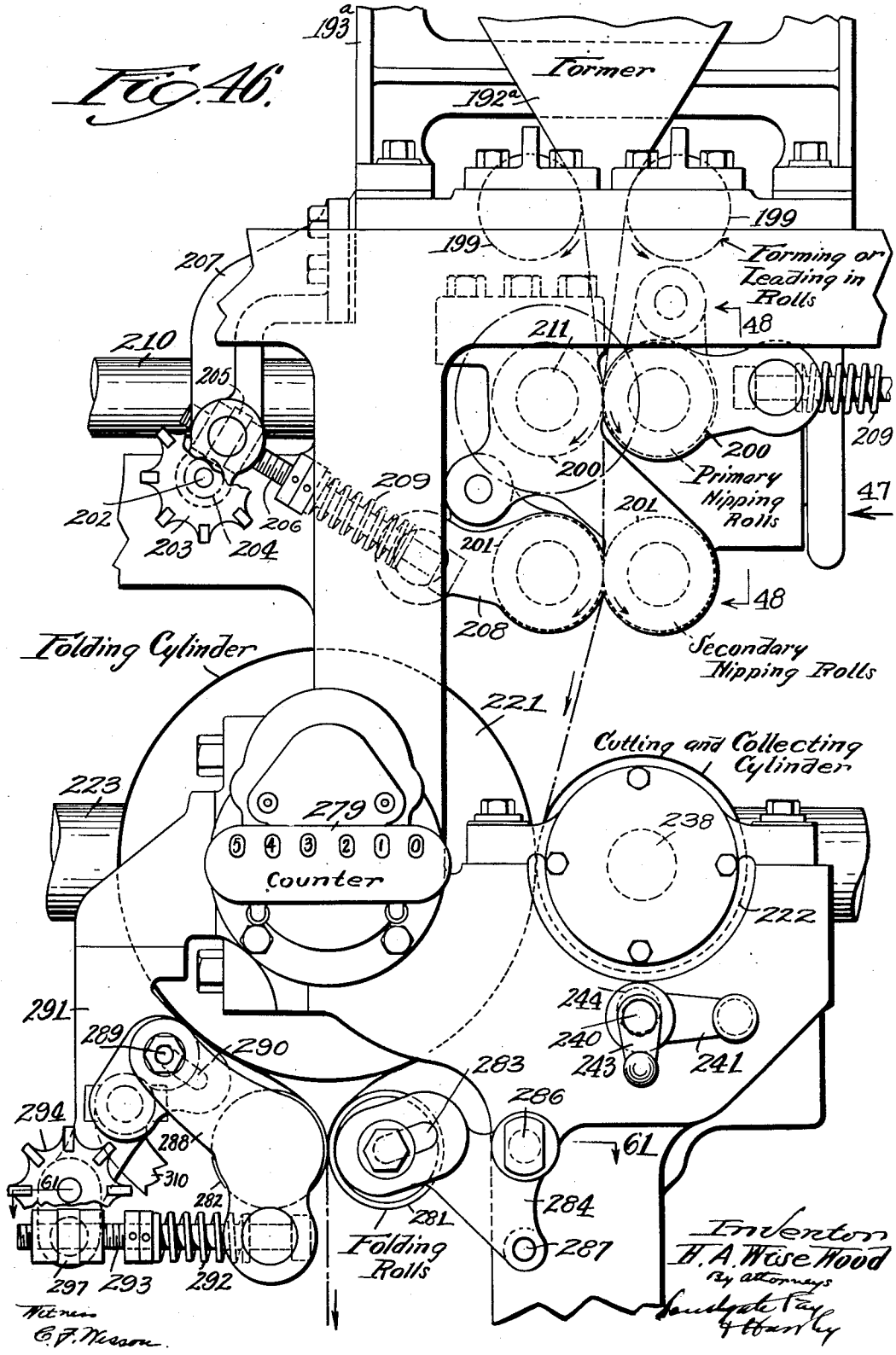
Inventor
Henry A. Wise Wood
By attorneys
Coultyate Fay & Hartley

March 8, 1932. H. A. W. WOOD 1,848,591

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Fig. 46.



March 8, 1932. H. A. W. WOOD 1,848,591

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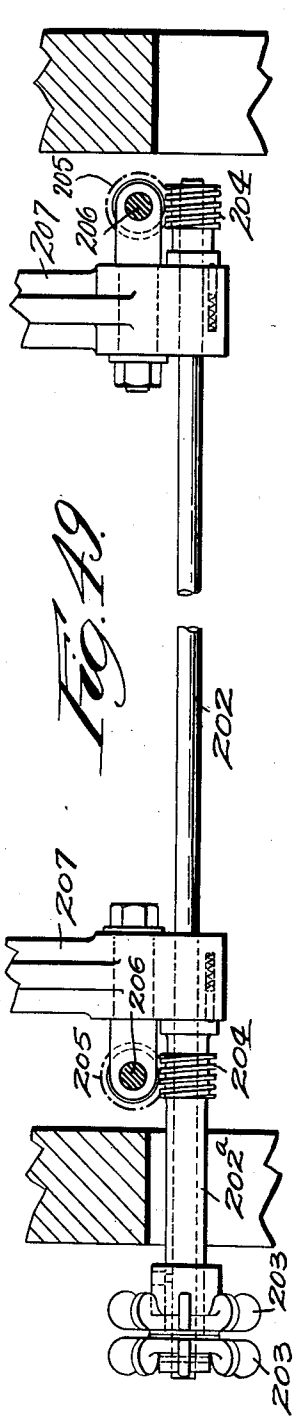


Fig. 49.

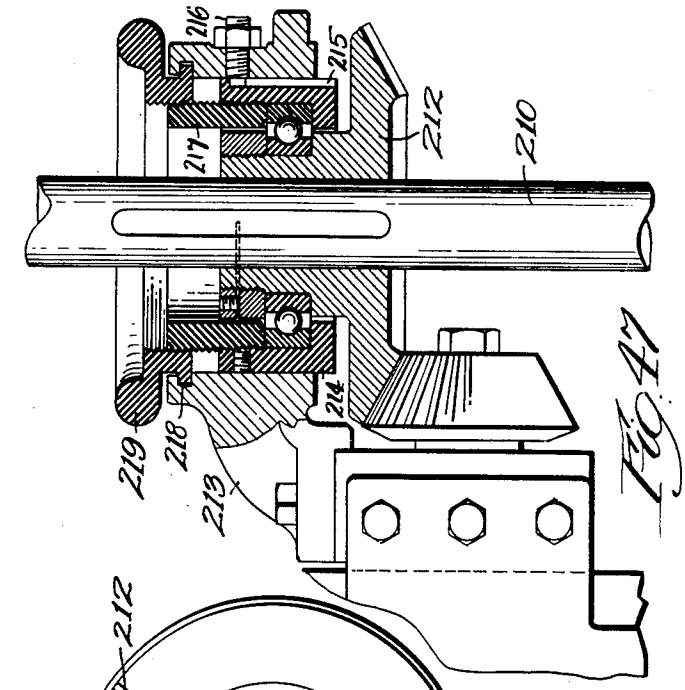


Fig. 47

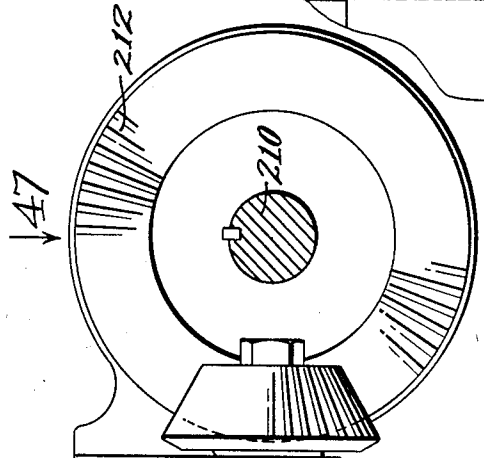
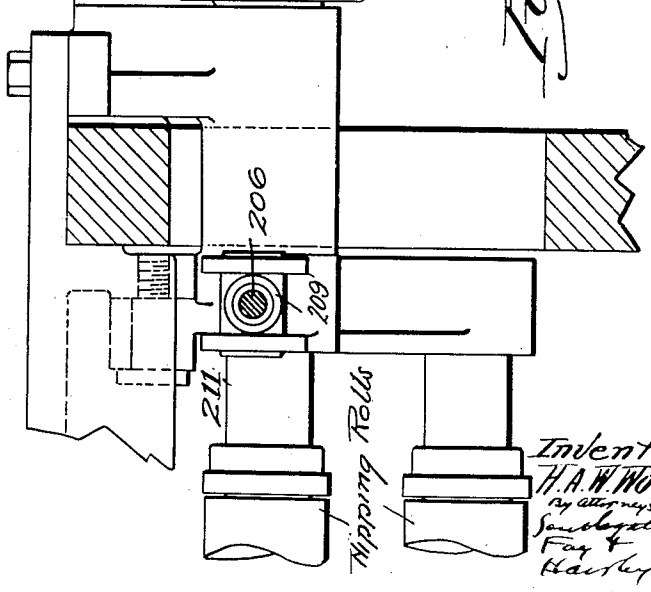


Fig. 48.



Witness
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By Attorneys
Sanborn Fay & Hartley

March 8, 1932. H. A. W. WOOD 1,848,591

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Filed May 26, 1926 29 Sheets-Sheet 23

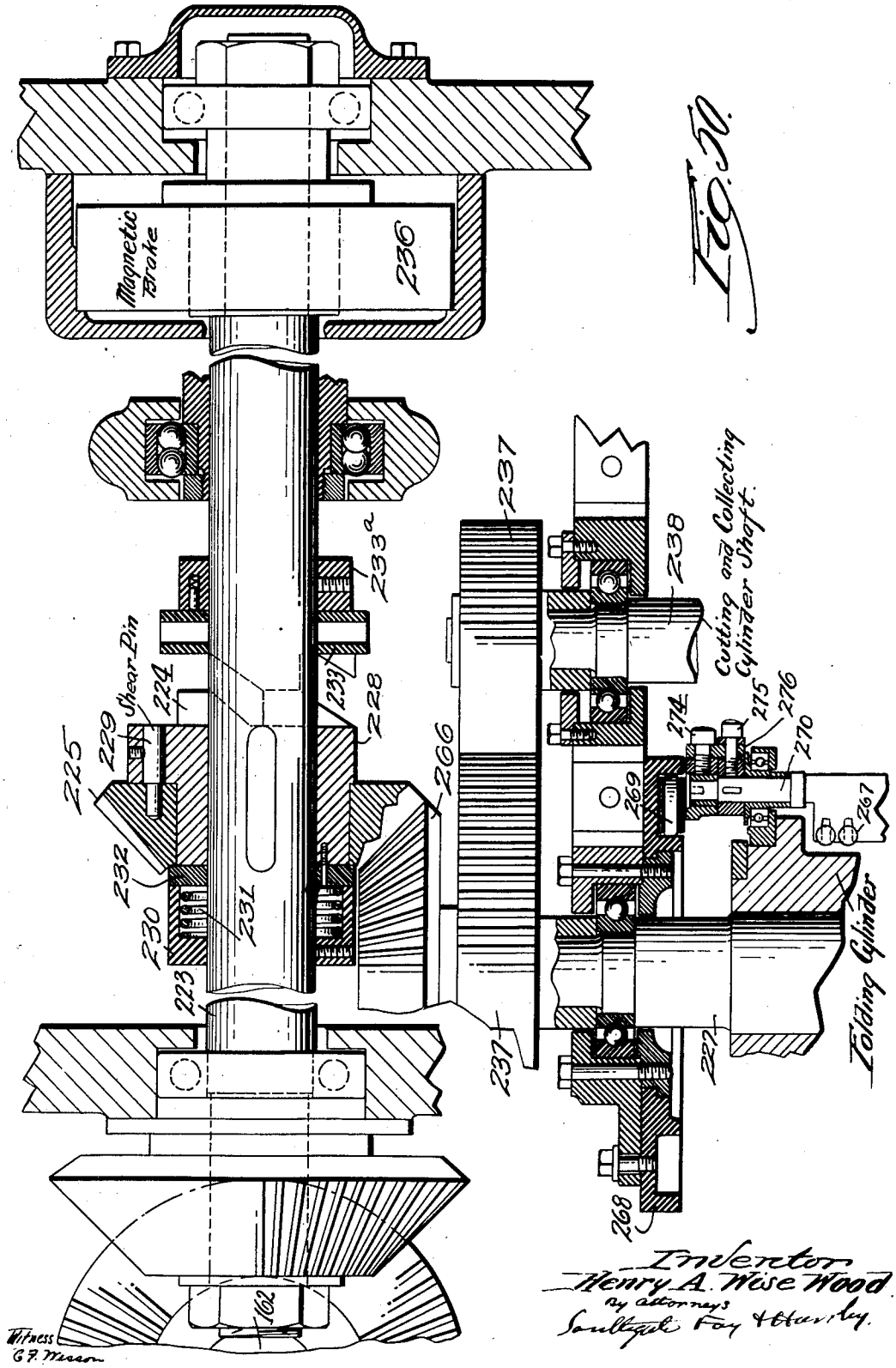


Fig. 30.

Witness
C. F. Mason

Inventor
Henry A. Wise Wood
By attorneys
Coulter Fay & Harding

March 8, 1932. H. A. W. WOOD 1,848,591

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Fig. 52.

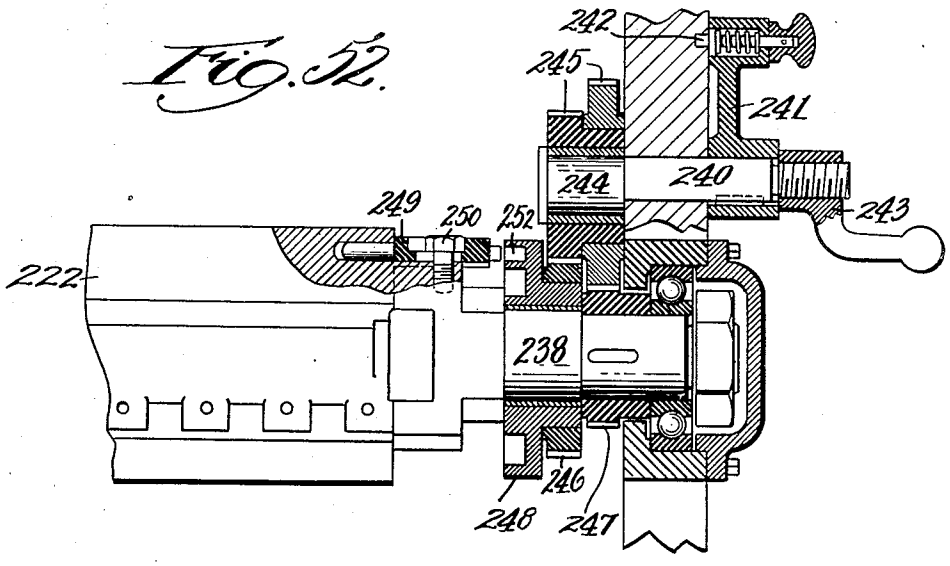


Fig. 53.

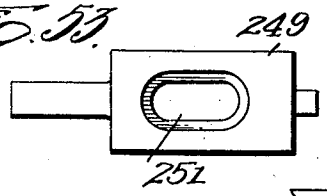


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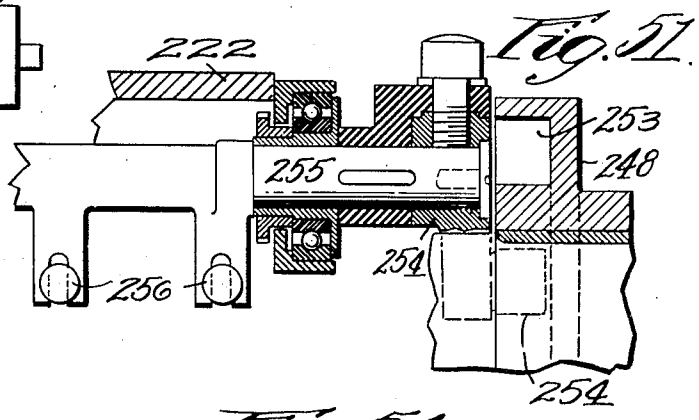


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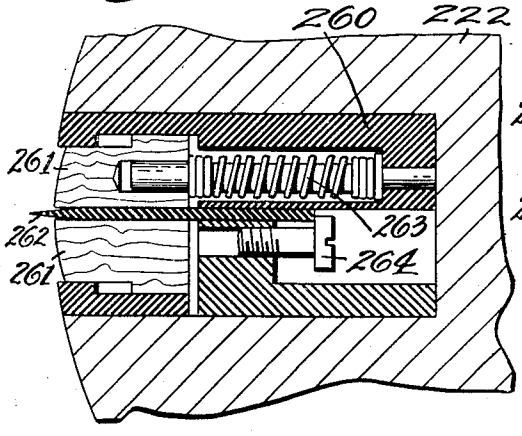
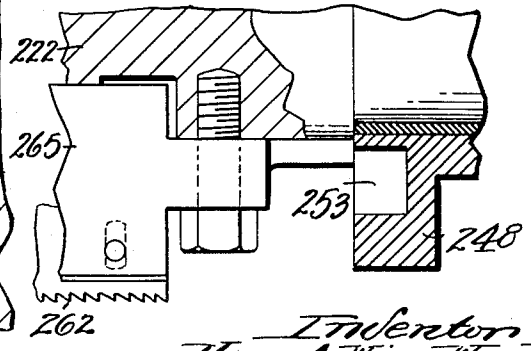


Fig. 54.



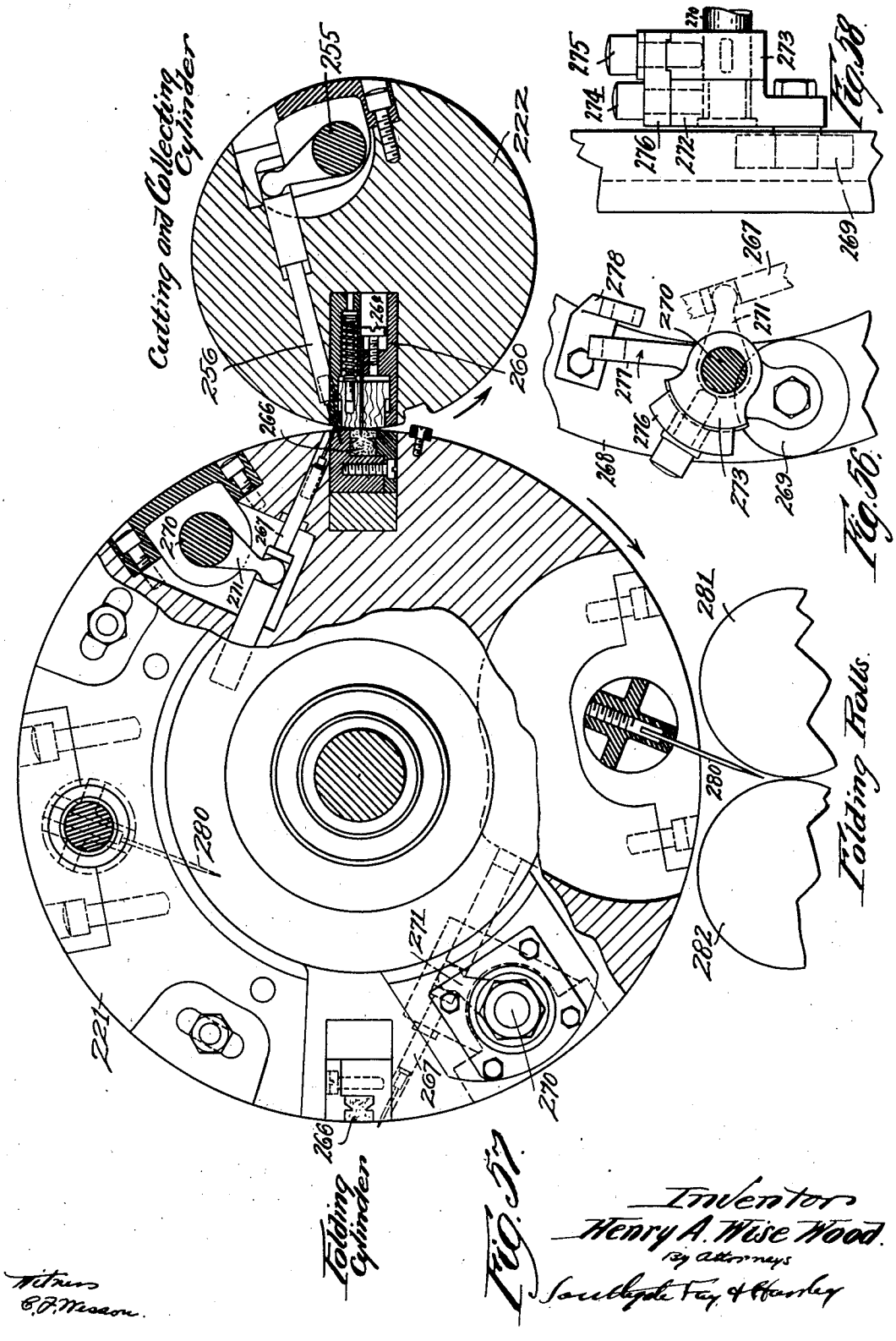
Witness
C. F. Wesson

Inventor
Henry A. Wise Wood
By attorneys
Lothrop Fay & Harby

March 8, 1932. H. A. W. WOOD 1,848,591

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March 8, 1932. H. A. W. WOOD 1,848,591

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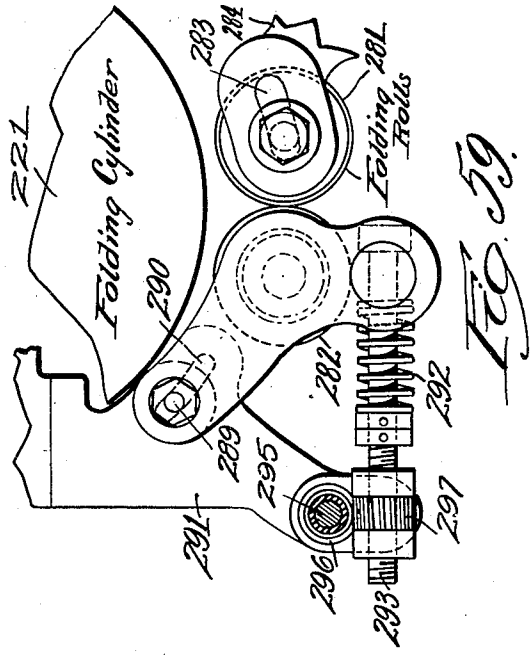


Fig. 59.

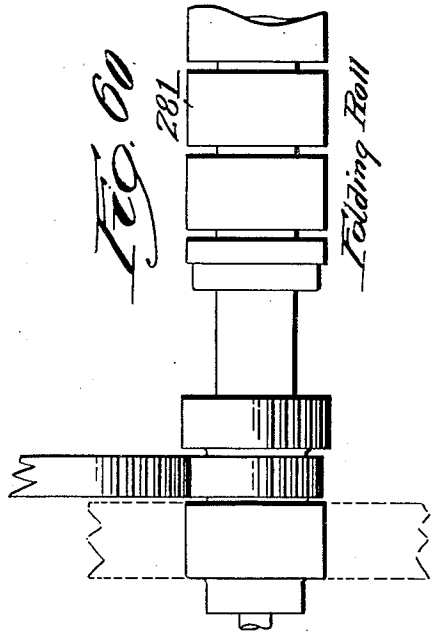


Fig. 60

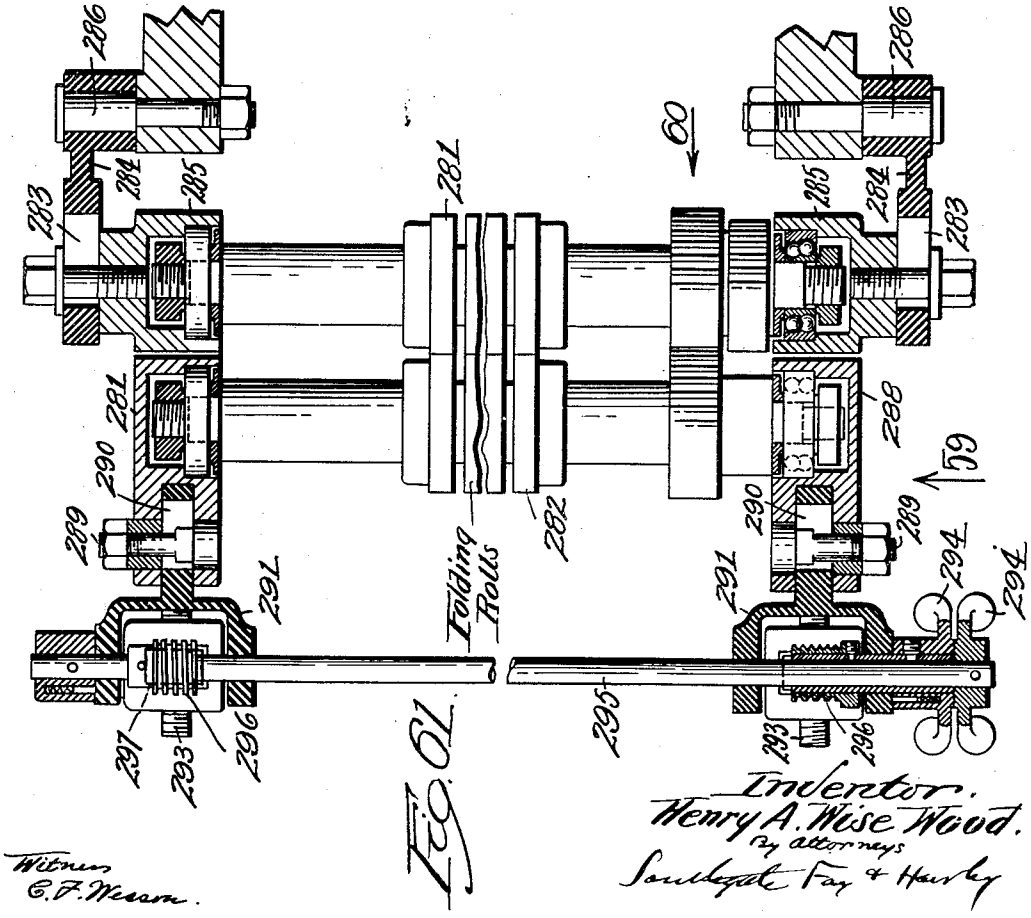


Fig. 61.

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March 8, 1932. H. A. W. WOOD 1,848,591

HIGH SPEED PRINTING PRESS

Filed May 26, 1926 29 Sheets-Sheet 27

Fig. 63.

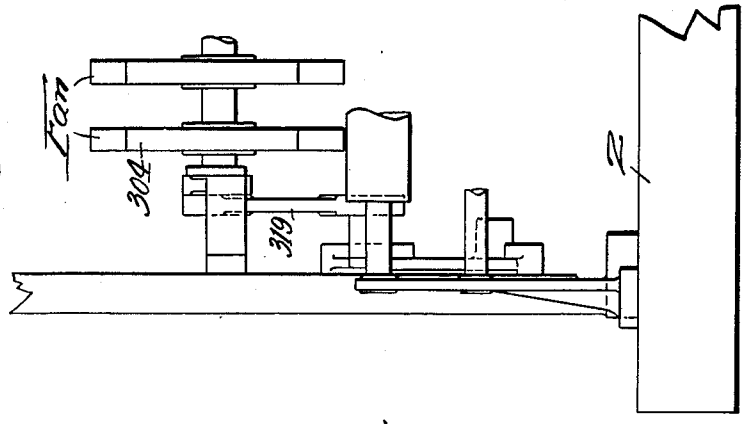
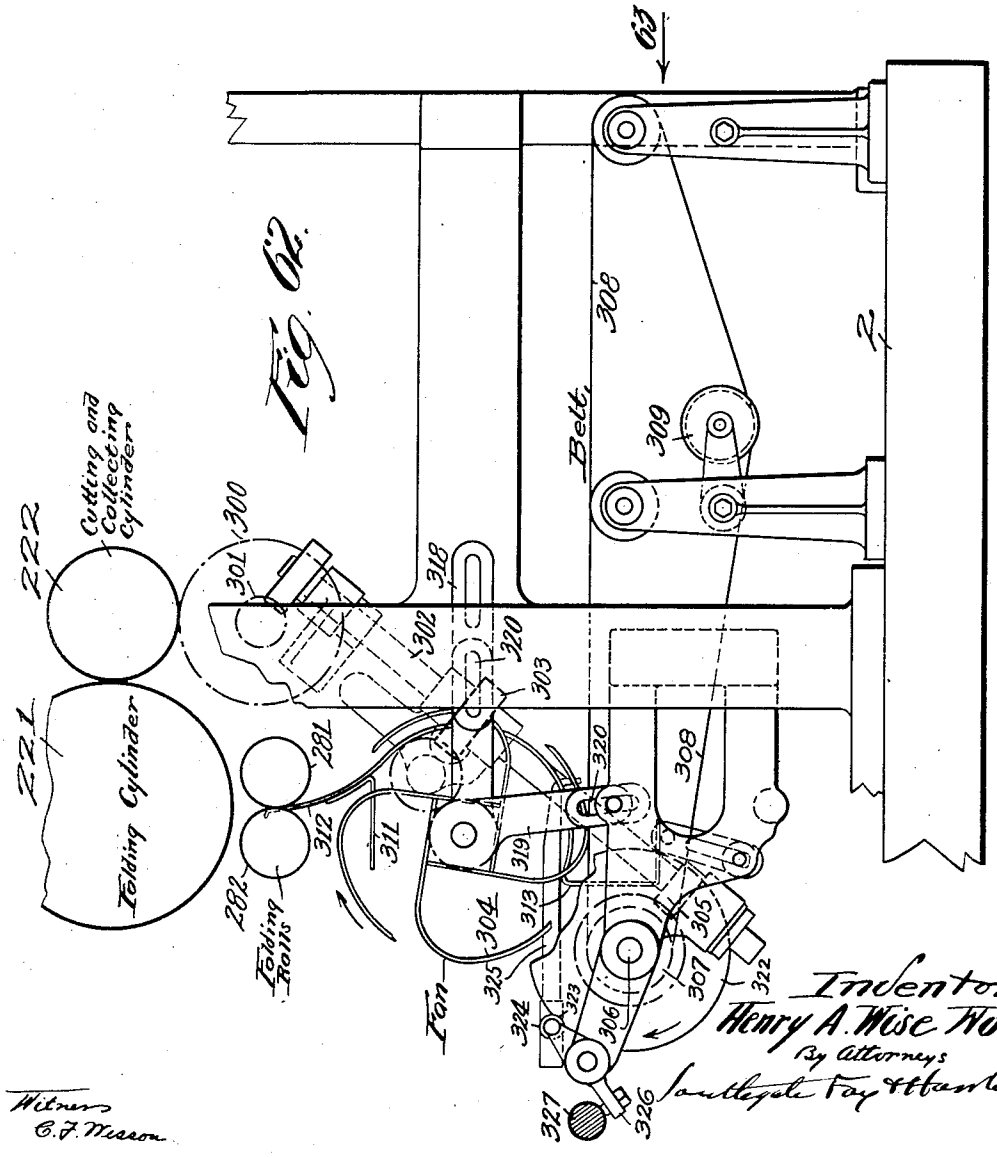


Fig. 62.



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HIGH SPEED PRINTING PRESS

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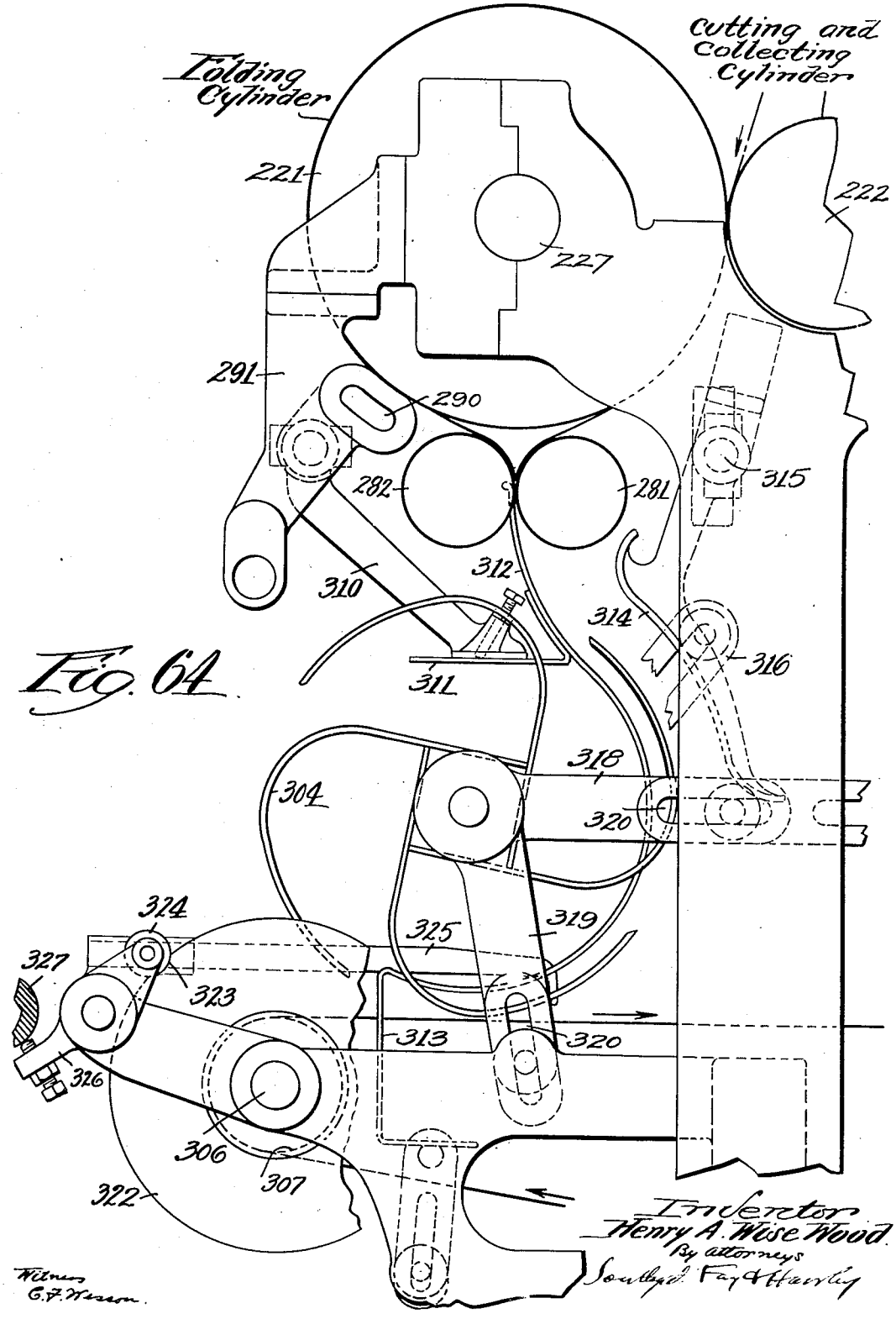


Fig. 64.

March 8, 1932. H. A. W. WOOD 1,848,591

HIGH SPEED PRINTING PRESS

Filed May 26, 1926 29 Sheets-Sheet 29

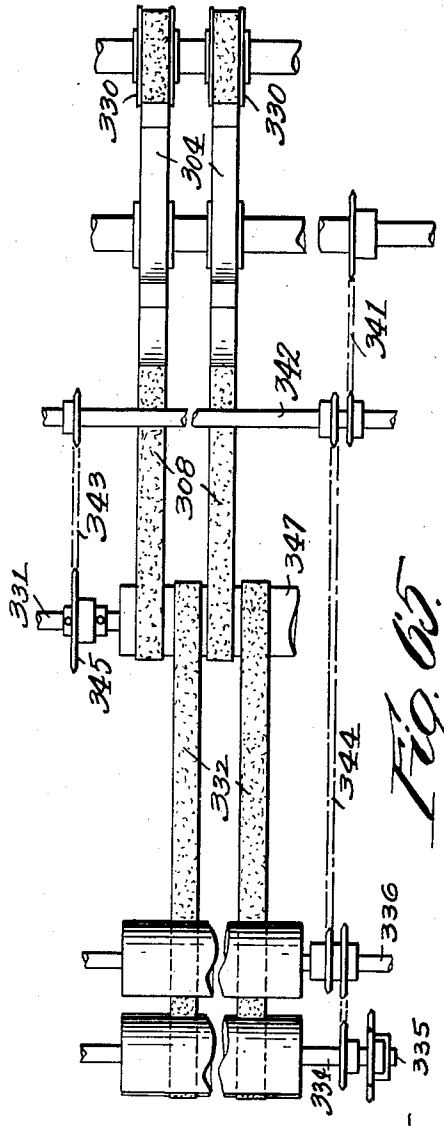


Fig. 6B.

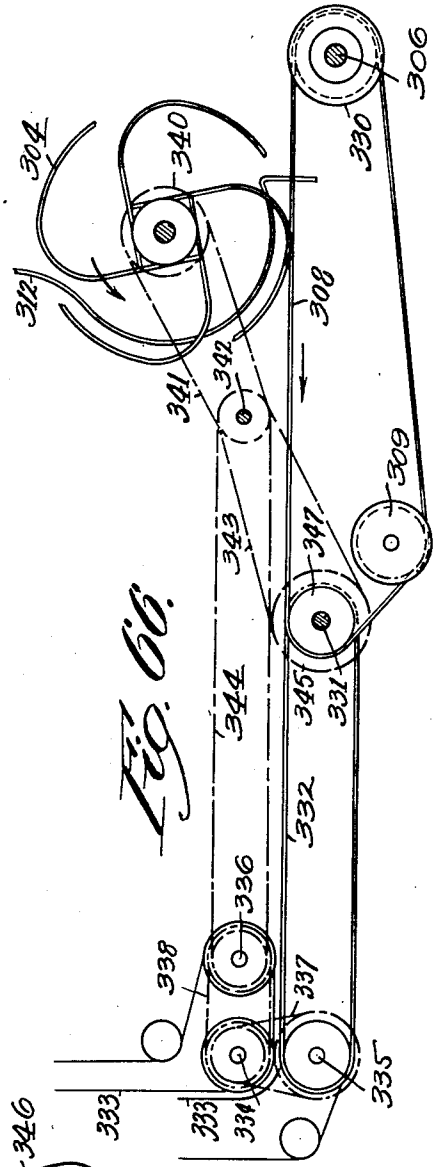


Fig. 6C.

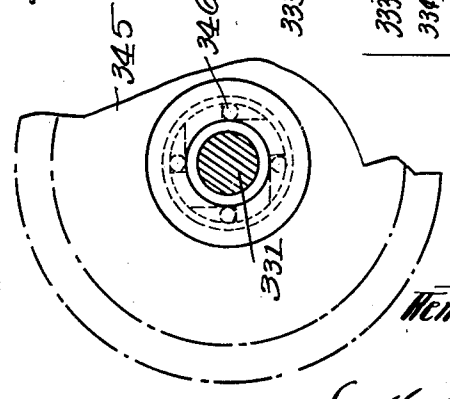


Fig. 6A.

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Patented Mar. 8, 1932 1,848,591

UNITED STATES PATENT OFFICE

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HIGH SPEED PRINTING PRESS

Application filed May 26, 1926. Serial No. 111,787.

This invention relates to a multi-unit press comprising a number of individual press units cooperating with each other to enable them to be operated together at a high speed for producing simultaneously a number of newspapers each having a large number of pages. The press units are shown as arranged in groups so that they can be connected in the form of four 24 page presses or sextuples, three 32 page presses or octuples, two 40 page presses or decuples, or two 48 page presses or double sextuples, and other combinations if a smaller product is to be produced. These statements represent the principal objects of this invention, but it has several others. They comprise the arrangement of the various units of the press with folders, in some cases placed between the units or groups, so as to take care of webs which are fed to the folder from the printing units in front of it as well as those behind; to provide connections by which several motors can be used to drive the units and groups and connect them up in various ways so as to make the whole press flexible to produce the different products above mentioned; to provide for making these changes in a very simple manner; to provide means for feeding the paper into all the press cylinders at the proper speed so as to relieve the paper from any internal tensions to which it may be subjected; to provide proper adjustments and guiding means therefor so as to secure any desired tension on the web, as it enters the press; to provide regulation of the tension under the control of the operator and means for equalizing any strains that may be due to uneven winding of the paper rolls; to provide an arrangement of clips on the plate cylinder that will permit the printing of the product with as narrow a margin as may be desired; to provide a plate cylinder with as few recesses as possible to secure a more solid support for the plates; to provide for applying brakes to each active heavy revolving member simultaneously and magnetically to bring all parts of the press including the inking mechanism and folder to a stop at the same time, thus relieving the strain produced in moving such heavy revolving bodies to a stand-still and avoiding the breakage of the gears which connect the parts and of the web, and in general to provide means whereby all the elements are cooperatively connected and many of them can be thrown out at times to avoid injury to the press or product.

Other objects and advantages of the invention will be described hereinafter.

Several features are shown in this case which are claimed by themselves in one or more of my co-pending applications and patents as follows: Patent No. 1,584,828, May 18, 1926; 1,678,896, July 31, 1928; 1,684,901, Sept. 18, 1928; 1,720,776, July 16, 1929; 1,737,628, Dec. 3, 1929.

These are not claimed herein by themselves for that reason but in some cases they cooperate in a new way with the other parts and are claimed herein in combination.

Reference is to be had to the accompanying drawings in which

Fig. 1 is a diagrammatic plan showing a battery of presses and folders consisting of twelve printing units and four sets of folders showing them connected in accordance with this invention in double sextuples;

Fig. 1[a] is a plan of the same battery showing the units connected in the form of decuples, two of the printing units being left idle;

Fig. 1[b] is a similar view showing the press connected up as octuples;

Fig. 1[c] is a similar view showing the units connected up in sextuples;

Fig. 2 is a diagrammatic side view of one of the units and folder and part of another unit;

Fig. 3 is a side view of means for operating and adjusting the propelling belts;

Fig. 4 is a side view, diagrammatic in part, showing the arrangement of the printing cylinders and various parts of the inking mechanism;

Fig. 5 is an end elevation of the eccentric boxes for the plate and impression cylinders;

Fig. 6 is a sectional view of one of these boxes on the line 6—6 of Fig. 5;

Fig. 7 is a plan of the plate cylinder showing especially the plate clips thereon;

Fig. 8 is a longitudinal sectional view on the line 8—8 of Fig. 7 on an enlarged scale;

Figs. 9, 10 and 11 are similar enlarged sec-

tional views on the lines 9—9, 10—10 and 11—11 in Fig. 7;

Fig. 12 is an end view of a finger guard located between the plate and impression cylinders;

Fig. 13 is a side view of the same;

Fig. 14 is a view similar to Fig. 12 showing the parts in section and in a different position;

Fig. 15 is a side view of a part of the inking mechanism on the left side of Fig. 4 showing the ink fountain in longitudinal section;

Fig. 16 is a fragmentary plan of the same;

Fig. 17 is a sectional view of the blade and its cooperating parts;

Fig. 18 is a rear view of one side of the ink fountain showing means for varying the speed of the fountain roll to control the supply of ink;

Fig. 19 is a sectional view on the line 19—19 of Fig. 18 on an enlarged scale.

Fig. 20 is a vertical central sectional view at the end of the fountain roll showing the method of supporting it in the ink fountain;

Fig. 21 is a similar view of the bearing for the pick-up roll;

Fig. 22 is a sectional view of the bearing and magnetic brake for the ink cylinder shaft;

Fig. 23 is an end view of part of the inking apparatus on a large scale, showing the adjustment of the distributing roll relative to the pick-up roll and inking cylinder;

Fig. 24 is an end view of a detail, taken in the direction of the arrow 24 in Fig. 23;

Fig. 25 is a side view, with parts in section, of the adjusting rod shown in Fig. 23;

Fig. 26 is a plan of one end of the ink fountain showing the piping for supporting the ink to the two sections thereof;

Fig. 27 is a side view of the same as indicated by the arrow 27 in Fig. 26;

Fig. 28 is a rear end view as indicated by the arrow 28 in Fig. 26.

Fig. 29 is a side view of the upper parts of the press, with some details omitted, showing the bars and compensators for leading the webs from the printing couples and registering them before passing to the folder;

Fig. 30 is a similar side view showing the additional features;

Fig. 31 is a similar view of a part of the same particularly illustrating the belt tightener;

Fig. 32 is a plan of the construction shown in Fig. 30;

Fig. 33 is an end view showing the spring roller and its supports at one end;

Fig. 34 is a plan of the same partly in central section;

Fig. 35 is a plan of the supporting means for the compensating roller;

Fig. 36 is an end view of the same;

Fig. 37 is a plan of the drag roller, propellers and slitters with parts omitted;

Fig. 38 is an elevation of the same showing the formers;

Fig. 39 is an end view of the same from the rear side as indicated by the arrow 39 in Fig. 37 and on a larger scale;

Fig. 40 is a detail view of the slitters and propellers on an enlarged scale;

Fig. 41 is an end view as indicated by the arrow 39 in Fig. 37;

Fig. 42 is an end view showing the relation of the propeller and its supporting elements to the drag roller;

Fig. 43 is a similar view showing the adjusting means for the whole set of propellers;

Fig. 44 is a front view of the press largely diagrammatic;

Fig. 45 is a side view of the same with the former omitted;

Fig. 46 is a front view of one folder on enlarged scale illustrating the cooperating parts of the left hand folder in Fig. 44;

Fig. 47 is a sectional view through the center of the driving shaft of the folder;

Fig. 48 is a sectional view along the line 48—48 of Fig. 46;

Fig. 49 is a plan of the means for adjusting independently the two ends of the nipping rollers;

Fig. 50 is a section taken at the axis of the driving shaft of the folding cylinder to show the various parts connected therewith and illustrating the bearings for the folding, collecting and cutting cylinders and shafts, also in section;

Fig. 51 is a sectional view through the pin shaft showing its bearing and associated parts;

Fig. 52 is a sectional view of the end of the collecting and cutting cylinder and its bearing, showing the method of changing from a collecting to a non-collecting operation;

Fig. 53 is a detail view of part of the sliding lock thereof;

Fig. 54 is a side view of the knife box;

Fig. 55 is a sectional view of the same;

Fig. 56 is an end view of the cam for the folding cylinder;

Fig. 57 is a transverse sectional view of the folding cylinders;

Fig. 58 is an edge view of a portion of the cam thereof with associated parts;

Fig. 59 is an end view of the folding rollers and associated parts;

Fig. 60 is a front view thereof;

Fig. 61 is a plan of the same showing the supporting and bearing devices in section;

Fig. 62 is a side view of the left hand delivery arrangement;

Fig. 63 is a rear view;

Fig. 64 is a view similar to Fig. 62 on a larger scale showing in detail the means for attaching and supporting the paper guides and fan;

Fig. 65 is a plan of the drive for the delivery roller;

Fig. 66 is a side view thereof; and

Fig. 67 is an end view of the sprocket wheel therefor.

General structure

Referring to the first sheet of drawings, I have shown how the units of this press can be connected up in four different ways, but it is to be understood that the invention is not limited to these particular combinations. In Fig. 1 I have shown twelve press units U and four folder units F arranged in four groups. These units are all run by the main shaft which consists of four main sections, S, S', S^2 and S^3, each connected to be operated directly by a motor M, an additional set of shaft sections S^4, S^5, S^6 and S^7, these sections being located in alignment with each other in the order indicated in Fig. 1 and the several sections being connected by clutches C end to end.

In Fig. 1 all the shaft sections of the main shaft are connected by the several clutches so that all of them are driven by the motors. In this case they are in two parts, as the clutch C between the sections S^5 and S^2 is not connected necessarily, although it could be. In this case two main shafts are provided which run all the press and folder units in two series, each series producing a 48 page product and folding it. Each series is made up of two complete groups.

In Fig. 1^a, two of the press units at the center and one folder, which are connected to be driven by the shaft section S^5, are thrown out of operation by disconnecting the clutches at both ends of that shaft. The rest of the units are connected up in two series so as to produce two forty-page products. Each series comprises one whole group and part of another.

In Fig. 1^b all the units are also employed but they are connected up in three sections, each comprising units from two groups. The clutches between the shaft sections S^4 and S' and between the shaft sections S^2 and S^6 are disconnected and the other clutches connected. This provides three main shafts disconnected from each other but running at the same speed, the center one run by two motors and the end ones by one motor each. This produces three 32 page products. In some of the cases, as indicated in Figs. 1^a and 1^b, the product from one press unit has to be run back to a folder which is between two of the press units.

In Fig. 1^c, three of the clutches are disconnected as indicated and the others connected so that each motor runs a separate press comprising one complete group of units. Each press produces 24 page products. It will be understood that other combinations can be employed.

The machinery for this press is all mounted on a single frame 1, or a series of sections constituting the frame. The frames 14 for the various units U are mounted on the frame 1. There is a horizontal platform 2 running preferably the length of the frame and located at the level of the feet of the frames 14 above the floor level for the use of the attendants.

The platform carries underneath it a series of pillow blocks 3 in which the bearings for the main drive shaft sections are located. Several of the sections of this main shaft, one for each press unit, as for example the section S^4 in Fig. 3, carry spur gears 4 which drive secondary driving shafts 5. The secondary driving shaft for each press unit operates a propeller roller by means of bevel gears or in any other simple way. This roller has a series of propelling tapes running around its periphery and supported by propelling tape rollers 7 and a tightening roller 8 in each case. It will be seen that the propelling roller 6 is driven positively from the main driving shaft, therefore it can be driven at web speed or at whatever speed is necessary to relieve the paper web of internal tensions to which it would otherwise be subjected. I have shown an adjusting device 9 for adjusting the tightener roll 8.

In each case, there is a reel 10, diagrammatically indicated, for a series of web rolls R. I have shown three of these rolls mounted on each reel and one of them is shown as delivering the web W at one side in contact with the feeding belts 11. These feeding belts are driven by a chain drive 12 from a sprocket on the shaft of the propelling roller 6. These feeding belts hang against the active web roll and they are rotated at a speed calculated to provide the necessary tension or retardation of the web. They deliver it to the press at web speed. The reel carrying the rolls R is rotatable on a central axis to bring the rolls into and out of position for delivering below the several presses in each case, in a pit if desired. The tension on the web can be varied by swinging the reel 10 carrying the rolls R so that the weight of the feeding belts may be felt to a greater or lesser degree upon the roll which is feeding the press. The operation of the press controls this position to suit the conditions existing. The web W leaving the paper roll passes over a spring-seated tension roller 13 before it comes into contact with the propelling tapes and the propelling roller 6. This roller is spring-seated at both ends to relieve any strain which may be present on account of uneven winding of the paper rolls.

In Fig. 4 I have shown diagrammatically the course of the web through the printing couples of one unit U and also the inking mechanism. Each unit is carried by a frame 14. On one of the main shaft sections is a miter gear driving a vertical shaft 15 which

is the driving shaft for the press unit. This shaft, through gearing 16, drives the printing couples. The two impression cylinders 17 are driven at the same rate in opposite directions and the plate cylinders 18 are driven therefrom at the same speed so that the web passes through one couple and up over an adjustable roller 19 located above the printing couples and between them. This roller is adapted to be moved and fixed in adjusted position to provide for the proper register between the two sets of cylinders.

It is to be noted particularly that the two printing couples are arranged in substantially horizontal position instead of the usual way, one above the other. This avoids the application of the weight of one cylinder to another one underneath it. The springing of the lower cylinder is thereby eliminated as well as the making of the impression uneven from one end to the other and making it difficult to maintain printing pressure. The web is led upwardly from the second couple as indicated in this figure.

The printing couples

The details of each printing couple are shown in Figs. 5 to 14 inclusive. The impression and plate cylinders are mounted in a similar way. Each of these cylinders is provided with a journal 20 located in a box 21. The frame 14 is provided with openings extending all the way through and of uniform cross section so that the box can move longitudinally to adjust the cylinders in alignment with each other. This adjustment is made by screws 22 adapted to engage lugs 23 on the bottom of the box. These boxes are both made eccentric for the purposes fully described in my Patent No. 1,584,828, patented May 18, 1926.

The box 21 of the impression cylinder is held stationary, being provided with a projection 25 cast integral with the box. Through this projection a stud 26 extends and also extends into a hole in the side frame 14. The eccentric box 21 of the plate cylinder is also provided with an integral lug 27 which has a round nut 28 set into it rotatably through which passes an adjusting screw 29. This screw is provided with a shoulder 30 located in the stud 26 through which it passes to prevent the screw itself from having any endwise motion. It is turned by applying a wrench to its square end 31 for adjusting the eccentric box 21 circumferentially as described in my above mentioned patent. The screw 29 can be clamped in any desired position after proper adjustment by means of a sleeve 32 thereon, reaching from the stud 26 substantially to the end of the screw which is provided with a circular groove 33 for receiving a clamp screw 34.

Each of the boxes 21 carries a holder 36 for a back lash ball bearing 37 on the journal 20. These holders have integral portions through which pass adjustment screws 38 threaded into studs 39 carried by the boxes themselves to permit circumferential adjustment individually. The adjustment of the eccentric boxes is maintained by bolt and slot connections 39^a. I will not describe the effects of these features as they are fully described in said patent, but it is to be observed that one of the boxes is held stationary and the entire adjustment is secured by the other and this adjustment is utilized to prevent friaring as in said patent. The eccentricity of the stationary box is utilized for the purpose of taking out whatever back lash may develop in the bearing from wear as also described in said patent.

Further along the journal, the shaft 20 is provided with a magnetic brake. This is in the form of an armature 40 secured to a hub 41, keyed to the journal and supported therefrom by means of an annular plate 42. The other part of the clutch comprises field magnets 43 held in stationary position on the frame 14 by a support 44 to which it is secured by bolts. The wiring for the brake construction is not shown but it is connected with the motor circuits and with other magnetic brakes to be described so that they can all be operated simultaneously. This brake operates in conjunction with the eccentrically adjusted box and its back lash device. When the power to the motor is shut off, the dynamic energy created by the revolving of the armature within the motor is converted into power which magnetically draws the armature against a friction surface 46, bringing the press to a stop. The provision of magnetic brakes on each and every revolving member which has any considerable weight relieves the strain produced in bringing each revolving body to a standstill from the gears which are otherwise expected to absorb this energy. This obviates the frequent breakage of such gears. One the end of the cylinder shaft 20 there is a gear 45 for a purpose to be described.

In Figs. 7 to 11 I have shown the arrangement of clips on each plate cylinder. By reference to the first of these figures, which shows one-half of a cylinder, the other half being identical therewith, it is to be seen that in the center of the cylinder is fastened a margin ring 48. This is of dove-tail section to hold two sets of plates P on opposite sides. It is provided with a base ring 49 sunk down into the cylinder so that the screws 50 for holding the margin ring are not in the plate holding section which projects beyond the cylinder. By providing a groove around the cylinder for the base of this ring, the raised portion of the ring is independent of the diameter or length of the screw heads so that as narrow a margin as may be desired may be had by thinning the projection down to its lowest possible dimension.

In Figs. 9 and 10 is shown one of the intermediate dove-tail clips 51 and the clip holder 52. These clips are of short length and each cylindrical clip holder 52 is let into a round recess 59 driven or bored in the cylinder adjacent to the margin of a plate. These holders have diametrical ways on which the base portions of the clips can be adjusted longitudinally of the plate. The clip is held in position by pins projecting into the base portion 61. The latter is limited in position by two stop pins 53 projecting in opposite directions against the wall of the recess 59 in which the same is located. The holders 52 are secured in place by screws 53.

The end clip or ring 55 shown in Fig. 8 is made up of segments which in the form indicated, occupy one quarter of a full circle each. Therefore, two of these segments hold the end of each plate but each segment is operated by a single screw 56. Each segment is provided with a lip 57 which enters an annular groove turned all around in the end of the cylinder 18. This is for guiding the clip and also preventing its lifting under pressure. The clamp screw 56 is threaded in a round nut 58 which is dropped into a circular hole 62 driven or bored in the cylinder. The screw has a square end and there is space enough to reach it for operation. The construction of these clips provides a plate cylinder with as few recesses as possible. This furnishes a more solid support than usual for each plate.

I have also provided a set of finger guards shown in Figs. 12, 13 and 14 for warning the operator when his fingers come in too close proximity to the bite between the plate and impression cylinder. This guard consists of a very thin tube 60 shown as cylindrical in form. It is loosely suspended on two projections 61 attached to the inside of the frame 14. It is kept in place by a collar 62 on each stud 61. When one collar is shifted to the end nearest the frame, it permits the tube to be taken out by releasing the other end for the purpose of replacement. The tube is made so thin that if it is caught in the bite between the cylinders it will merely be flattened out without any material damage to the plate or blanket. This provides a loose device which will not interfere with the printing but will warn the operator if he gets his fingers into a dangerous position at this point where the surfaces of the adjacent cylinders are moving inwardly toward the bite.

Inking mechanism

The plate cylinder 18 on each side of each unit is provided with a gear 45 on the end which drives the two form rolls 65 and there is gearing also driving a gear 103 on the ink cylinder shaft, the distributing rolls 67 and the gear 102 on the pick-up roll 68. The pick-up roll is located directly over the fountain 70. In this fountain is located the fountain roll 71 as is well understood in this art. The pick-up roll has on its shaft a spiral gear 72 (see Figs. 18 and 19) which drives a complimentary gear 73 loose on a vertical shaft 74. Also mounted loosely on this shaft is a spur gear 75. These gears are connected by speed change back gears 76 and 77 and double clutch 78. On account of a difference in the speed ratios the shaft 74 can be driven at two different rates of speed by throwing the clutch in either direction. The box containing the speed change gears 73, 76, 77 and 75 is closed by a guard or door 87. The clutch is operated by a handle 79 on the frame 14. On the bottom of this vertical shaft 74 there is a bevel gear 86 which drives the shaft of the ink fountain roll 71.

The lower spiral gear 73 acts as a worm wheel receiving power from the worm 72 on the end of the pick-up roller. When the clutch is raised it delivers power to the vertical shaft 74 at a higher speed so that no change is necessary for a change of speed and increase in the amount of ink, except to raise or lower the clutch.

This change in speed of the fountain roller is provided for the purpose of feeding more or less ink regardless of the individual adjustment of the fountain keys so as to provide for printing half tones or illustrations with this simple adjustment, for furnishing additional ink without opening each key on the fountain. This constitutes a method of providing for this change in a much simpler manner than has been used heretofore.

It will be noticed that the fountain roll is driven in this way at one end by a vertical shaft extending down in from above instead of the usual method of driving it by gearing on the end of the fountain roll shaft and outside the fountain. The ink fountain is made so that it cannot possibly permit ink to leak through. It is made different from the ordinary ink fountain by reason of the fact that the shaft of the ink fountain roll does not extend through the wall of the fountain and thus furnish a source of leakage present even in the best machines heretofore. On account of this shaft extending down, no bearing has to be provided through the wall of the fountain, but the bearing 80 is located entirely within the fountain proper. This is shown in Fig. 20 from which it will be seen that the ink fountain 70 is provided with the full bearings 80 inside the fountain box for supporting the shaft of the fountain roll 71. This is duplicated on the other side and a gear which receives power from the pinion 86 is also shown in this figure. On one side I have shown a guard 87a, which of course is also duplicated on the other side, for avoiding the splashing of ink at the side. These guards are mounted on brackets 88 on the frame 14 of the press unit.

The ink fountain 70 (see Fig. 26) is di-

vided into two parts by a partition 81 and ink is fed to the two compartments of the fountain from two supply pipes 82 and 83 which if desired can contain different qualities of ink and which extend along the entire press. These supply pipes deliver through piping 84 controlled by two three-way cocks 85. These three-way cocks are provided for the purpose of admitting either one of the two grades of ink contained within the pipe lines to both compartments of the fountain when desired. In this way the quality of the ink can be varied. The piping 84 of course is located at each ink fountain so that they can be controlled individually. One quality of ink could be supplied to half the press and another quality, or even color, to the other if desired.

The ink fountain is provided as usual with a series of adjusting keys for the blade 90 for each column or other section of the page so that the ink feed for such a column or section can be adjusted at will. These keys have to be made fully accessible to the operator. When the ink in a fountain feeds upwardly, as indicated in Fig. 4, the blade must necessarily be placed within the confines of the press where it is not readily accessible ordinarily. I have provided certain novel features by which the blade can be adjusted from the front. Referring to Figs. 15, 16 and 17 I provide the flexible blade 90 with a series of pins 91 which obviously can be pushed in to bring the blade against the fountain roll at all points. I also provide springs 91ª for pulling the pins out when the pressure is released. These parts have to be on the inner side of the inking device in the press illustrated. These parts are mounted on a frame 89 pivoted at 89ª so that they can be turned back for clearing the blade.

In order to operate the pins 91 from the outer sides of the press units, I provide a series of levers 92, each having a long arm and short arm and pivoted on a cross shaft 93. The short arms bear against the pins 91 individually. Guide plates 94 are provided for supporting the projecting ends of these pins. The long arms of the levers 92 are substantially horizontal and each one is supported by an adjusting screw 95. These adjusting screws extend upwardly from the pivot pins 96 by which they are connected with the arms 92. The adjusting screws are arranged in two rows, each set being carried at the top by a cross bar 97 through which the screws pass. The screws are arranged alternately as indicated in Fig. 16 so that each one can be readily reached by the pressman and operated. Each one is provided with a thumb nut 98 at the top for this purpose. These are accessible from the platform 2 through a trap door 99 located at the end of the ink fountain. This is lifted to expose the entire group of thumb nuts for adjusting purposes. It will be apparent that I maintain the advantages of having the fountain blades at the rear of the fountain and at the same time provide for their adjustment at the front, within easy reach of the operator. In this case, by front I mean the two exposed sides of the press unit.

In fountains of the same general type heretofore employed for this type of press, it has been necessary to bring all of the screws to one side of the press. This makes it necessary for the operator to find the particular screw which he may desire to operate by adjusting the ink on a certain column. On the contrary I have located the adjustments of the otherwise inaccessible fountain blade in alignment with the separate columns or webs. This makes it extremely easy on the part of the operator to find the proper screw which he needs for adjusting the ink on any particular column.

In the fountain I employ a scraper 6ª and screen 8ª as shown and claimed in my copending application Serial No. 738,894 filed Sept. 20, 1924.

The pickup roll 68 is provided with a shaft 100 (see Fig. 21) extending through it, mounted in ball bearings 101, carried on the frame 14 in stationary position. This pickup roll has the gear 102 by which it is driven by a train of gears including the gear 103 on the shaft of the ink cylinder 66. The ink cylinder shaft 104 is also mounted in two sets of ball bearings 105 on the frame and another one on an out-board bearing 106. This gear 103 is located between the two bearings 105 shown in Fig. 22.

The shaft 104 is provided with a magnetic brake to bring the ink cylinder to a stop more quickly than has been possible heretofore. It operates like the brake 40—43 described above. On the end of the shaft, and in fact of each heavy revolving member, a disc 108 is provided fixed to a hub 109 keyed to the shaft. This cast iron disc revolves in close proximity to the field magnet 110 which is held stationary in the out-board bearing 106. This is like the construction shown in Fig. 6 on the plate cylinder. This construction and arrangement is provided at several points on the press.

In Figs. 23, 24, and 25 the method of making certain adjustments in the inking mechanism is illustrated. In the frame 14 are two projections 111 to which are bolted brackets 112. The distributing roll 67 is supported by bearings in sockets 115 carried adjustably by socket holders 113 centered on the shaft 104. The distributing roll has to run in contact with the ink cylinder 66 and the pick-up roller 68 which are both mounted in stationary bearings. Two adjustments are provided for the distributing roller, one to adjust it radially with respect to the pick-up roll and the other radially with respect to the ink cyl-

inder. These adjustments are designed so that they will not interfere with each other. In other words, when one adjustment is made, the changing of the other adjustment will not change the first one. The socket holder 113 is supported around the ink cylinder journal at one end and by poppets and screws 114 carried by the brackets 112 at the other. The operation of these screws will cause the distributing roll to move in a circumferential direction relative to the ink cylinder so that it can move toward or from the center of the pick-up roll.

The adjustment in the transverse direction is secured in the following way: The sockets 115 for supporting the distributing roll are tapped in at their ends and a screw 116 inserted in each one. These screws are held from longitudinal motion by two pins 117 fixed on the frame between two flanges 118 on the screw. The screw is rotated by a socket adjusting rod 119 provided with a spiral gear 120 at its lower end meshing with a similar spiral gear 121 on the screw 116. The adjusting screw rod 119, as well as the screw 114, is provided with a square end and pin hole by which it can be operated easily by the pressman. The rotation of this adjusting rod 119 turns the screw 116 and moves the socket 115 with the socket holder 113 radially with respect to the ink cylinder. This adjustment does not interfere with the previous adjustment of the roller 67 into proper contact with the pick-up roll 68. The distributing rolls, or at least some of them, are reciprocated as usual by crank shafts 123.

It will be seen from what has been said so far that the keys for controlling the supply of ink to the different columns are not only fully accessible to the operator on both sides of the press, but that the blade is brought into contact with the fountain roller in a positive manner, operated from a convenient position and with the adjusting screws arranged in alignment with the several columns or webs to enable the pressman to select the right ones without trouble. Also the fountain roller can be speeded up very conveniently to supply additional ink without opening up each key.

Furthermore, at least two grades of ink can be supplied and each one ready to be used at any time without making any complicated changes. The ink fountain is fully protected against the possibility of any ink leaking through to the web at any point. Furthermore, the magnetic brakes are provided for stopping each heavy unit of the press, including the ink cylinder, at the same time and thus bringing the whole press to a stop without the usual strains and danger of breaking the gears and also the web. The magnetic brake for one part of the device is combined in a novel way with the eccentrically constructed boxes and back lash device. All these improvements are made in the inking mechanism as I have shown above.

Mechanism for transferring the webs from the presses to the folders

Figs. 29 and 30 are of a similar character, but Fig. 30 is on a larger scale, and although the constructions are intended to be the same, several details are entirely omitted from Fig. 29.

From each press unit the driving shaft 15 extends upwardly as shown in Fig. 30 to an upper frame 122 which is supported by several of the frames 14. This shaft is shown as provided with a bevel gear 123 in each case and with several bevel gears 123 in one case in each group. The bevel gears operate a series of guide rollers 124 and slitter rollers 125 so that these are rotated directly in unity with the operation of the presses below. A plurality of these slitter rollers is mounted on one section of the frame 122 one over the other. Cooperating with each slitter roll is a slitter knife 126 mounted on a shaft 127. This shaft is supported in bearings pivoted on a cross shaft 128 and having a handle 129 for manipulating the slitter. In other words the slitter can be raised and lowered and when in action it rests on the web by gravity. The slitter roll 125 is provided with a circumferential groove for receiving the rotary slitter 126 which is rotated by contact with the roll.

The web W1 passes over the slitter roll which is properly sized and driven from the driving mechanism at web speed. If desired, the web is separated into two halves. One-half is guided directly to the compensator roll 130 the same as if the whole web would be if not slit, and it is then turned back and run over a spring roller 131 and then over guide rolls 132, any number of which can be employed. After this it is deflected and fed to a drag roll 133 by the leading-in rolls 134.

The other half of the web is fed over a pair of turning bars 135 so as to bring it in a position directly in line with the other half and under it instead of along side it. After leaving the turning bars it is run over a compensating roller 136, spring roller 137 and guide and lead-in rolls as in the case of the other web and brought to the same drag roll in registration with the web above.

These compensating rolls are for the purpose of adjusting the web so that the head and tail margins of the several webs will be in line with each other. In addition to this, it is run over the spring roller which has springs on each end to support it so as to equalize any tension there may be within the web itself. This arrangement, together with the several other spring seated rollers tends to remove the stresses in the web which are caused by unequal winding of the ordinary web roll. By mounting the compensating rollers to be guided to move rectilinearly they avoid the

usual trouble of uneven yielding at the two ends. The sliding arrangement is very important as the compensating roller is kept square or at right angles to the path of the web. There are no pivoted levers to get out of square and cause paper breaks by putting more strain on one edge than on the other. This increases the speed of the web by reducing breakages, which are generally caused or at least started by these stresses.

The particular arrangements of these compensating rollers, spring rollers and turning bars are shown in Figs. 30 to 36.

The spring seated roller 131 is supported by means shown especially in Figs. 33 and 34 and claimed in my above mentioned Patent No. 1,720,776. This roller is provided with ball bearings at each end and these are supported by journals 140 which extend into a casing 141. This casing has a slot 142 receiving a pin 143 from the journal 140 which is of skeleton form. In the casing 141 are springs 144 bearing on opposite sides of the journal 140 and adapted to be adjusted by nuts 145 extending into each end of the casing. Through these nuts in the centers of the springs extend screws 146 screwed into the journal 140 on opposite sides. This provides for a spring mounting at each end of the spring roll so that it will yield to suit the conditions existing. The pin 143 extends upwardly to show the position of the parts so that the operator at some distance can note any undue strain and take whatever action may be necessary. The screws 146 are turned in and out for adjustment by heads 147. The spring rolls 137 are mounted in the same way.

In Figs. 35 and 36 I have shown the mounting for the compensator rolls 130 and 136. In this case it is to be noted that a belt 149 passes over a pulley 150 on the shaft of the slitter roll 125 and also over a pulley 151 fixed on each compensating roll which is loose on its shaft 160. The belt passes over several idlers 152 so as to give it a good wrap around each pulley and also allow for any adjustment that may be required. As the pulley 150 is operated directly from the press and as these idlers are adjusted to take up just the right amount of slack, the compensating rolls can be made to use the proper amount of paper to bring the imprints into registration, so that the head of each sheet will register with the head of the next sheet.

For this purpose the two compensating rolls 130 and 136 are mounted on longitudinal supporting rods 153 each having a rack 154 formed of sections of screw teeth. Surrounding each rod is a worm wheel 155. These worm wheels are hollow and carried on the rods 153 between two lips 156 in each case on the bracket 157 which carries the compensator roll. The wheel 155 is operated by a worm 158 on the compensating roll shaft 160. This construction is duplicated on the other side of the press. A hand wheel 159 is attached to the end of each compensating roll shaft to permit the operator to rotate the shaft 160. The rollers are loosely mounted thereon. This produces the rotation of the worm wheels supporting the shafts and engaging the rack thread on the supporting shaft 153. This moves the compensating rolls forward and backward as may be desired equally at both ends. This constitutes a squaring means for the web.

The folder

On one of the sections of the main drive shaft is a bevel gear, driving a vertical shaft 162 on a folder frame 161 resting on the platform 2. (See Fig. 45.) This is the driving shaft of one of the folders. Near the top of this shaft are beveled gears 163 driving a train of gears 164 and through that a drag roll 133. It will be seen from Fig. 29 that the shaft 162 extends above this point and in a similar way drives the upper drag roll 166. Also, by reference to the same figure, it will be seen that I have shown two positions of the web in several cases in dotted and dot and dash lines respectively to indicate two ways in which a web can be fed from the compensating rolls to the drag rolls 133 or 166, as may be desired. Furthermore in this figure I have shown other similar webs W3 coming into the leading-in rolls 134 from the right to provide for the condition indicated in Fig. 1ª more fully in which a press unit delivers to the folder from the other side.

The drag roll 133 itself, as has been stated, is rotated positively with its shaft. By gears 167 on both ends each drag roll rotates two shafts 168 and 169 each being provided with slitters 170 (see Fig. 37). In this case the drag roll and slitter cooperate in a similar way to the slitter roll 125 and slitters 126, the roll being grooved to provide for these slitters. However, in this case a difference will be noticed. Independent drives 167 are provided on the opposite ends of the drag roll for the two slitter shafts 168 and 169 for the purpose of permitting the raising and lowering of these shafts, as well as the propeller shafts 171, on one part of the machine without disturbing those on the other. This is useful when running a web only two pages wide or when running a greater number of webs on one-half the drag roll than on the other.

It will be noticed that the slitter shaft 168 is provided with a square hole, or at least a non-circular one, and that an extension 172 of this slitter shaft is provided with a corresponding sliding key so that one shaft will operate the other and we have two slitters at this end of the drag roll operated by the same power. These slitter shafts are mounted on arms 173, which are pivoted on a shaft 174

so that the slitters 170 can be moved out and in toward the drag roll 133. For this purpose each arm 173 is provided with an operating arm 175 with a bolt or screw 176 for adjusting it in a slot 177 in the arm. The bolt 176 is supported on the frame of the folder and the handle 175 can be adjusted out and in to regulate the pressure of the slitter or move it entirely out of contact with the drag roll.

In a similar way there is a cross shaft 180 which carries a series of arms 181 individually pivoted thereon. On the end of each of them there is a propeller roll 184 adapted to rest on the drag roll and keep the web against the drag roll to preserve the web speed and keep the paper from wrinkling and for the usual purposes for which these rolls are provided. Fixed on the shaft 180 is an upwardly extending arm 182. Two thumb screws 183 are supported on the frame on opposite sides of the arm 182. These are used to adjust the shaft 180 as a whole.

Each of the arms 181 is independently adjustable on this shaft. The shaft is provided with arms 185 fixed thereon and provided with spring pressed pins 186 which are pivotally connected with the arms 181 individually. These pins are adjusted longitudinally by hand wheels 187 and spiral gears 188 so that each propeller roller 184 can be adjusted to the drag roll with the desired pressure and all of the propeller rolls can be drawn back or pushed forward at once without disturbing their individual adjustment by the hand wheel 187.

The propeller rollers can be drawn back entirely out of the way in the same way as the slitters by a handle 189 and held back by an adjusting bolt 190 similar to the adjusting bolt 176. The provision for controlling the slitting of the web at one end of the drag roll independently of that of the other and the corresponding independent adjustment of the propeller rolls provides important advantages. More webs can be carried on one side of the drag roll than on the other. When the web is only two pages wide the propellers and slitters on one end can be entirely thrown out, leaving the rest of the roll to operate in the usual way. The usual formers 192 are supported in position to receive the webs from the two drag rolls. In Fig. 39 I have shown a new means for supporting the upper one, which comprises supporting brackets 193 each carrying three loose studs 197. A horizontal shaft 194 extends across between the brackets. On this shaft are two rings 195 having three radial bolts 196 arranged around it at 120 degrees apart. These bolts pass radially through the three studs 197 and are held to the studs by nuts and adjusted as desired to change the position of the shaft 194. The shaft carries two supports 198 on which the former 192 is mounted. The nuts on these bolts can be adjusted as desired. With this adjustment it is possible to move the former into any desired position and clamp it in that position. The lower formers 192^a are supported in a similar way from brackets 193^a.

The formers are shown at each level delivering through leading-in or forming rolls 199 to primary nipping rolls 200 and secondary nipping rolls 201. The principal webs pass from the several formers directly through the corresponding sets of nipping rolls as in my application Serial No. 3,510. In Fig. 44 I have shown another web W4 coming into the folder over an adjusting device 191 to the second or supplementary nipping rolls of one set. Another web W5 is shown passing from either set of primary nipping rolls to the other set of secondary nipping rolls. Each pair of nipping rolls is individually adjusted and spring seated as shown in Figs. 46–49. This adjustment comprises a rod 202 having two hand wheels 203 one fixed to it and the other fixed to a sleeve 202^a thereon. This rod and sleeve having two worms 204 thereon meshing with wheels 205. Each of these wheels 205 is fixed on a screw 206, pivotally supported by a bracket 207 on the frame and pivotally connected at the other end in an arm 208 extending from the shaft of the nipper roll. A spring 209 adjustable by nuts or the like normally holds this nipping roll against the other of the pair, but it is held yieldingly and adjustably. The adjustment can be made the same at both ends as indicated at Fig. 49 by turning both hand wheels 203 but each end can be adjusted separately by its hand wheel. This construction is similar to that shown in said pending application, Serial No. 3,510 and need not be described more in detail for that reason.

The upper nipping rolls are driven by a shaft 210 receiving its power through bevel gears from the vertical shaft 162. This shaft, by means of bevelled gears shown in Fig. 48, drives the upper nipping roll shaft 211. The bevel gear on this shaft is fixed to it, but the bevel gear 212 on the shaft 210 is slidably keyed thereto. It is provided with ball bearings in brackets 213 on the former carriage which have uniform passages therethrough for the bearings of the shaft 210. In the outer casing 214 of the ball bearing is a slot 215 adapted to be engaged by the end of the screw 216, carried by the bracket 213 to allow for longitudinal adjustment. This casing is provided with an internal screw thread and there is a collar 217 therein with an external screw thread which screws up against the ball bearing. The bracket 213 is provided with a circular groove 218 and a hand wheel 219 has a circular flange entering the groove 218. This hand wheel has a screw thread meshing with the screw on the collar 217. The turning of this hand wheel therefore shifts all the parts connected with the collar

217 including the gear 212. This is provided because the nipping rollers are supported by brackets 213 carried by the carriage of the former. This carriage is adjustable by a hand wheel 220 and screw to move laterally. Therefore this adjustment is provided to keep the two gears in mesh if desired, when the former carriage is adjusted. It can be used also for disconnecting the nipping rolls temporarily in case of any trouble.

The web, of course, is led from the nipping rolls to the folding cylinder 221 and cutting and collecting cylinder 222 as usual. There is a horizontal shaft 223 connected by gearing to the shaft 162 for driving these cylinders (see Fig. 50). This shaft 223 is provided indirectly with ratchet teeth 224 cooperating with an opposite circular rack 233 for keeping a gear 225 in mesh with a gear 226 on the shaft 227 of the folding cylinder. This gear 225 is provided with a hub 228 which is slidingly keyed to the shaft 223 and has the ratchet teeth 224 on its end. It is connected to the gear 225 by a shear pin 229 which is designed to shear off in case the web chokes up the folder to such an extent as to stop the machine. This is a protecting device constituting the weakest point in the transmission and the one easiest to fix.

Behind the hub is a box 230 fixed to the shaft and having a spring 231 pressing on a plate 232 fixed to the end of the hub 228. The rack 233 is temporarily held to the shaft 223 by a collar 233^a, spring pin and set screw. When it is desired to disconnect the gear 225 from the gear 226, it is necessary to turn the member 233 until the ratchet teeth are in mesh with each other. Then the spring 231 pushes the hub 228 and gear 225 along until the latter is out of mesh.

The shaft 223 is mounted in ball bearings on the frame of the folder and is provided with a magnetic brake 236 connected electrically with the brakes of the printing cylinders, inking cylinders and other heavy elements. It operates simultaneously with them as previously described.

The shaft 227, through a pair of gears 237, drives the shaft 238 of the cutting and collecting cylinder. In Figs. 51, 52 and 53 I have shown the means employed for changing the cutting cylinder 222 from a collecting cylinder to a non-collecting one. On the frame is mounted a shaft 240 adapted to be turned by a handle 241 to two different positions controlled by depressions and a spring pin 242 and to be fastened in adjusted position by a nut 243. This shaft 240 is provided with an eccentric stud 244 on which are a pair of speed change gears 245 meshing with gears 246 and 247 respectively. The gear 246 is fixed on a shoulder on the pin operating cam 248 while the gear 247 is fixed on the shaft 238.

The cylinder 222 is provided with a sliding lock 249 having a pin for guiding it. A bolt 250 has its head located in a slot 251 in the lock which has a margin around it for receiving the edge of the head of the bolt. When it is desired to run non-collected products the only thing necessary is to throw the half speed gears out of mesh with each other and to push the sliding lock 249 so that its pin will enter a hole 252 in the pin operating cam 248. This makes the cam rotate positively with the cutting and collecting cylinder instead of being rotated at a different speed as it does when running on collected products. The operation of the cam 248 is shown more fully in Fig. 51 where its cam groove 253 operates a crank 254 on the pin operating shaft 255 as usual. The usual pins 256 are shown.

The means for holding the knife box in place and the means for springing the cheek woods on each side of the cutting knife are shown in Figs. 54 and 55. They involve some changes from the construction shown and claimed in my copending application Serial No. 666,364. The two part knife box 260 is removably mounted in a recess in the cylinder 222. They, themselves, are recessed to receive the cheek woods 261 with the cutting blade 262 between them. The cheek woods are moved outwardly together from the position shown in Fig. 55 to that shown in Fig. 57 by a series of springs 263 and as usual moved back by contact with the folding cylinder. The blade is adjusted by a series of screws 264 on holders 265 at the ends of the blade.

The folding cylinder has the usual cooperating cutting rubbers 266 and pins 267 (see Fig. 57). One set of pins can be silenced in a very simple manner for the usual purpose. The pin operating cam 268 swings a roll 269 on an arm projecting from the pin rod 270. On the latter are the arms 271 for reciprocating the pins 267. On the end of the pin rod is a loose cam lever 272 and a keyed operating lever 273. Two screws 274 and 275 hold the levers 272 and 273 together by means of a cross bar 276. To silence this series of pins, the screw 275 is taken out, thus allowing the lever 272 to oscillate idly. Then the screw 275 is inserted through a hole in an arm 277 on the operating lever 273 and screwed into a bracket 278 on the folding cylinder. Thus the pin rod 270 is positively prevented from oscillating. A counter 279 is shown on the end of the folding cylinder shaft.

The folding cylinder has the usual folding blades 280 for tucking the folded sheets between the folding rolls 281 and 282 (Figs. 46, 59, 60 and 61). I call the folding roll 281 the stationary one as it is stationary after adjustment along curved slots 283 in the arms 284 which support its bearings 285. These arms 284 are hung on pivots 286 on the folder frame. The arms are held in place by shearing pins 287 that are constructed to break in

case of a choke that would stop the proper feed.

The other folding roll 282 is carried by arms 288 pivoted on studs 289 adjustably carried in curved slots 290 in brackets 291. It is forced against the companion roll 281 by springs 292, pivotally connected with the arms 288 and adjustable. These springs are carried by pivoted rods 293. Both of them can be adjusted simultaneously, as in the case of the nipping rollers, by two hand wheels 294, rod 295 and worms 296 on the brackets 291. The worms mesh with worm wheels 297 threaded on the rods 293. One worm is pinned to the rod 295 and the other is loose on it but has the second hand wheel fixed to it. By turning both hand wheels both ends of the roll are adjusted but either end can be by turning only one hand wheel. Both rolls, can be adjusted if desired to bring the pair into a different position with respect to the folding cylinder. These rolls are supported in ball bearings and geared together and to the folding cylinder, as shown in Figs. 60 and 61. Some of these features constitute improvements over my copending application, Serial No. 580,437, now Patent No. 1,684,901.

The delivery

The cutting and collecting cylinder has a gear on its shaft which drives a gear 300 on a shaft on which there is a spiral gear 301. This gear drives a spiral gear on a shaft 302 for operating the delivery. In Fig. 44, two complete folders being shown, two of these shafts 302 are necessary. I have not shown them exactly in the same position because two forms of delivery tapes are shown and the fans are placed differently. But they are exactly alike except for their angular position and distances between the spiral gears thereon. Each of these shafts is provided with a spiral gear 303 which drives the train of gearing that directly operates the delivery fan 304. Also on each shaft 302 is a spiral gear 305 which directly meshes with a gear on the shaft 306 of the delivery mechanism.

In the delivery at the right there are pulleys 307 on the shaft 306 which drive delivery tapes 308 which are supported in the usual manner and receive the products from the fan and deliver to the right. A tightening means 309 is shown for these delivery tapes. This is the simpler arrangement.

Before describing the other form of delivery, I will describe certain details relating to the fan. (See Fig. 64.) There is an arm 310 extending from the bracket 291 which has a plate 311 at the bottom turned up at the ends to furnish a support for a paper guide 312. This guide extends from the folding rollers on a curvature down around through the fan. At the bottom it is fastened to an adjustable bracket 313 on the frame of the folder. This guide is provided with an S curve and the lower part of it is concentric with the center of the fan and at a short distance inside the curved blades. This, it will be obvious, controls the position of the paper. There is also shown a back guide 314 for the paper which is pivoted on studs 315 and adjusted by means of slotted brackets 316 on the frame. This intercepts any paper that goes wrong far enough to get outside the fan.

The fan itself is supported by two sets of arms or brackets 318 and 319, each having a slot 320 by which it can be fastened in adjusted position on the frame by usual bolts. This provides for setting the fan in any desired position, either laterally or vertically.

On the shaft 306 there is the usual counting mechanism comprising a disc 322 having a notch 323 for operating a roll 324 and allowing the roll to move into the notch once in each rotation of the disc. This counting mechanism is not a part of this invention, but it operates hooks 325 to separate one sheet after fifty papers have run so it will be easy to pick out the product in bunches of fifty. This device operates once for every twenty five products if they are collected products. It is adjusted by an arm 326 having a screw resting against a stop 327.

Now, referring only to Figs. 44, 65, 66 and 67, I have described an additional feature for the delivery tapes as shown on the left side. In this case the tapes 308 are run from a second shaft 306 as shown on the right side of Fig. 44 and in substantially the same manner. The shaft 306 is the shaft that supports the counter above described. It is provided with pulleys 330 which are loose thereon and have no function except to support the tapes. On another shaft 331, extending transversely, there are pulleys fixed thereto for supporting the tapes 308. There are other pulleys fixed thereto for driving, when necessary, tapes 332. These tapes 332 constitute a continuation of the delivery. They deliver directly to a pair of tapes 333 which are driven by means, not shown herein, and provide a place between them for receiving the printed products from the tapes 332 at the left and carrying them off to any desired point.

These tapes 333 pass over pulleys on shafts 334, 335 and 336. These shafts are connected together by belts or chains 337 and 338 and one of them can be driven by a separate motor or in any other desired way. A separate motor ordinarily is used, simply to drive these shafts after the machine stops to deliver the products already collected. It will be observed that on the fan shaft there is a pulley 340 which drives a chain 341 by a sprocket on a shaft 342. On this shaft there is another sprocket which drives a chain 343 which in turn drives the shaft 331. This is the usual way of operating and providing the power. The shaft 336 is also connected with the shaft 342 by another chain 344 and sprocket wheels.

In the ordinary operation the delivery tapes 308 and 332 are driven by the chains 341 and 344 and the shafts 334, 335, and 336 are also driven by this power. The chain 343 drives a ratchet equipped sprocket wheel 345. This is shown as having a well known form of ratchet 346. The speed ratio is arranged so that ordinarily this chain 343 drives the ratchet wheel 345 at a slower speed than the roll 347 on the shaft 331 on which the wheel 345 is located. Therefore this does no work normally but merely ratchets over the ratchet teeth all the time.

Now, if a choke occurs in the paper sufficient to break the chain 344, which has been driving all the parts of the delivery, the shaft 342 will have to drive the shaft 331 through the chain 343 and ratchet 345. This drive will be at a lower rate of speed than normally but it will be sufficient to take the papers or products out of the delivery and clear them from the machine. It is to be understood that while this construction is shown on only one side of the machine, I have done that merely to show two forms in one figure. Preferably I use it on all the folders and on both sides of each of them.

Operation

As described above the press can be connected up merely by connecting or disconnecting the several clutches C in either one of the four arrangements shown in Figs. 1, 1ª, 1ᵇ and 1ᶜ. As a matter of fact, many other combinations can be provided, even non-symmetrical, if it is not desired to print products that are duplicates of each other in the different units. It is not intended that these figures should show all the ways in which the press can be used.

The webs of the different units are run into the different presses from the web rolls under yielding rollers 13, which yield independently at both ends to remove any internal stresses or strains. They are driven by the feed belts 11 and propelling tapes and enter the press unit above near the center. They are led through the two printing couples which are arranged in such a way that neither cylinder has to bear the weight of the other. The webs are registered by the roll 19 so that there is exactly the length of an imprint between the points of impression of the two printing couples.

The center margin ring 48 is set into a circumferential groove in the plate cylinder and fastened in such a way that the fastening means does not limit the width of the center margin ring or the position of the plates. The center clips 51 are also set in a similar way and secured in position in recesses in the plate cylinder 18 which are of as small an area as possible. The end ring 55 is secured at the end with very little cutting out of the surface of the cylinder. In these several ways, the printing cylinder is relieved from the usual necessity of cutting into it at various points and much more of the metal of the cylinder is left so that it is more rigid than usual.

As the web passes into the bite between the plate and impressions cylinders, a guard 60 is located at a point to protect the fingers of an operator that might get caught at this point. This guard is made light and thin so that it will not injure the type if it does get caught and is also arranged so that it is easily removed.

As the web is led through the two printing couples, both of the plate cylinders are inked by inking mechanism involving improved means by which the fountain blade 90 may be adjusted positively from the front or outer side of the ink fountain. The adjusting means are located so as to be readily accessible. Then adjustments are arranged so that each one provides for adjusting at a certain point or column in line with it, so that the operator can easily select the proper adjustment to make.

The several ink fountains 70 are divided by transverse partitions into two parts. Two lines of ink pipes extend throughout the whole series of presses and are connected with the two sides of each ink fountain. They are provided with such valves that they can deliver ink, of either poor or good quality, to both sides of the fountain or different qualities to the two sides if that should be desired. The several rolls of the inking mechanism are mounted in ball bearings. Those for the fountain roll are located inside the fountain itself so the fountain does not have to be pierced for the fountain roll shaft. This is accomplished by using a vertical shaft for transmitting the power down from the pick-up roll and is responsible for an important improvement in this connection.

The adjustment of the distributing roll 67 radially and circumferentially with respect to the ink cylinder 66 by two entirely different adjustments permits it to be adjusted into proper contact with the pick-up roll 68 either before or after it is adjusted into proper contact with the ink cylinder, without disturbing the first adjustment in either case. The inking mechanism therefore is improved at several points and furthermore the ink cylinder itself is provided with a magnetic brake by which it is stopped independently of the rest of the press but simultaneously, whenever the motors are disconnected. This has a certain bearing on other features of the press which appear hereinafter.

The webs from the several units are taken upwardly into the frame above and between a slitter roll 125 and its cooperating slitters 126. When the web is slit, one-half of it can be taken over turning bars 135 and brought back directly under the other half and the

wo halves delivered together in register to he folding machine. This mechanism also nvolves improvement in the spring roll 131, which is used for keeping the web taut and equalizing its tension on both ends so that any ension in the web may be eliminated at this oint as it was below the press by a similar oll 13 having spring supports at both ends. It also involves a compensating roll 130 which is provided with improved means for moving it along to take up just enough of the web so that the heads of two successive imprints will be in register with each other. In this part of the press there are other features which involve the passage of the webs in other ways and the leading of the webs into the folder from it at both sides. The various improvements of the features just above described constitute features of the present invention.

The web is fed in any one of a number of different ways as indicated more specifically in Fig. 29, to the formers over the drag roll 133 or 166. Each drag roll cooperates with propeller rolls 184 to contact with the web thereon and keep it going at web speed which is the surface speed of the drag rolls. Slitters 170 are mounted in a similar way, the propellers and slitters being provided with spring pressed or adjustable means for holding them in position. The propeller support shaft 180 is adjustable circumferentially and adapted to be held in adjusted position by the adjusting means itself. The slitter shaft is made up of independent parts so that either one of them can be drawn back when the machine is being used for a web of less than full width. Also one of the slitter shafts is made with a removable extension 172 having a slitter thereon for a similar purpose.

The former is mounted in a novel manner and adjusted conveniently. The webs can be brought down into the folding machine through the formers or outside them as may be desired, and as indicated in Fig. 44. The nipping rolls are arranged in two pairs 200 and 201 and adjusted across the machine so that the two ends of a roll can be adjusted equally and provided with means whereby they can be adjusted independently. The former is movably mounted and means is provided for keeping the nipping rolls in gear independently of the adjustment of the former.

The web then is to be taken to the folding couple which is provided with certain improvements in the method of holding the blade and cheek woods and means for conveniently converting the cutting and collecting cylinder from collecting to non-collecting and vice versa. The folding cylinder is also provided with similar means for silencing a set of pins for this particular purpose. It is mounted and connected so that it can be thrown out of gear very easily without affecting the operation of the rest of the machine. The cylinder also is provided with a magnetic brake, the same as the ink cylinder and impression couples, all acting in the same way and all cooperating to prevent the stripping of gears and the breaking of the web when the press is stopped.

The folding rolls are mounted conveniently in ball bearings and provided with means by which they are both adjusted circumferentially with respect to the folding cylinder. One is made stationary after adjustment and the other is yieldingly pressed against it. They are capable of being adjusted both ends alike or independently like the nipping rolls.

The delivery comprises several improvements in the method of mounting the fan and the paper guides, but the folded products are delivered substantially in the usual way. However, I have provided an improved auxiliary delivering arrangement by which, in case of breakage of the chain that runs the tapes in normal operation of the delivery, the tapes will continue to operate in the same direction. But they run at lower speed so as to clear the delivery of all products that have been deposited on it before the break occurs.

In other words, this is a complete printing machine in which many of the details are located far apart, yet cooperate with each other to permit operation at high speed while producing a large number of duplicate products. Cooperating means are provided throughout the machine for keeping the web clear from difficulties due to the setting up of internal strains and stresses at various points along the whole run of the web.

It will be noticed that the heavy cylinders of the machine, including the printing couple, the ink cylinder and folding cylinder, are shown provided with magnetic brakes. Although the wiring is not illustrated, they are either connected together, or so associated in their electrical connections, that when the motors are shut off, that automatically and simultaneously, but independently, applies the magnetic brakes to these several heavy cylinders or any other cylinders in the press to which these brakes may be applied. This not only prevents stripping of gearing but it reduces the time which is often consumed in restarting a press, because the web has little chance to break under these circumstances. In other words the web is stopped in the same way all along the line so that a part of it is not running, even for a moment, faster or slower than the rest of it.

No claim is made herein to the following features of this machine taken by themselves, namely, the rotary printing mechanism, plate carrying cylinder inking mechanism, web feeding and slitting mechanism, and the

folding and delivering mechanism, because these matters constitute the subject matters of my divisional applications, Serial Nos. 353,196; 353,197; 353,198; 353,199 and 353,200, all filed April 6, 1929.

Although I have illustrated and described only a single form of the invention I am aware of the fact that modifications can be made therein by any person skilled in the art without departing from the scope of the invention as expressed in the claims. Therefore I do not wish to be limited in this respect but what I claim is:—

1. In a multiple unit printing press, the combination with a plurality of printing units, a series of shafts extending along the line of units, means for coupling the shafts together end to end, and means for driving several of the shafts, some of them independently of the others, of a web feeding device below each press unit, a propelling roll, propelling tapes on the roll, and rolls cooperating with the propelling tapes, the propelling roll being positively connected with one of said shafts to rotate at web speed for delivering the web to the press unit above.

2. In a printing press, the combination with a printing unit frame, of a shaft, a vertical shaft driven by the main shaft, means connected with said vertical shaft for perfecting a web, a frame above the printing unit frame and supported thereby, a slitting roller on said frame operated from the vertical shaft, drag rolls, and means for guiding the slit webs over the drag rolls with one half of the slit web directly over the other half of the web.

3. In a printing press, the combination with a main frame and a series of printing unit frames thereon, of a shaft extending along the main frame, a series of vertical shafts mounted on each printing unit frame and driven by the main shaft, means connected with each of said vertical shafts for perfecting a web, a frame above one of the printing unit frames and supported thereby, a plurality of slitting rollers on said frame located one over another and operated from the vertical shaft of one of said frames for receiving webs from several units, a folder located at the end of a group of the printing units and supported on said main frame and having drag rolls, and means for guiding the slit webs over the drag rolls with one half of the slit web from each unit directly over the other half of the web from that unit.

4. In a multiple unit printing machine, the combination with a plurality of printing units arranged in groups, of a folder for each group, a frame above the units and supported thereby and having, over one of the units, a vertical series of slitter rollers and corresponding slitters for slitting the webs from the several units longitudinally, means on the last named frame for directing one of the webs to the folder along one course, and means on said frame for turning the other half web and bringing it into alignment with the first half web and thus taking it through the folder through another course.

5. In a multiple unit printing machine, the combination with a plurality of printing units, of a folder, a frame above the units and supported thereby and having a series of slitter rolls and corresponding slitters for slitting the webs from the several units longitudinally, means on the last named frame for directing one of the webs to the folder along one course, means on said frame for turning the other half web and bringing it into alignment with the first half web and taking it through the folder through another course and means for delivering a web from a unit on the other side of the folder to the folder in registration with one of said half webs.

6. The combination with a printing unit, of a frame thereabove, a plurality of slitting rolls on the frame, means for driving said slitting rolls positively at web speed from the printing unit, said slitters being arranged to slit the webs in two, a compensating roller and a spring roller for one-half of each web, a turning bar, compensator, and spring roller for the other half of each web, arranged to bring the said other half into exact registration with the first half, means for leading both halves of each web into registration with each other.

7. The combination with a printing couple and a folder, of means for positively forwarding a plurality of webs at web speed from the printing couple to the folder, rollers mounted in a loop of each web for taking up the slack, said rollers having their bearings at each end provided with yielding supporting means to permit them to yield to accommodate any stresses of the web, and compensating devices for each web comprising a roller mounted to move laterally to take up enough web so that each web may be brought into the folder for registration with the other webs.

8. The combination with a printing couple and a folder, of means for forwarding the web from one to the other, comprising a slitter roll directly connected with the press, a belt driven from the slitter roll, a series of idle rolls to take the belt, and a compensating roller so located with respect to said idler rollers and belt that it will be driven by said belt and will receive the web and drive it by surface contact therewith and take up enough of it to register the heads of successive imprints.

9. In a device for guiding a web from a press to a folder, the combination with a compensating roll located in a loop of the web for adjusting the length of the web between two points, and a shaft on which said roll is loosely mounted, of a hand wheel on the com-

pensating roll shaft, a supporting rod having a rack along which the roll is adapted to be moved back and forth by the hand wheel, and carrying the compensating roll with it, and power operated means for rotating said compensating roll in all positions thereof.

10. The combination of means for guiding a web, comprising a compensating roll, a shaft therefor on which the compensating roll is freely mounted, a pulley on the roll, means for turning the compensating roll, a supporting rod for the compensating roll extending longitudinally, a bracket slidable along the supporting rod having bearings for the shaft of said compensating roll, and means for moving the bracket along the supporting shaft.

11. The combination of a slitter roll, a drag roll, with means for guiding a web from one to the other, comprising a compensating roll, a shaft therefor on which the compensating roll is freely mounted, a pulley on the roll, connected with the slitter roll and means for turning the compensating roll, a supporting rod for the compensating roll extending longitudinally and having a rack thereon provided with helical tooth sections, a worm wheel surrounding said rod and having internal teeth meshing with the rack, a bracket slidable along the supporting rod and shaped to receive said worm wheel and having bearings for the shaft of said compensating roll, a worm fixed to said shaft and meshing with the worm wheel for turning the worm wheel and moving the bracket along the supporting shaft, and a hand wheel on the compensating roll shaft for operating said shaft and moving the roll bodily.

12. In a device for adjusting a web, the combination with a pair of longitudinal supporting rods, a transverse compensating roll, and a shaft for said compensating roll free from it, of means independent of said shaft for rotating said compensating roll on the shaft, a pair of brackets on the supporting rods carrying the compensating roll shaft, said brackets having means for moving them along the rods by the rotation of the shaft in the direction of the web, said means comprising a rack on each supporting rod, a rotatable element surrounding the supporting rod, and means on the roll shaft to be operated thereby for moving said brackets.

13. In a device for adjusting a web, the combination with a pair of longitudinal supporting rods, a transverse compensating roll extending from one to the other and located in a loop in the web, and a shaft for said compensating roll free from it, of means independent of said shaft for rotating said compensating roll on the shaft, and a bracket at each end of the compensating roll for supporting the shaft, said brackets each having means for moving themselves along slowly by the rotation of the shaft.

14. The combination in a web guiding and feeding device, of a compensating roll, a shaft therefor on which the compensating roll is freely mounted, a supporting rod extending longitudinally and having a rack thereon, a worm wheel surrounding said shaft and having internal teeth meshing with the rack, a bracket supporting said shaft and shaped to receive said worm wheel and adapted to move with it along the rack, and a worm fixed to said shaft and meshing with the worm wheel for turning the worm wheel and moving the bracket along the supporting rod.

15. In a multiple unit printing press, the combination with a plurality of printing units, and a main driving shaft formed in sections provided with couplings for driving said units in varying combination, each unit comprising a plurality of heavy rolls or cylinders, of brake mechanism connected with the several heavy rolls and cylinders throughout the press, whereby when it is desired to stop the press the brakes can be applied simultaneously to all these heavy elements so as to bring them to rest individually without undue strain on the gearing.

16. In a multiple unit printing press, the combination with a plurality of printing units, and a main driving shaft, mechanisms connected with the several heavy rolls or cylinders throughout the press, and motors for operating the main driving shaft and connected with said brake mechanisms, whereby when the power to the motors is shut off the dynamic energy created by the revolutions of their armatures is converted into power to operate the several brakes, thus individually relieving the strain produced in bringing the heavy revolving elements to a standstill from the gears.

17. The combination with a printing couple and a folder, of means for positively forwarding a web at web speed from the printing couple, means for slitting the web, means for directing the slit webs to the folder, guide rollers mounted in a loop of each web for taking up the slack, and yielding supporting means for the bearings of said rollers to permit them to yield at either end to accommodate any strains of the web.

In testimony whereof I have hereunto affixed my signature.

HENRY A. W. WOOD.