May 1, 1962 G. A. MEAD 3,032,209

TILTING BACK GAUGE AND CLAMP FOR PAPER CUTTERS

Filed Jan. 28, 1959 6 Sheets-Sheet 1

Fig. 1

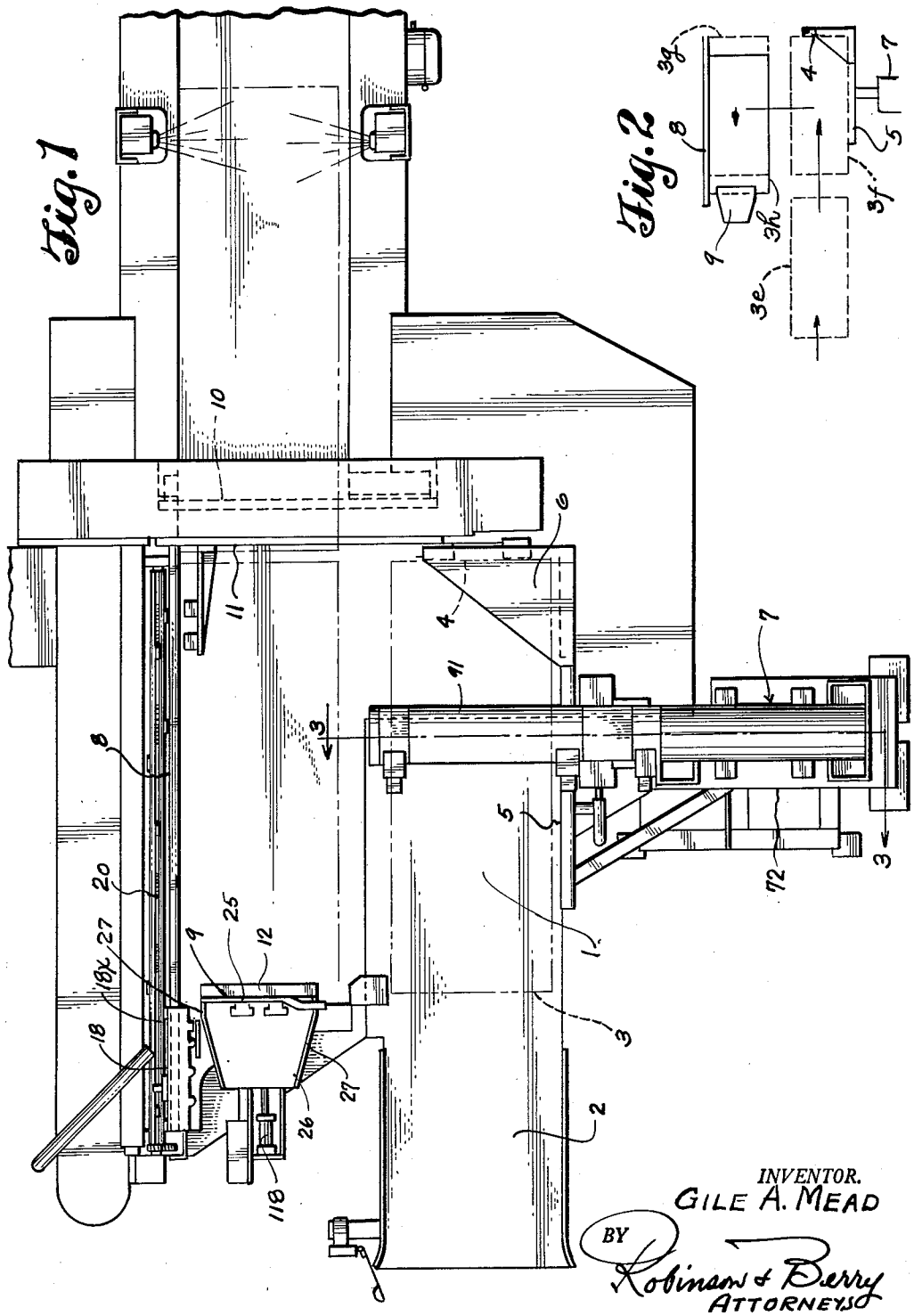


Fig. 2

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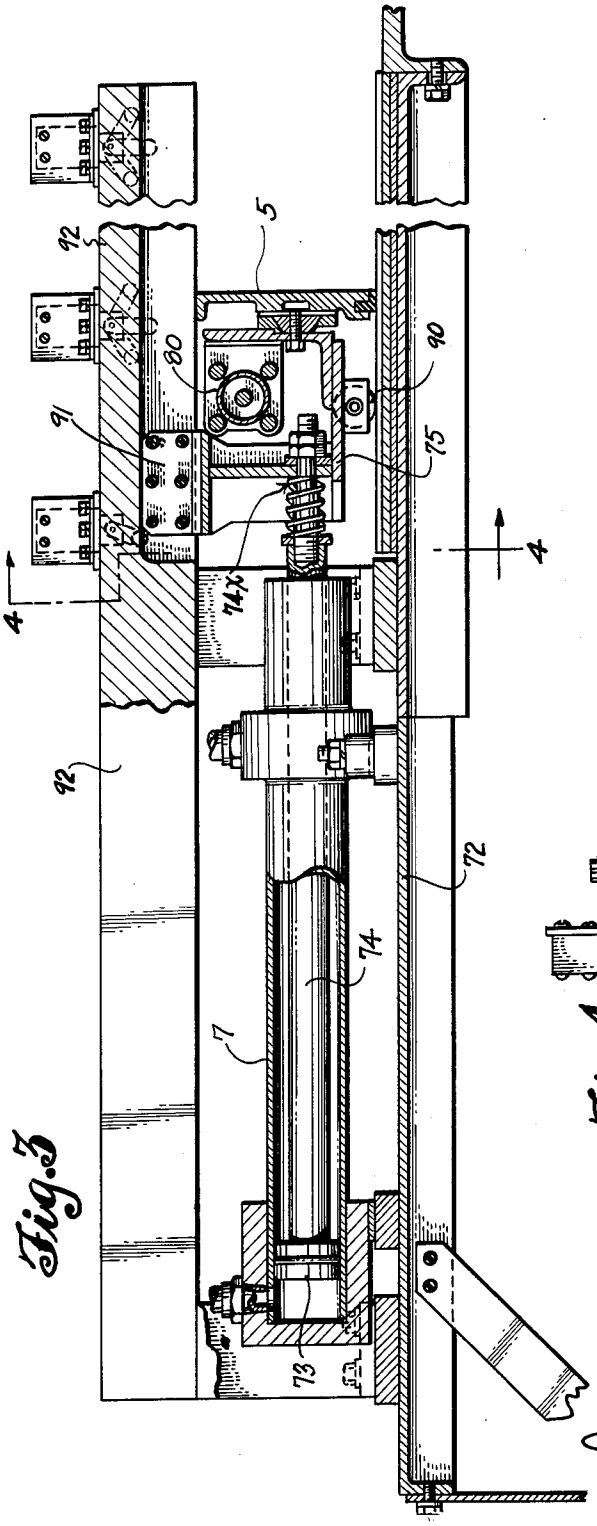


Fig. 3

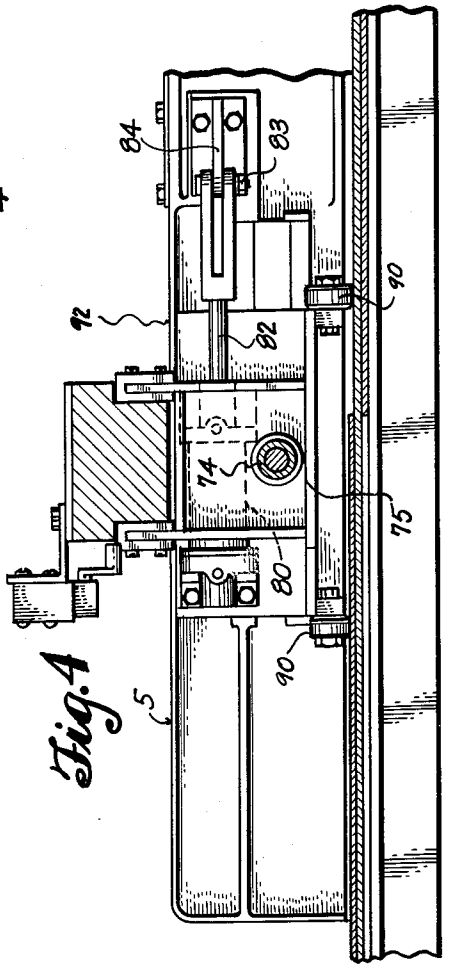


Fig. 4

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TILTING BACK GAUGE AND CLAMP FOR PAPER CUTTERS

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Fig. 6

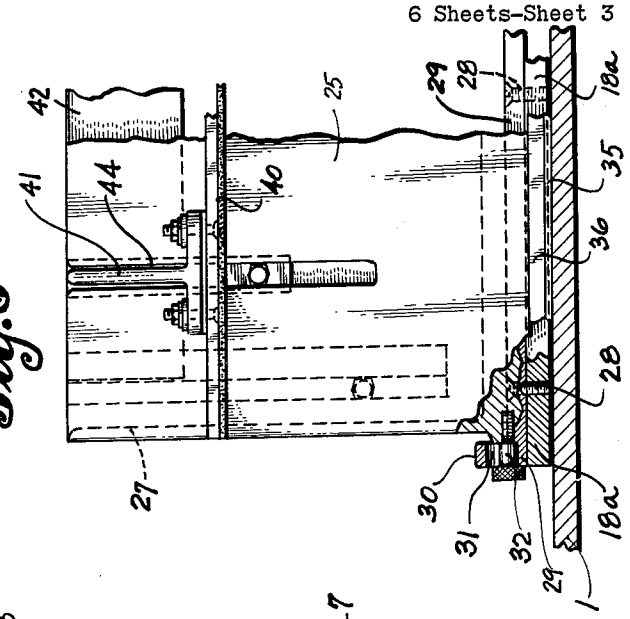
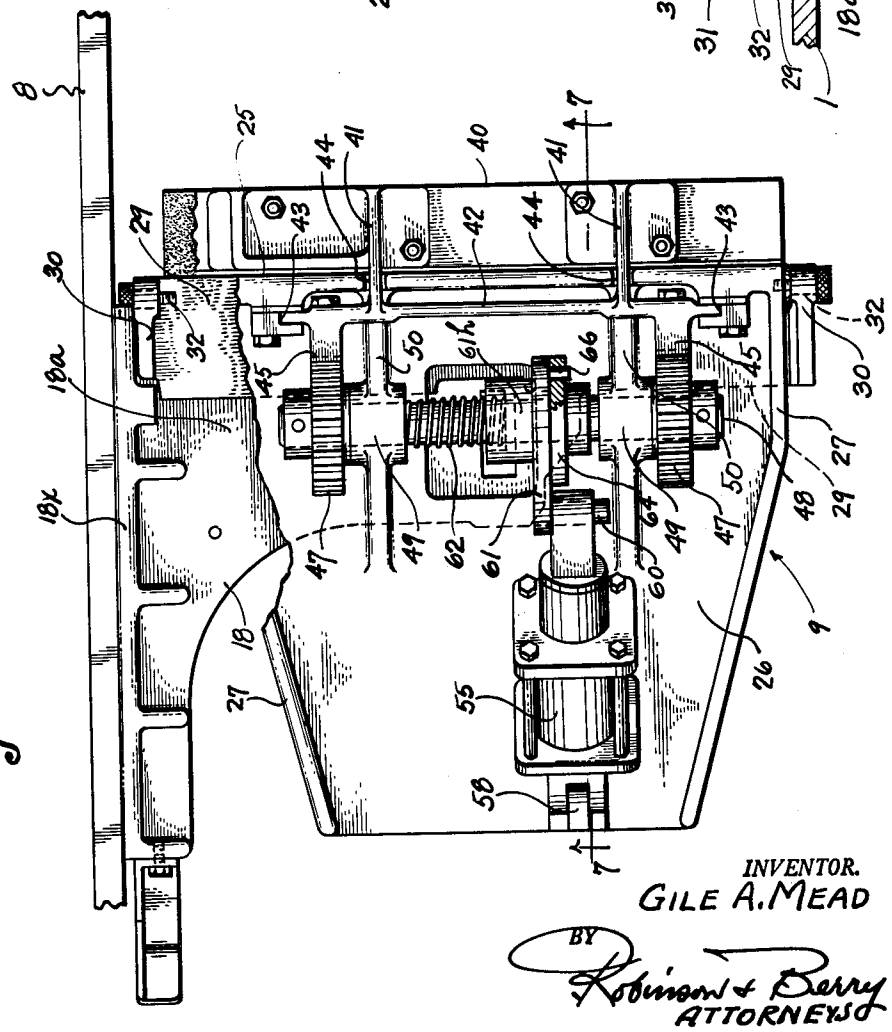


Fig. 5



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TILTING BACK GAUGE AND CLAMP FOR PAPER CUTTERS

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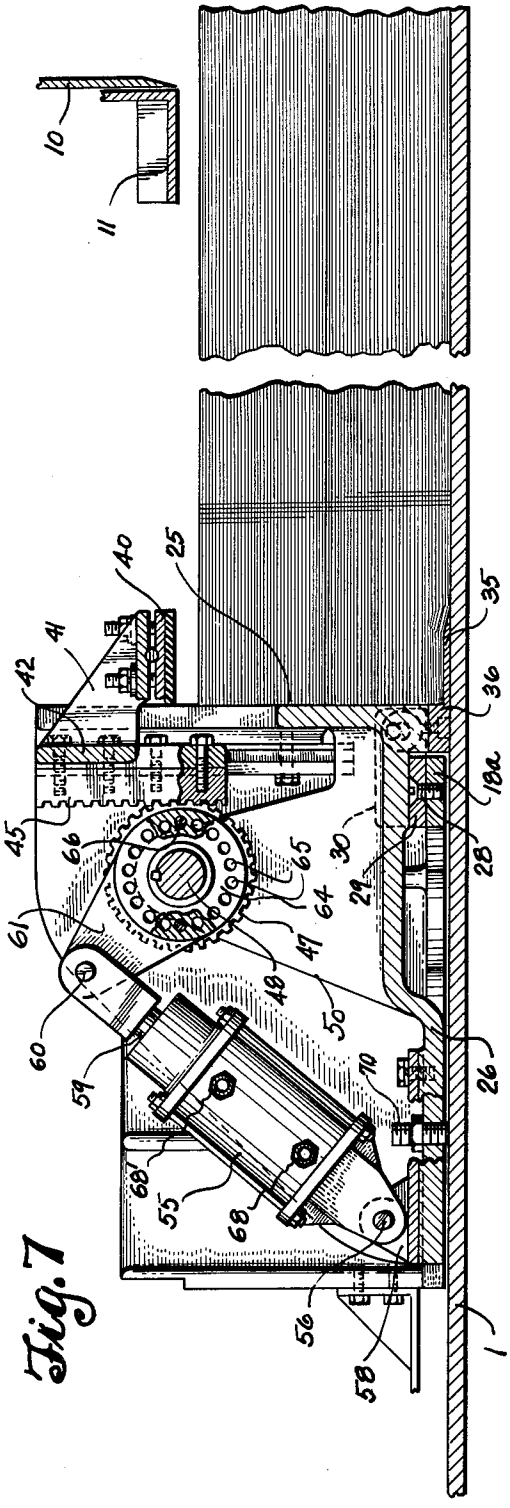


Fig. 7

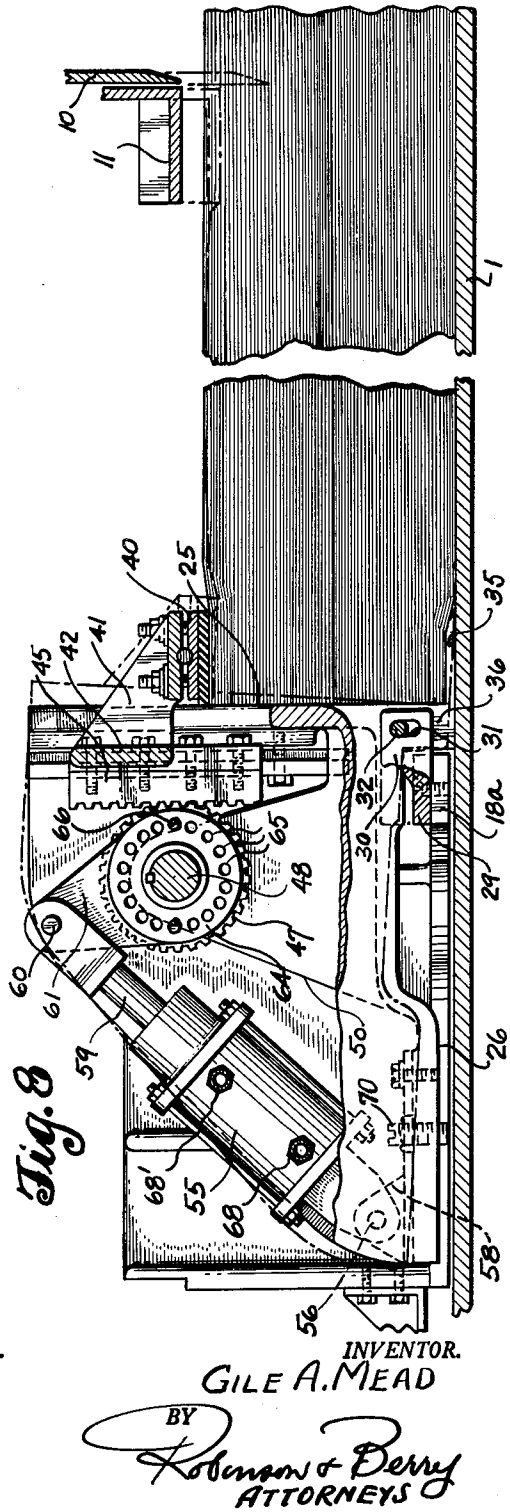


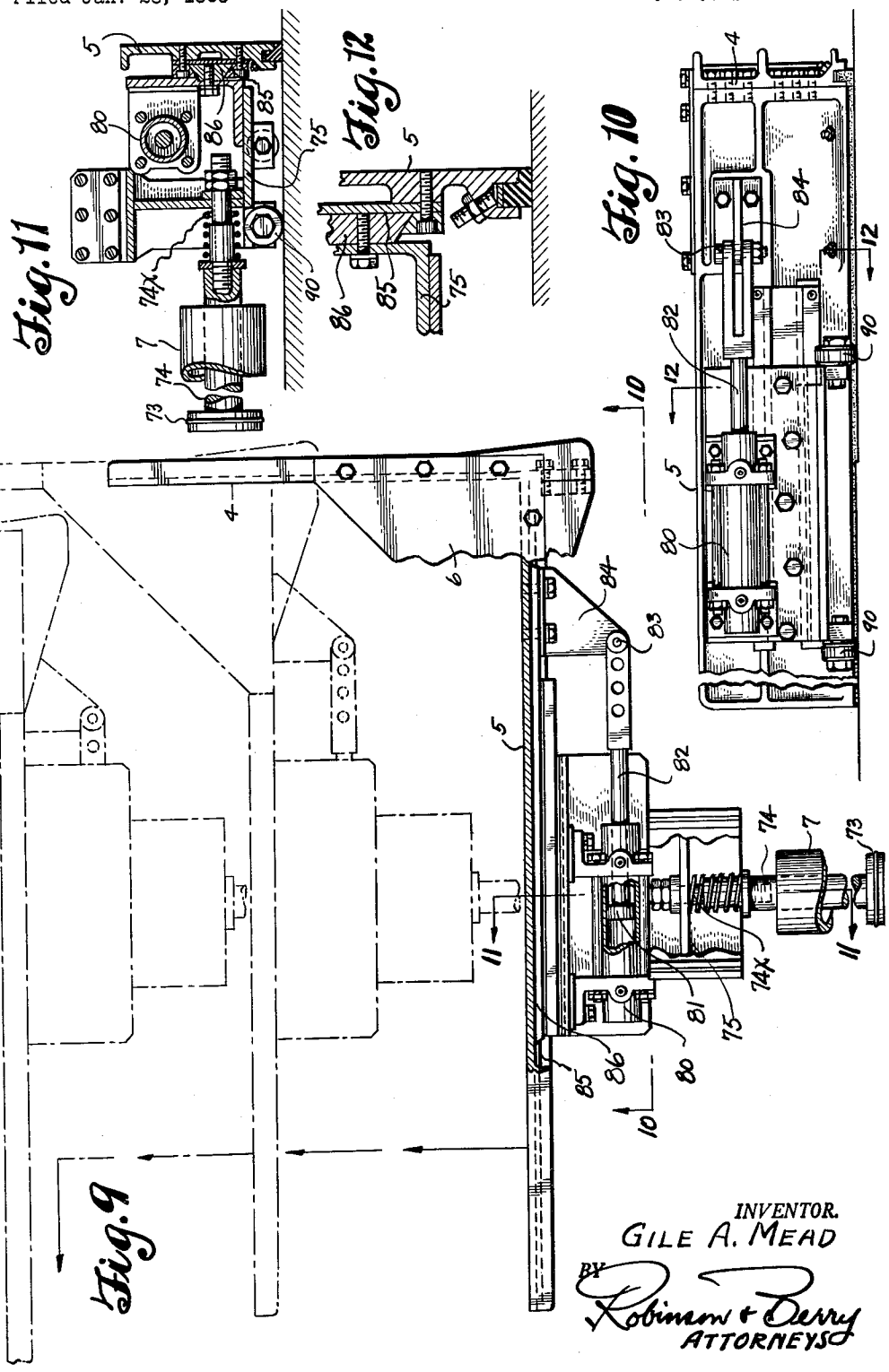
Fig. 8

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TILTING BACK GAUGE AND CLAMP FOR PAPER CUTTERS

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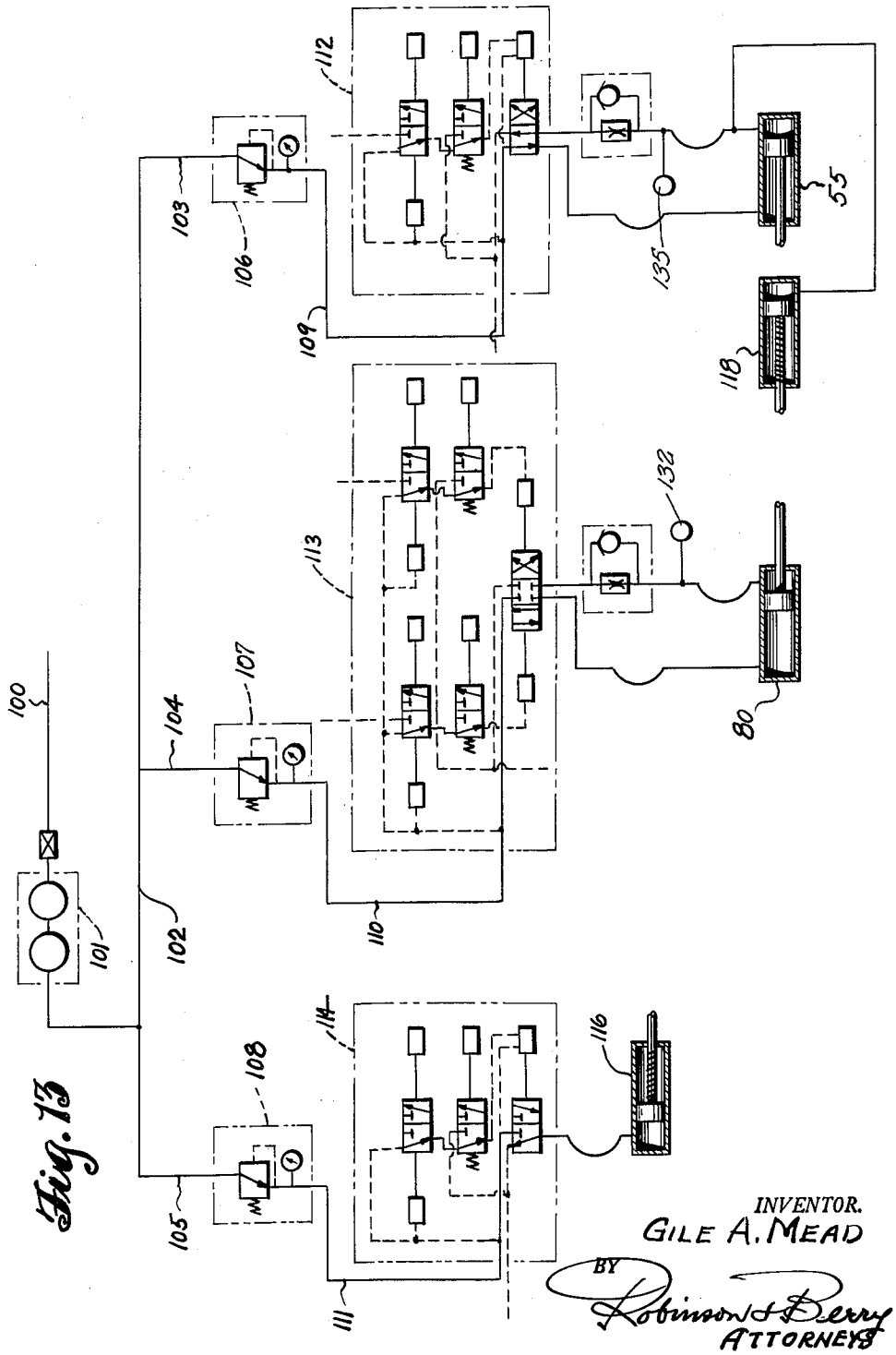


Fig. 13

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United States Patent Office 3,032,209 Patented May 1, 1962

3,032,209
TILTING BACK GAUGE AND CLAMP FOR PAPER CUTTERS

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Filed Jan. 28, 1959, Ser. No. 789,640
7 Claims. (Cl. 214—1.6)

This invention relates to paper cutters as used in the paper making industry for cutting stacks of paper sheets, such as those stacks referred to in the paper industry as lifts "strips" or "logs." For example, paper logs may be narrow in width, relatively long and of various heights, and machines of the type or kind to which the present invention is applicable, are employed to cut them into a plurality of sections or blocks of equal length; such cutting of a log or strip being effected by progressively advancing it endwise to a knife which, with each cut made thereby through the log, removes a section or block from its forward end.

Paper trimmers or cutters of the guillotine type that are presently in use for progressively feeding paper logs to a knife whereby sections or blocks are cut therefrom, have an inherent tendency to cause a slight distortion of the uncut portion of the log with the log clamping operation that is incident to the making of each cut. This distortion accumulates in the uncut portion of the log with successive clamping operations to such extent that when the final cut is made, the remaining portion of the log has to be turned end for end in the machine and its trailing end trimmed by the knife to eliminate the distorted end surface portion. The reason for such distortion is due to the following: It is the usual procedure in the use of the present type of paper cutting machine, to dispose the square cut rear end surface of the paper log against a back gauge and secure it thereto by a back gauge clamp. The log, as thus positioned and clamped is then fed endwise, by a forward adjustment of the back gauge, to a position for cutting a section or block of predetermined length from its forward end. However, before the blade or knife is actuated downwardly through the log, a clamp bar is actuated downwardly against the top of the log, closely adjacent the line of the cut, with considerable pressure. The pressure as applied by the bar is such that it causes a trough or depression to be formed across the top of the log. This troughing results in a substantial pull being exerted on the top sheets of the log. If the back gauge clamp has only a slight clamping pressure against the rear end portion of the log, this pull usually causes the top sheets to be slipped or pulled away from the back gauge. If the pressure applied by the back gauge clamp is sufficient to hold the top sheets against slipping, then those sheets below the top and forming the medial portion of the log will be slipped away from the back gauge. While this slippage or pulling away of sheets as caused by each clamping operation may be very slight, it accummulates in the log with successive clamping operations to such extent that when the final cut has been made, the remaining section of the log will be found to have the top or middle portion of its rear end surface pulled a substantial distance away from the back gauge, making it necessary that this section be turned end for end and trimmed thus to eliminate the distorted end surface portion. Such turning of the final section of the log in the machine and the extra trimming operation is not only time consuming but also requires that the log be given extra length to compensate for the length of that portion that must be removed by the final trimming.

In view of the foregoing objectionable results occurring in the normal and usual procedure of successively cutting blocks or sections of a designated length from paper logs, it has been the primary object of this invention to provide

an improvement in the manner of mounting and in the details of construction of a back gauge and its clamp thereon that will eliminate that pull on the stacked sheets that results in the above mentioned slippage and by so doing will eliminate the distortion and the necessity for turning the final section of the log and the trimming off of its distorted end surface.

It is a further object of the present invention to provide a paper cutter of the kind above mentioned in which the log advancing back gauge, and the clamp mounted thereon that grips the trailing end of the paper log, are adapted to tilt forwardly under that pull on the top sheets that is incident to the clamping pressure applied adjacent the log cutting blade and by such tilting will prevent or avoid the cause for the above mentioned distortion of the end surface of the log.

It is a further object of the present invention to so embody the improvements of the present invention in a back gauge and tilting clamp mechanism that it can be readily applied as a replacement to certain automatic paper trimming machines already in use without necessitating any material change in their construction or mode of operation.

Further objects of the present invention reside in the provision of novel means for properly and automatically positioning a paper log upon its delivery into the machine, against the back gauge.

Still further objects and advantages of the present invention reside in the details of construction and combination of its various parts and in their mode of use, as will hereinafter be fully described.

In accomplishing the above mentioned and other objects of the invention, I have provided the improved details of construction, the preferred forms of which are illustrated in the accompanying drawings, wherein:

FIG. 1 is a top, or plan view of a paper trimmer or cutter embodying the improvements of the present invention therein.

FIG. 2 is a diagram illustrating the several directional movements of a paper log upon being delivered into the machine, in the operation of positioning it against the back gauge and clamp.

FIG. 3 is an enlarged vertical section taken on line 3—3 in FIG. 1, illustrating details of the log pusher mechanism and power cylinder, and parts directly associated therewith.

FIG. 4 is a vertical cross section taken on line 4—4 in FIG. 3.

FIG. 5 is an enlarged top view of the tiltable log feeding back gauge member of the machine as equipped with a log clamp in accordance with the teaching of the present invention.

FIG. 6 is a front, or face view of an end portion of the tiltable back gauge member and clamp.

FIG. 7 is a vertical section, taken substantially on line 7—7 in FIG. 5, showing the rear or trailing end of a paper log as abutted against the face plate of the back gauge preparatory to securing that end of the log by the back gauge clamp.

FIG. 8 is a view similar to that of FIG. 7, after the end of the log has been secured by the back gauge clamp.

FIG. 9 is a top, or plan view of a part of the log pusher or positioning mechanism, indicating in two dotted line showings, successive positions of the pusher in moving a log on the table top first to dispose it against a side guide rail and then against the back gauge face plate; certain parts of the mechanism being broken away for better disclosure.

FIG. 10 is a vertical section, taken on line 10—10 in FIG. 9, showing the air cylinder for shifting the log rearwardly in positioning it against the back gauge face plate.

FIG. 11 is a vertical section, taken on line 11—11 in FIG. 9.

FIG. 12 is an enlarged cross-section, taken on line 12—12 in FIG. 10.

FIG. 13 is a schematic layout of pneumatic and electrical controls and wiring employed with the present mechanism.

Referring more in detail to the drawings:

In FIG. 1, I have shown, in plan view, a paper trimmer and cutter that is typical of those machines to which the present invention may be applied. In this view, 1 designates a flat, horizontal table top, formed at its left hand end, in respect to its showing in FIG. 1, with a paper stack receiving guide 2 across which the stack, such as that shown in dot and dash lines at 3, may be advanced endwise by means not herein shown, onto the table top and its forward end surface caused to be pressed under a predetermined pressure flatly against a horizontal stoprail 4 which is fixed to the far end of a pusher plate 5. The stop rail and pusher plate are rigidly joined in right angular relationship, which relationship is retained by a triangular web plate 6 that is bolted or otherwise fixed to these parts.

The paper stack 3 may comprise two identical logs, placed side by side, or it might be a single log. To simplify the following description the stack 3 will be referred to as a "log" and it is to be understood that it may be a single or a pair of logs.

When the paper log 3 has been advanced endwise into the machine and disposed with its forward end flatly against the stop rail 4, a hydraulic cylinder which in FIG. 1 is designated in its entirety by numeral 7, is then energized to move the pusher plate 5 against the log and push it across the table and engage its opposite side surface firmly against the vertical inside face of a guide and side stop rail 8 under a predetermined pressure. The parts 4 and 5 are then automatically shifted, by power means presently described, to cause the trailing end of the log to be abutted flatly and firmly against the vertical face plate of the back gauge which, in FIG. 1, is designated in its entirety by numeral 9. This back gauge will presently be described in detail.

Disposed transversely across the table top as shown in FIG. 1, at a location slightly beyond the forward end of the log as thus positioned against the back gauge 9, is the log cutting knife here designated in general by numeral 10. Immediately in front of the knife 10 is a horizontal clamp bar 11 which is adapted to be actuated downwardly against the log preparatory to making each cut therethrough. The knife 10 and clamp 11 are, or may be, conventional in form and mode of use and considered per se neither forms a part of the present invention. In FIGS. 7 and 8 the knife 10 and clamp 11 have been shown in their relationship to the log before it has been clamped for cutting.

Associated with the back gauge 9 is a log securing clamp, herein referred to as the "back gauge clamp." In FIG. 1, this clamp has been designated in its entirety by numeral 12 and it will presently be described in detail.

Referring now more particularly to FIG. 5, it will be observed that the back gauge 9 as associated with guide rail 8 comprises a log advancing or indexing bracket 18. This comprises a mounting and guiding portion 18*x* that is arranged to follow the stop rail or plate 8 and an arm 18*a* that extends horizontally from the lower edge of the part 18*x* and closely over the table top, as best shown in FIGS. 5 and 6.

The bracket 18 is the medium through which the back gauge is advanced toward the knife 10. The indexing of the movements of the bracket is effected by means of a revolving spacer shaft in which stops are set. This part of the mechanism is not claimed as a part of the present invention and will not be further described. However, its position is indicated at 20 in FIG. 1.

Overlying the arm 18*a* is the tilting back gauge 9. This

comprises a vertical forward end wall 25 herein referred to as the back gauge face plate; this wall is integral with the forward edge of a horizontal base plate 26. It is shown in FIG. 7, that the rear end portion of this base plate lies close to the table top 1 and that its forward end portion is upwardly offset and extends with clearance over and across the arm 18*a* and slightly forwardly of it. Along its opposite side edges, the base plate 26 is formed with upwardly directed flanges or webs 27—27 that join with the opposite end portions of the vertical face plate 25.

Secured upon the arm 18*a*, along its forward edge, by means of screw bolts 28, is a flat bar 29 which, at its opposite ends, is equipped with upwardly and forwardly extending wings 30—30 which as seen in FIG. 5, are parallel to and closely adjacent the sides and forward ends of the flanges 27—27. Each of these wings is formed in its forward end portion with a short vertical slot 31 as shown in FIG. 8. Pivot bolts 32 are fitted to and passed inwardly through these slots and are fixed at their inner ends in the ends of the vertical face plate 25 of the tilting back gauge. These pins serve to retain the relationship of back gauge and clamp to the bracket without detriment to its tilting action.

When a paper log 3 is moved into position against the face plate 25 as shown in FIG. 7, its rear end portion moves onto a thin, flat plate or shoe 35 that extends the full length of and forwardly from a bar 36 that extends across and is bolted to the underside and forward edge of the base plate 26 of the back gauge. This plate 35 as thus mounted comprises the lower jaw member of the back gauge clamp. The upper jaw of the back gauge clamp comprises a flat horizontal bar 40 that is rigidly and adjustably supported by a pair of brackets or arms 41—41 that extend forwardly from a vertical frame 42 that is mounted immediately back of and parallel to the face plate 25. This frame, as shown in FIG. 5 has vertical opposite end edges contained in vertical guideways 43—43 formed by gibs applied to the back face of plate 25. Also, it is shown in FIG. 5 that the arms or brackets 41—41 extend forwardly from the frame 42 through vertical slots 44 in plate 25 to permit substantial vertical adjustment of the clamp bar 40.

Vertical adjustment of the clamp bar 40, to move it from or against the log, as in FIG. 8, is effected through racks 45—45 fixed vertically to opposite ends of the frame 42. These racks mesh with paired pinion gears 47—47 that are fixed on a horizontal shaft 48 that is rotatably mounted in bearings 49—49 formed in webs 50—50 cast on the base plate 26 as seen in FIG. 5. Rotative movement of shaft 48 to effect the clamping action of the bar 40 or to release it from the log, is effected by use of an air cylinder 55. This cylinder is disposed in an upwardly and forwardly inclined position and is pivoted at its lower end, as at 56 in FIG. 7, to a bracket 58 fixed on plate 26. A piston rod 59 extends upwardly from the air cylinder and is pivoted at its outer end, as at 60, to the outer end of a lever arm 61 that is adjustably fixed to and extends radially from the shaft 48. It is shown in FIG. 5 that the arm 61 extends from a hub portion 61*h* that is rotatably mounted on the shaft 48. A coil spring 62 is applied about the shaft under compression between a shaft mounting bearing 49 and the arm hub. This spring urges the arm against a disk 64 that is keyed on the shaft. Disk 64 is formed concentrically with a row of holes 65 and pins 66 that are mounted in the arm, can be selectively applied to the holes. This permits the clamp jaw 40 to be properly adjusted for the proper clamping of logs 3 of various heights.

Application of air under pressure from a source of supply to the air cylinder 55 is under control of a solenoid valve which has connection with the cylinder through flexible hose connections designated at 68—68' in FIG. 7.

Assuming that a log 3 has been disposed in the machine with its trailing end portion abutted against face plate 25 of back gauge 9 and between the clamp jaws 35

and 40 as shown in FIG. 7, it can then be clamped by admittance of air under pressure into the lower end of cylinder 55. With this application of air under pressure the piston rod 59 moves outwardly and with its movement the cross-shaft 48 will be rotated and through gears 47—47 and racks 45—45 will move the clamp bar 40 downwardly against the top of the log with clamping effect.

With the log so clamped to the back gauge it is then advanced by a forward indexing adjustment of the back gauge along the guide rail 8, to the knife 10 for cutting off a section of predetermined length from its forward end. Preparatory to making this cut, the clamp bar 11 is actuated downwardly against the log under a force that causes it to be substantially compressed, as for example, to the dash line showing in FIG. 8. This compression results in pull on the top sheets of the log that causes the back gauge 9 to be bodily tilted in a forward direction. In this tilting action the parts 25 and 26 pivot about the forward edge of shoe 35 resting on the table top, and are retained against forward movement by the pins 32 as mounted in the vertically slotted wings at the ends of cross bar 29. This forward tilting of the back gauge prevents that excessive pull on the top sheets of the log that ordinarily would have caused them to be slipped or pulled away from the back gauge face plate 25, and the back gauge clamp retains the original evenness of the clamped end surface of the log. Thus, by the provision as herein made for avoiding this excessive pull, the distortion of the end surface of the log is avoided. It is by reason of the elimination of distortion that the necessity for the end for end turning of the final section of a log and the trimming of a distorted end, is eliminated, and the necessity for additional length of the log to compensate for this trimming is made unnecessary.

It is also shown in FIGS. 7 and 8 that a stud 70 is threaded downwardly through the rear end portion of the base plate 26 of the back gauge to adjustably support the rear end of the back gauge from the table top.

Referring now to the present log positioning mechanism as shown in FIGS. 1, 2, 3, 4 and 9 to 12 inclusive. It is shown in FIG. 1 that the log pushing hydraulic cylinder 7 is disposed horizontally above and at a right angle to the log 3 as delivered onto the table top against the stop 4. This cylinder, as obserbed in FIG. 3, is fixedly mounted upon a frame structure 72 that, in turn, is fixed relative to the table top. The cylinder 7 contains a piston 73 from which a piston rod 74 extends. At its outer end the rod has a yieldable connection, at 74*x*, with a horizontal frame 75 for effecting its movement. Fixed to the forward face of frame 75 is the log pusher plate 5. This plate has a vertical face that is parallel with the side face of the log 3 as delivered onto the machine against the stop 4. When the piston rod 74 is extended by admittance of hydraulic fluid into the rearward end of the cylinder, the plate 5 engages flatly against the side of the log 3 and pushes it directly across the table to engage its opposite face flatly against the face of guide rail 8. The log then is slightly in advance of the back gauge 9 and it is then necessary that it be moved endwise in a direction opposite to its direction of entry into the machine, thus to position its trailing end surface firmly against the back gauge face plate 25, as seen in FIG. 7. To accomplish this relatively short backward movement, the plate 5 and bar 4 are shifted toward the back gauge by means of a horizontal air cylinder 80 that is rigidly fixed on the frame 75 parallel with the plate 5, as has been shown best in FIGS. 9 and 10. This air cylinder contains a piston 81 from which a piston rod 82 extends. The rod is connected at its outer end, as at 83, to a bracket 84 that is fixed to plate 5. Plate 5 is equipped on its back side with a horizontal keyway 85 that slidably contains therein a key 86 fixed to the outer face of frame 75.

When operating air is admitted to the forward end of cylinder 80, the piston is actuated toward the left, in reference to its showing in FIG. 9, and pulls the plate 5 and stop bar 4 to the left accordingly. This disposes the rear end of the log against the face plate 25 in proper position for clamping. After the log has been so disposed, and clamped to the back gauge, operating air is admitted to the rearward end of cylinder 80 to move the stop rail 4 away from the log. The cylinder 7 then is energized by admittance of hydraulic fluid to its forward end to pull the parts back to starting position as seen in FIG. 1.

The diagram shown in FIG. 2 represents the travel of a log in thus being positioned. The dash line showing 3*e* represents it as entering the machine. In its showing at 3*f* it is disposed against the stop rail 4. At 3*g* it is shown as first disposed against rail 8 and at 3*h* it is shown as disposed against the face plate 25 of the back gauge 9.

The frame 75 to which the piston rod 74 is fixed is shown in FIGS. 3 and 4 to be mounted by rollers 90 for rolling support on the underlying portion of the table top 1, and at its top side to be equipped with a guide 91 for travel along a rigid rail 92 that is fixed to frame 72 to extend along and above the cylinder and over the adjacent portion of the table 1.

Controls for the operating or moving parts of the described mechanism have been diagrammatically shown in FIG. 13 wherein a supply line for air under pressure is designated by numeral 100. This leads through a filter and lubricator 101 to a distributing line 102 which has connections 103, 104, 105, respectively, with pressure regulators 106, 107 and 108 from which air lines 109, 110, and 111 lead, respectively, to solenoid valve systems represented within the dash dot rectangles 112, 113 and 114.

As indicated, the valve system 112 controls the back gauge clamping cylinder 55. It also controls the action of a back gauge lock cylinder 118 that is shown in FIGS. 1 and 13 but is not herein described since it is common in machines of this character. The valve system 113 controls the back feed cylinder 80 as carried on the side pusher plate frame 75 and valve system 114 controls an air cylinder 116 whereby the clamp bar 11 is controlled. This cylinder is shown in FIG. 13, but not described since it also is common to machines of this kind.

Assuming that the tilting back gauge and clamp are applied to the machine as described, their use and operation is as follows:

Starting with the back gauge 9 in its fully retracted position, the back gauge clamp unclamped and open, and the side pusher plate 5 fully retracted, a log 3 is fed into the machine along the receiving table 1 and is pushed endwise against the stop rail 4.

A limit switch associated with the log feeder, not shown, is actuated by the log feeder reaching its "out" position and energizes the valve controlling the admittance of hydraulic fluid to the head end of cylinder 7. Under the action of hydraulic cylinder 7, the pusher plate 5 engages and pushes the log laterally and firmly against the side gauge rail 8. At this point, the pusher guide 91 actuates the pusher "out" limit switch, energizing the back feed cylinder valve which admits air to cylinder 80 causing it to move the log back and seat its end firmly against the face plate 25 of the back gauge 9.

When pressure builds up in the back feed cylinder system of valve 113 to a predetermined amount, a pressure switch 132 controlling the log clamping cylinder valve is automatically actuated, causing air under pressure to be applied to the log clamping cylinder 55 and resulting in the log being clamped between the jaws 35 and 40 of the back gauge clamp. When pressure builds up in this valve system to actuate another pressure switch 135, the back feed cylinder 80 and side pusher valves are deenergized resulting in the side pusher being moved back to its fully retracted position and a limit switch, not shown, being actuated which clears the back gauge for advancement. It is then advanced to the first cut off posi-

tion; this position being established by a dog as applied to the spacer shaft 20. At this point the carriage is stopped; the knife clamp valve is energized and the log is first clamped and then a section cut from the log by the knife. When the cut is completed, the knife and clamp 11 return to raised positions and the carriage advances the log to the next cutting position as established by another dog in the spacer shaft.

After the last cut has been made, the carriage feeds forward enough to insure the last section being discharged from the machine, then returns to fully retracted or "back" position ready to receive the next log.

What I claim as new is:

1. In a paper cutter of the character described comprising a table, a horizontal clamping means vertically movable above said table, a bracket movably mounted on said table, a back gauge mounted for movement along said table, said back gauge including a face plate engageable with the end surface of the trailing end of a log of paper, a log holding clamp having upper and lower jaws between and by which the trailing end of the log is clamped and held against said face plate and means pivotally joining said back gauge to said bracket whereby said back gauge is permitted to tilt toward said horizontal clamping means to accommodate the pull of the paper sheets in the top portion of the log incident to the clamping of the log by said horizontal clamping means.

2. The combination recited in claim 1 wherein said back gauge comprises a base portion extending rearwardly from and with which said face plate is rigidly associated and wherein said lower clamp jaw is rigidly fixed to the lower edge of said face plate, and rests slidably on the table, and wherein said upper jaw is mounted on and extends forwardly from the face plate, and a power means is mounted on said back gauge and is operable to adjust the upper jaw into and from log clamping positions.

3. The combination recited in claim 1 wherein said face plate is vertically slotted, and said upper clamp jaw is equipped with adjusting brackets that are adjustably mounted on the back side of the face plate and extend forwardly through the slots therein, and wherein said power means is operable to equally adjust the jaw mounting brackets in unison.

4. The combination recited in claim 3 wherein said power means comprises a power cylinder operable by a fluid pressure medium pivotally mounted at one end on the rear end portion of the back gauge and equipped with a piston having a piston rod extended from the other end of said cylinder, a rack bar fixed vertically to each of the jaw supporting brackets, a cross-shaft rotatably mounted on the back gauge, pinion gears fixed on said shaft and meshing with said rack bars and a lever arm fixed to said shaft and extended radially therefrom and connected to said piston rod.

5. The combination recited in claim 4 wherein said lever arm is rotatably mounted on said shaft, and means is associated therewith for fixing it at different positions of adjustment to accommodate the upper jaw to the different heights of various logs.

6. The combination recited in claim 1 wherein said back gauge is slidably supported on said table for the advancement of the log and said means pivotally joining said back gauge to said bracket is on the forward end of the back gauge and adjacent its lower edge.

7. The device of claim 6 wherein said back gauge has an adjusting screw threaded therethrough in its rear end portion in sliding contact with the table to coact with the lower clamp jaw for the sliding support of the back gauge and for vertical adjustment of its rear end portion.

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