May 28, 1957 E. W. PEARSON 2,793,584

PRECISION DEPTH STOP FOR PRESS BRAKES OR THE LIKE

Filed March 4, 1954 3 Sheets-Sheet 1

Fig. 1.

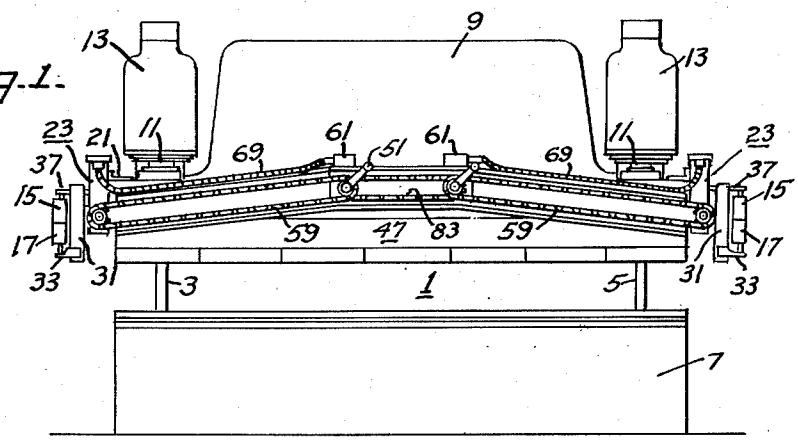


Fig. 3.

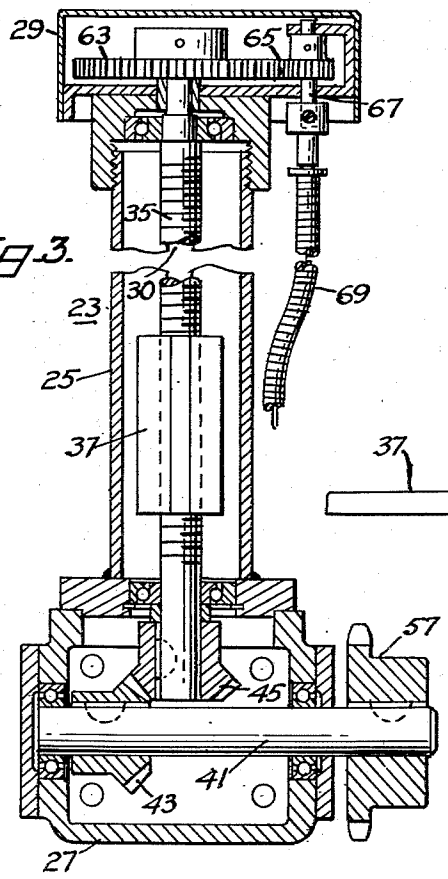
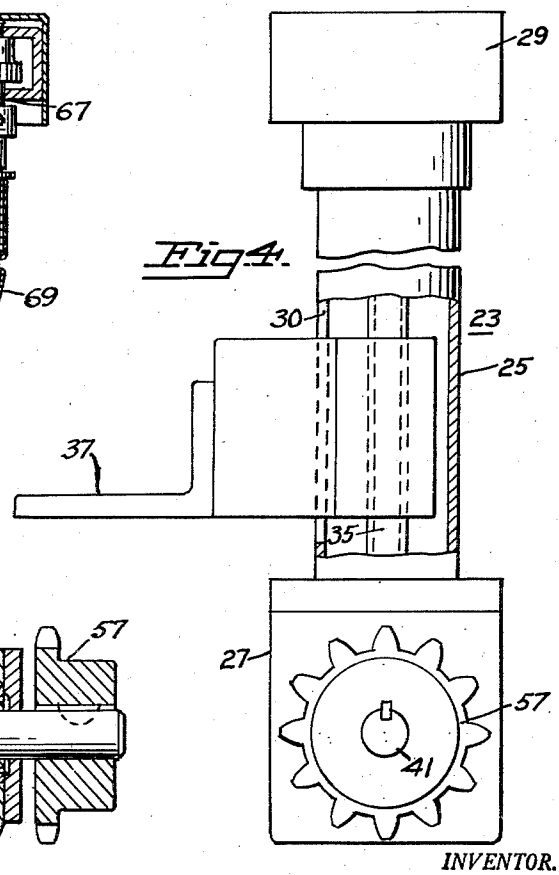


Fig. 4.



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PRECISION DEPTH STOP FOR PRESS BRAKES OR THE LIKE

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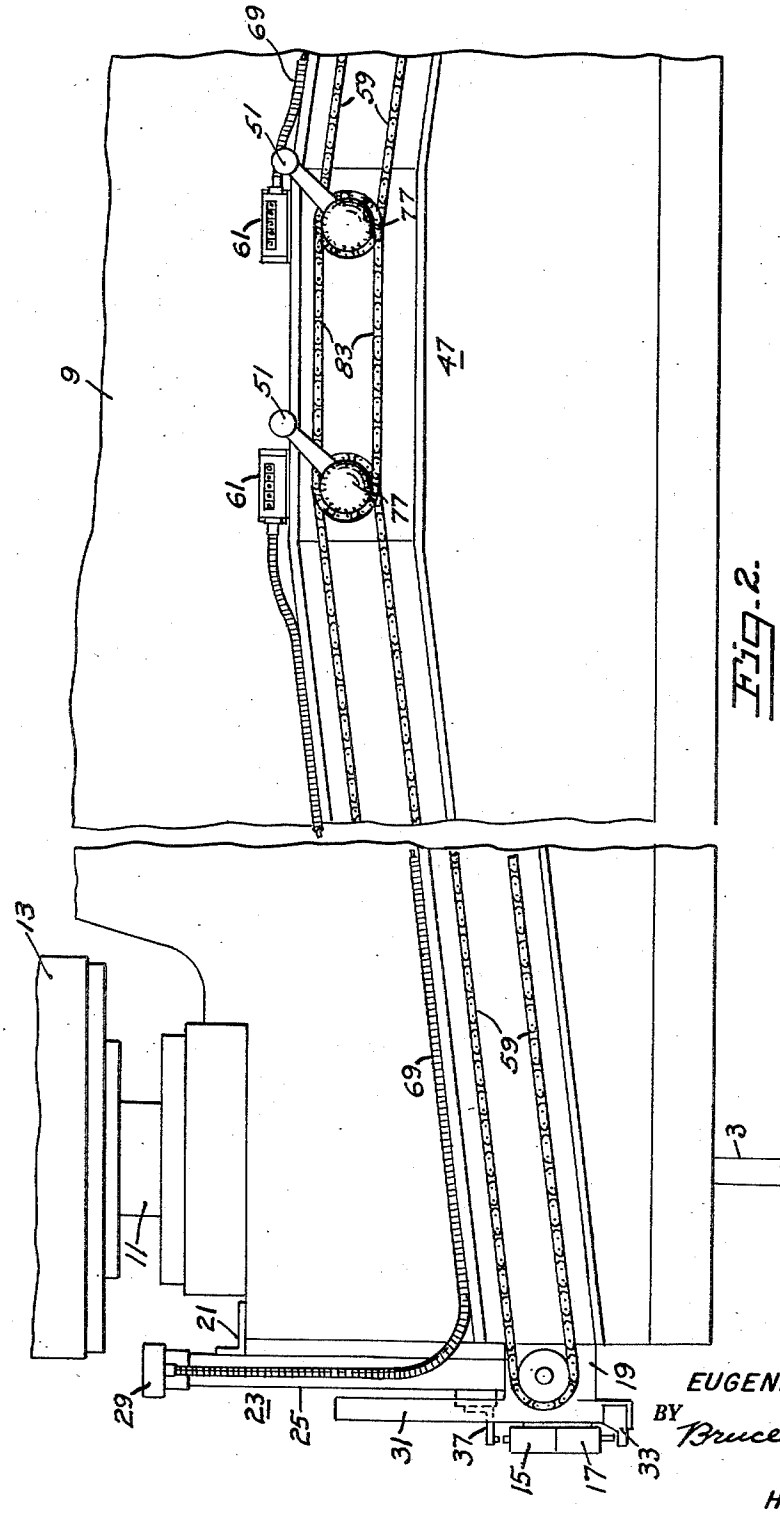


Fig. 2.

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PRECISION DEPTH STOP FOR PRESS BRAKES OR THE LIKE

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Fig. 5.

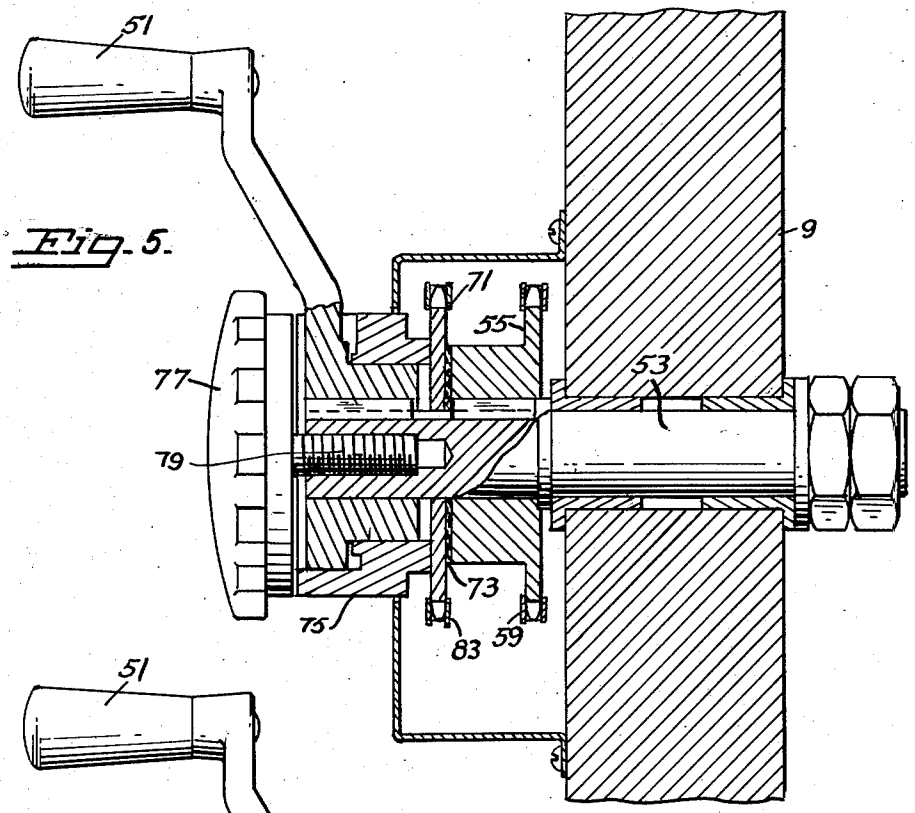
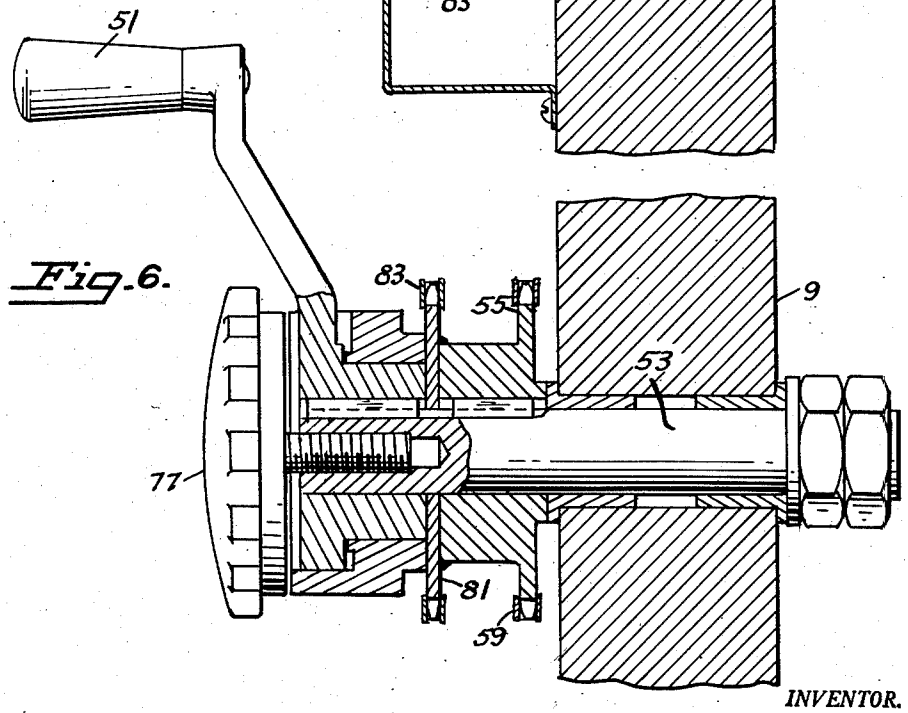


Fig. 6.



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United States Patent Office 2,793,584 Patented May 28, 1957

2,793,584

PRECISION DEPTH STOP FOR PRESS BRAKES OR THE LIKE

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Application March 4, 1954, Serial No. 414,101

12 Claims. (Cl. 100—256)

My invention relates to press brakes or the like, and more particularly to precision depth stop adjustment means for such machines.

Among the objects of my invention are:

1. To provide a novel and improved precision depth stop adjusting means for press brakes or the like;

2. To provide a novel and improved means for adjusting the lower limit of travel of the ram of a press brake or the like;

3. To provide a novel and improved means for adjusting the lower limit of travel of the ram of a press brake or the like which permits of controlling both ends of such ram from a common station;

4. To provide a novel and improved stroke adjusting means for the ram of a press brake or the like, which permits of simultaneous control of both ends of the ram;

5. To provide a novel and improved stroke adjusting means for the ram of a press brake or the like which selectively permits of simultaneous adjustment for both ends of the ram, or the individual adjustment for one end with respect to the other.

Additional objects of my invention will be brought out in the following description of a preferred embodiment of the same taken in conjunction with the accompanying drawings wherein,

Figure 1 is a front elevational view of a press brake incorporating the precision depth stop adjusting means of the present invention and depicting the relationship of the invention to the machine;

Figure 2 is a fragmentary enlarged view covering the pertinent portion of the press brake of Figure 1;

Figure 3 is a view in section through a portion of the depth stop adjusting means of Figure 1;

Figure 4 is an elevational view, partly in section of the mechanism of Figure 3 rotated through 90 degrees;

Figure 5 is a view in section through one of a pair of adjusting controls involved in the present invention;

Figure 6 is a corresponding view through the other adjusting control.

Referring to the drawings for details of the invention, in its preferred form, the system is depicted as applied to a press brake **1**, and more particularly a press brake of the type illustrated and described in the patent to Castle et al. for Electro-Hydraulic Control Means for Machines Employing Plural Hydraulic Motors, No. 2,558,071 of June 26, 1951. This machine is shown from the front in outline, to bring out the relationship to the press brake, of certain of the components of the invention, which in an actual installation, are mounted on the machine.

The press brake comprises in general a pair of side plates **3** and **5**, across the lower front edges of which is a stationary bed or lower fixed blade **7**. Slidably mounted on suitable guides along the upper front edges of the side plates, is a movable ram or upper blade **9**.

This blade is supported at each end by a piston **11**, working in a cylinder **13** which is mounted above the blade at the upper end of a side plate. Each of the cylinders is of the double acting type, that is, the operating fluid can be forced into the upper end of the cylinder to drive the ram downward, or it can be forced into the lower end of the cylinder to lift the blade.

Depth stops are necessary on such machines, when it is desired to control the lower limit of stroke of the ram or equivalent member. To realize precision work from such machine, the control of the down stroke of the ram must be accomplished with extreme accuracy, and toward this accomplishment, it became necessary to control each end of the ram as distinguished from exercising control at one end only. Since such rams may be of the order of several feet in length, the adjustment of the stop at each end of the ram not only became inconvenient but also time consuming.

In the co-pending application of Rolland A. Richardson, Ser. No. 398,080, filed December 4, 1953 for Precision Control System for Press Brakes or the Like, a stop is mounted at each end of the blade for precision control thereof. This application has been assigned to the same assignee as the present application.

In accordance with the general nature of the present invention, such adjustments may be made simultaneously from an operator's station intermediate the ends of the ram, and when desirable, one end may be adjusted relative to the other from the same location. The adjustments may thus be made quickly, and from the nature of the mechanism employed, the adjustments may be made with precision.

Accordingly, at each end of the machine, a depth stop micro-switch **15** and an upper limit micro-switch **17** are mounted in a conventional manner on a bracket **19** extending from one of the side plates. Supported by a bracket **21** at each end of the ram adjacent the micro-switches, is a vertically disposed housing **23**, which includes a cylindrical section **25** terminating its lower end in a gear case **27**, and at its upper end in a gear case **29**. The cylindrical section is provided with a longitudinal slot or opening **30**.

Affixed to the lower gear case and disposed alongside the micro-switches is a scale **31**, on the lower end of which is adjustably mounted an upper limit stop **33** in position to engage the upper limit micro-switch **17** when the ram reaches a desired upper limit of travel. Inasmuch as the upper limit control of the ram is not involved in the present invention, further reference thereto will not be made.

A screw **35** journalled in the housing in parallel with the longitudinal opening therein, and extending into the gear cases, constitutes an adjustable mounting for a depth stop **37** which is threadedly mounted on the screw and extends through the opening in the housing to a point enabling engagement with the depth stop micro-switch, when the proximate end of the ram has reached its desired lower limit of travel.

In the lower of the gear cases, a stub shaft **41** is journalled and carries a beveled gear **43** in mesh with a similar gear **45** on the lower end of the screw, whereby rotation of the stub shaft will produce corresponding rotation of the screw to produce elevational adjustments of the depth stop.

Control of such elevational adjustments of the depth stop is provided for at an operator's station **47** located intermediate the ends of the ram. From this location, means are provided for manually controlling rotation of the screw to determine depth stop adjustments. Such means includes a crank handle **51** keyed to a shaft **53** which is journalled in the ram. On this shaft is fixed a sprocket **55** corresponding to a similar sprocket **57** mounted on the exposed end of the stub shaft, the two sprockets being encircled by a chain **59** to constitute a chain drive connection.

To enable the operator to visually determine the elevational adjustments of the stop as they are being made, an indicator in the form of a counter **61** is mounted on the ram at a point above the associated crank, and such counter is driven from the screw which is under control of the crank below it.

In effecting this drive connection to the counter, a gear **63** is mounted on the upper end of the screw and this in turn is coupled to a small gear or pinion **65** pinned to a small shaft **67** extending from the gear case, to which shaft a drive cable **69** from the counter is connected. The relative size of these gears is such as to create a step-up ratio sufficient to provide a precision indication at the counter, of the elevational adjustment of the depth stop with which the gears are associated.

As thus far described, an operator may adjust each depth stop from a common station, and with precision by reason of the sensitivity imparted to the counters through the interposition of the step-up gear ratio in the drive between the adjusting screw and the counter.

I contemplate, however, the further simplification of the depth stop adjustments by selectively coupling the two chain drives in such a manner, that the operation of one crank will serve to effect the depth stop adjustments at both ends of the ram simultaneously, while still making it possible for the operator to effect the individual adjustment of one depth stop with respect to the other to establish strict correspondence between the readings on the two counters, or to effect an adjustment which will produce any desired tilt in the ram, as sometimes is desired in the operation of such a machine.

With this objective in mind, a sprocket **71** is freely mounted on the shaft of one of the cranks, in clutch relationship to the sprocket **55**, a washer **73** of leather or the like being preferably interposed between the two. A collar **75** interposed between the freely rotatable sprocket and the crank handle, extends slightly beyond the handle end of the shaft for engagement by a locking knob **77** having a threaded stem **79** adjustably threaded into the end of the shaft whereby the added sprocket might be pressure locked to the keyed sprocket for rotation therewith.

On the other crank shaft, a similar sprocket **81** is mounted, but unlike the freely rotatable sprocket **71**, this one is secured, as by welding, to the adjacent keyed sprocket **55**. By coupling the freely rotatable sprocket to the welded sprocket by a chain **83**, it becomes apparent that while the first sprocket is freely rotatable, the depth stop adjusting means for one end of the ram may be adjusted independently of the other, but as soon as the freely rotatable sprocket is locked through adjustment of the locking knob, then rotation of either crank will enable simultaneous adjustment of both depth stops. After such simultaneous adjustment, should one of the counters indicate a slight discrepancy between the adjustment of one end of the ram with respect to the other end, they can be brought into agreement by restoring the sprocket **71** to its freely rotatable condition and then making whatever adjustments are required to the "off" stop.

On the other hand, should the operation of a machine call for a tilted blade, the desired tilt can be realized quickly and easily from the operator's station through independent adjustment of each depth stop.

While I have disclosed my invention in its preferred form and in considerable detail, it is apparent that the same is subject to alteration and modification without departing from the underlying principles involved. I, accordingly, do not desire to be limited in my protection to such details as I have illustrated and described except as may be necessitated by the appended claims.

I claim:

1. Precision depth stop adjustment for press brakes or the like having a hydraulically actuated ram of substantial length, comprising means for adjustably mounting a stop at one end of such ram; a stop carried thereby; means for adjustably mounting a separate stop at the opposite end of such ram; a stop carried thereby; and means for operatively interconnecting both said adjustable mounting means whereby both may be simultaneously adjusted from a common operator's station.

2. Precision depth stop adjustment for press brakes or the like having a hydraulically actuated ram of substantial length, comprising means for adjustably mounting a stop at one end of such ram; a stop carried thereby; means for adjustably mounting a separate stop at the opposite end of such ram; a stop carried thereby; means for operatively interconnecting both said adjustable mounting means whereby both may be simultaneously adjusted from a common operator's station; and means within view of an operator at such station for indicating adjustments of said stops.

3. Precision depth stop adjustment for press brakes or the like having a hydraulically actuated ram of substantial length, comprising means for adjustably mounting a stop at one end of such ram; a stop carried thereby; means carried by said ram for adjusting said stop through said adjustable mounting means from an operator's station intermediate the ends of such ram; separate means for adjustably mounting a stop at the opposite end of such ram; a stop carried thereby; and means also carried by said ram for adjusting said latter stop through its associated separate adjustable mounting means from said operator's station.

4. Precision depth stop adjustment for press brakes or the like having a hydraulically actuated ram of substantial length, comprising means for adjustably mounting a stop at one end of such ram; a stop carried thereby; means for adjusting said stop through said adjustable mounting means from an operator's station intermediate the ends of such ram; separate means for adjustably mounting a stop at the opposite end of such ram; a stop carried thereby; means for adjusting said latter stop through its associated separate adjustable mounting means from said operator's station; and means within the view of an operator at such station and independently responsive to adjustments at each of said stops for indicating adjustments of said stops as they are made.

5. Precision depth stop adjustment for press brakes or the like having a hydraulically actuated ram of substantial length, comprising means for adjustably mounting a stop at one end of such ram; a stop carried thereby; means for adjusting said stop through said adjustable mounting means from an operator's station intermediate the ends of such ram; and means within view of an operator at such station and responsive directly to adjustments at said stop for indicating adjustments of said stop as they are made; separate means for adjustably mounting a stop at the opposite end of such ram; a stop carried thereby; means for adjusting said latter stop through its associated separate adjustable mounting means from said operator's station; and means within the view of an operator at such station and responsive directly to adjustments at said latter stop for indicating adjustments of said latter stop as they are made.

6. Precision depth stop adjustment for press brakes or the like having a hydraulically actuated ram of substantial length, comprising means for adjustably mounting a stop at one end of such ram; a stop carried thereby; means for adjusting said stop through said adjustable mounting means from an operator's station intermediate the ends of such ram; and means within view of an operator at such station for indicating adjustments of said stop as they are made; separate means for adjustably mounting a stop at the opposite end of such ram; a stop carried thereby; means for adjusting said latter stop through its associated separate adjustable mounting means from said operator's station; means within the view of an operator at such station for indicating adjustments of said latter stop as they are made; and means for operatively interconnecting both said adjusting means

whereby both may be simultaneously operated through the operation of one of said adjusting means.

7. Precision depth stop adjustments for press brakes or the like having a hydraulically actuated ram of substantial length, comprising means for adjustably mounting a stop at one end of such ram; a stop supported thereby; means carried by said ram for adjusting said stop through said adjustable mounting means from an operator's station intermediate the ends of such ram; and means within view of an operator at such station and responsive to said stop adjusting means on said ram for indicating adjustments of said stop as they are being made.

8. Precision depth stop adjustment for press brakes or the like having a hydraulically actuated ram of substantial length slidably supported thereon adjacent each end thereof, comprising means for adjustably mounting a stop at one end of such ram, said means including a vertically disposed housing having a longitudinal opening therein and a screw journalled in said housing in parallel with said longitudinal opening; a stop threadedly mounted on said screw and extending through said housing opening; means for adjusting said stop through said adjustable mounting means from an operator's station intermediate the ends of such ram; and means within view of an operator at such station and responsive to adjustments at said stop for indicating adjustments of said stop as they are being made.

9. Precision depth stop adjustments for press brakes or the like having a hydraulically actuated ram of substantial length slidably supported thereon adjacent each end thereof, comprising means for adjustably mounting a stop at one end of such ram, said means including a housing having a tubular section terminating at one end in a gear case, said tubular section having a longitudinal opening therein, a screw journalled in said housing in parallel with said longitudinal opening and extending at one end into said gear case, a stub shaft journalled in one of said gear cases, gear means in said gear case coupling said stub shaft to said screw at one end thereof; a stop threadedly mounted on said screw and extending through said housing opening; means for adjusting said stop through said adjustable mounting means from an operator's station intermediate the ends of such ram; and means within view of an operator at such station and responsive to adjustments at said stop for indicating adjustments of said stop as they are being made.

10. Precision depth stop adjustments for press brakes or the like having a hydraulically actuated ram of substantial length slidably supported thereon adjacent each end thereof, comprising means for adjustably mounting a stop at one end of such ram, said means including a housing having a tubular section terminating at one end in a gear case, said tubular section having a longitudinal opening therein, a screw journalled in said housing in parallel with said longitudinal opening and extending at one end into said gear case, a stub shaft journalled in said gear case, gear means in said gear case coupling said stub shaft to said screw at one end thereof; a stop threadedly mounted on said screw and extending through said housing opening; and means for adjusting said stop through said adjustable mounting means from an operator's station intermediate the ends of such ram, said means including a crank mounted on said ram at such operator's station, with its shaft journalled therein, and a chain drive connection between said crank shaft and said stub shaft.

11. Precision depth stop adjustments for press brakes or the like having a hydraulically actuated ram of substantial length, comprising means for adjustably mounting a stop at one end of such ram, said means including a housing having a tubular section terminating at one end in a gear case, said tubular section having a longitudinal opening therein, a screw journalled in said housing in parallel with said longitudinal opening and extending at one end into said gear case, a stub shaft journalled in said gear case, gear means in said gear case coupling said stub shaft to said screw at one end thereof; a stop threadedly mounted on said screw and extending through said housing opening; means for adjusting said stop through said adjustable mounting means from an operator's station intermediate the ends of such ram, said means including a crank mounted on said ram at such operator's station, with its shaft journalled therein, and a chain drive connection between said crank shaft and said stub shaft; and means within view of an operator at such station for indicating adjustments of said stop as they are being made.

12. Precision depth stop adjustments for press brakes or the like having a hydraulically actuated ram of substantial length, comprising means for adjustably mounting a stop at one end of such ram, said means including a housing having an intermediate tubular section terminating at each end in a gear case, said tubular section having a longitudinal opening therein, a screw journalled in said housing in parallel with said longitudinal opening and extending at each end into one of said gear cases, a stub shaft journalled in one of said gear cases, gear means in said last mentioned gear case coupling said stub shaft to said screw at one end thereof; a stop threadedly mounted on said screw and extending through said housing opening; means for adjusting said stop through said adjustable mounting means from an operator's station intermediate the ends of such ram, said means including a crank mounted on said ram at such operator's station, with its shaft journalled therein, and a chain drive connection between said crank shaft and said stub shaft; and means within view of an operator at such station for indicating adjustments of said stop as they are being made, said means including a counter mounted on said ram at such operator's station, and a drive connection from the other end of said screw to said counter, said drive connection including a gear train in the remaining case and having a step-up ratio.

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