July 30, 1929. F. E. MUNSCHAUER 1,722,819

HOLDDOWN MECHANISM FOR SHEARING MACHINES

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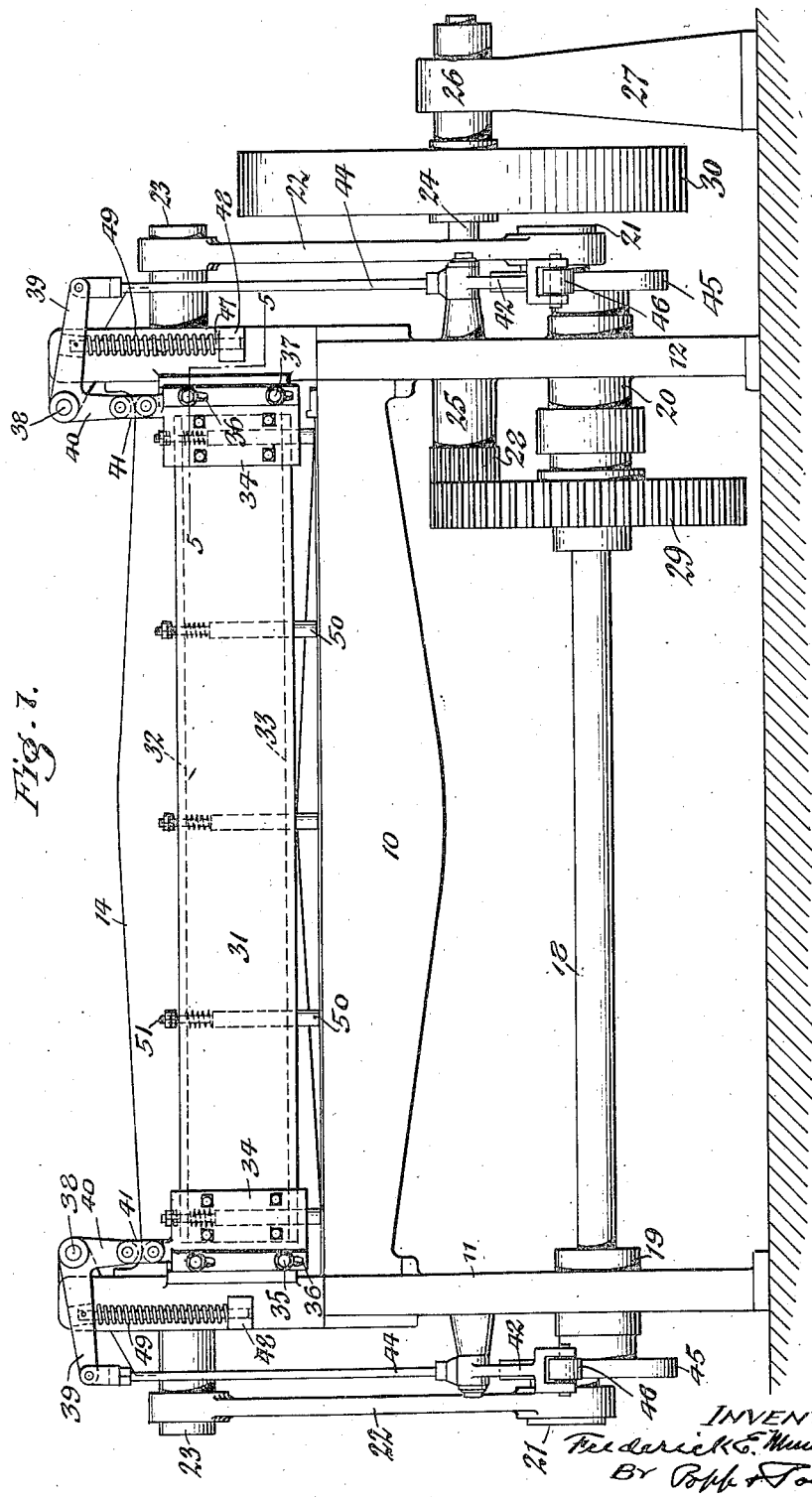


Fig. 1.

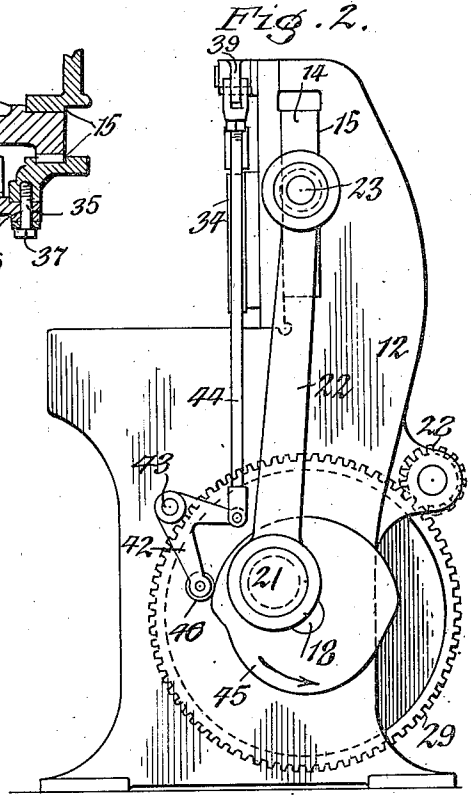
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Fig. 2.



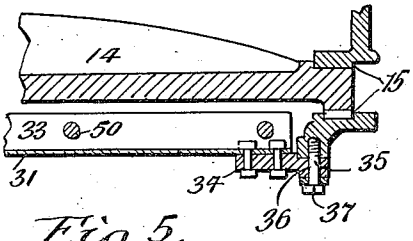


Fig. 5.

Fig. 3.

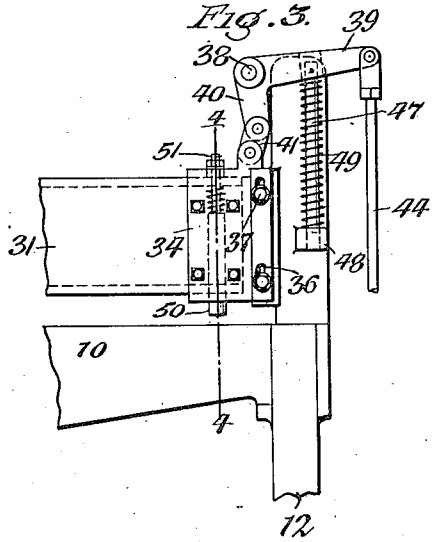
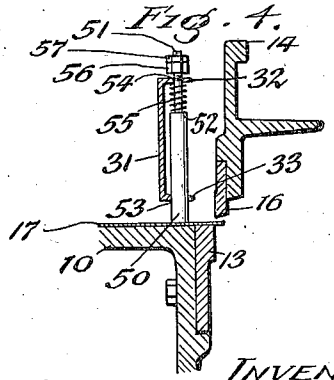


Fig. 4.



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Fig. 7.

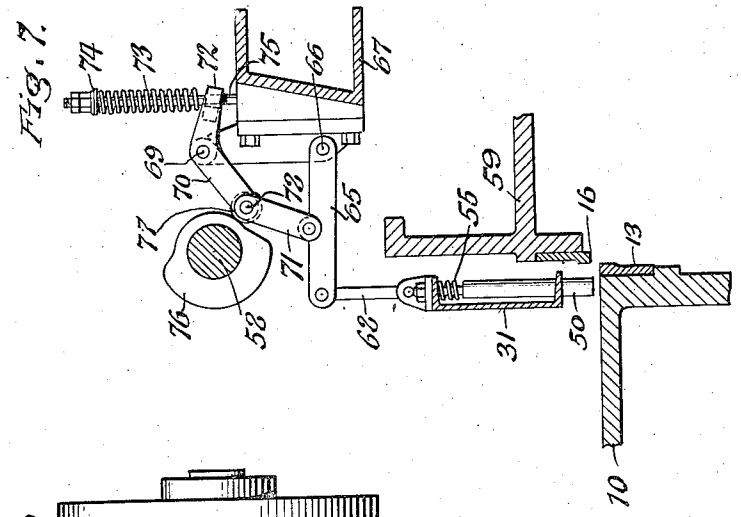
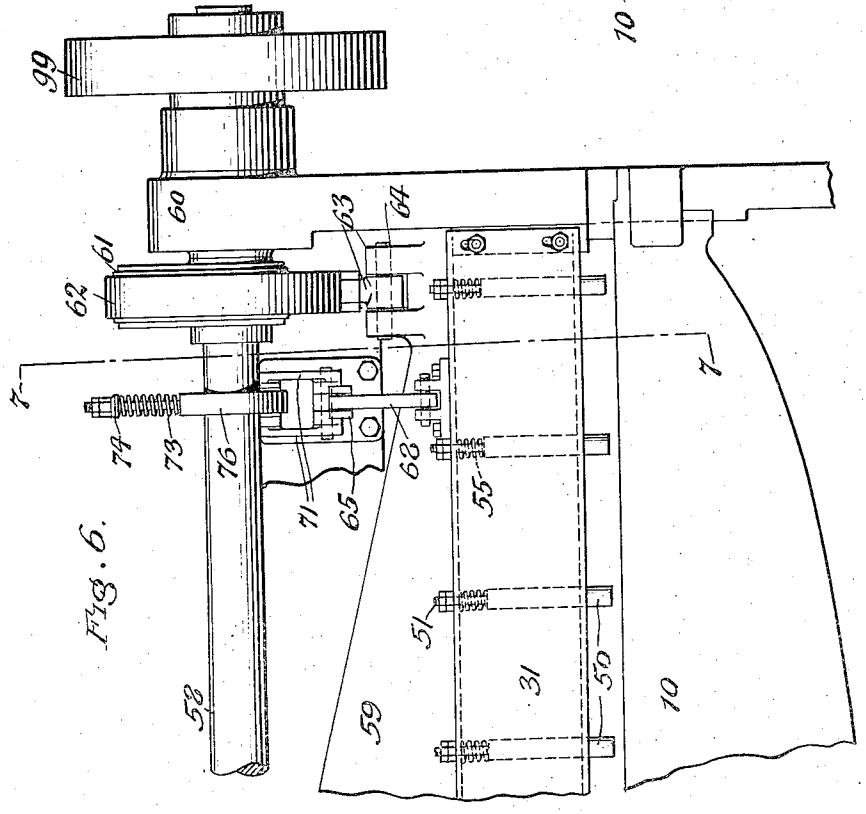


Fig. 6.



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Fig. 8.

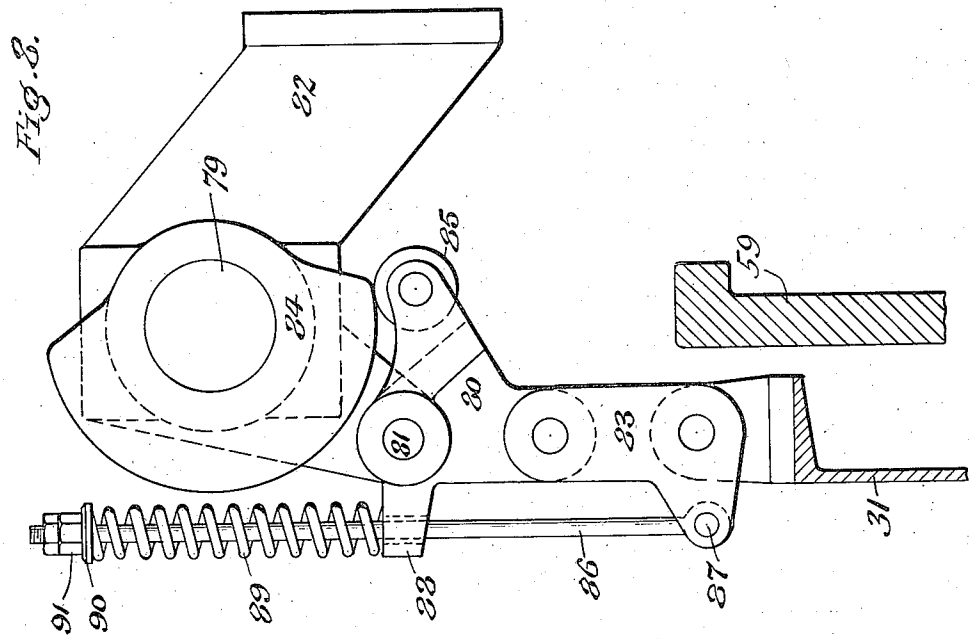
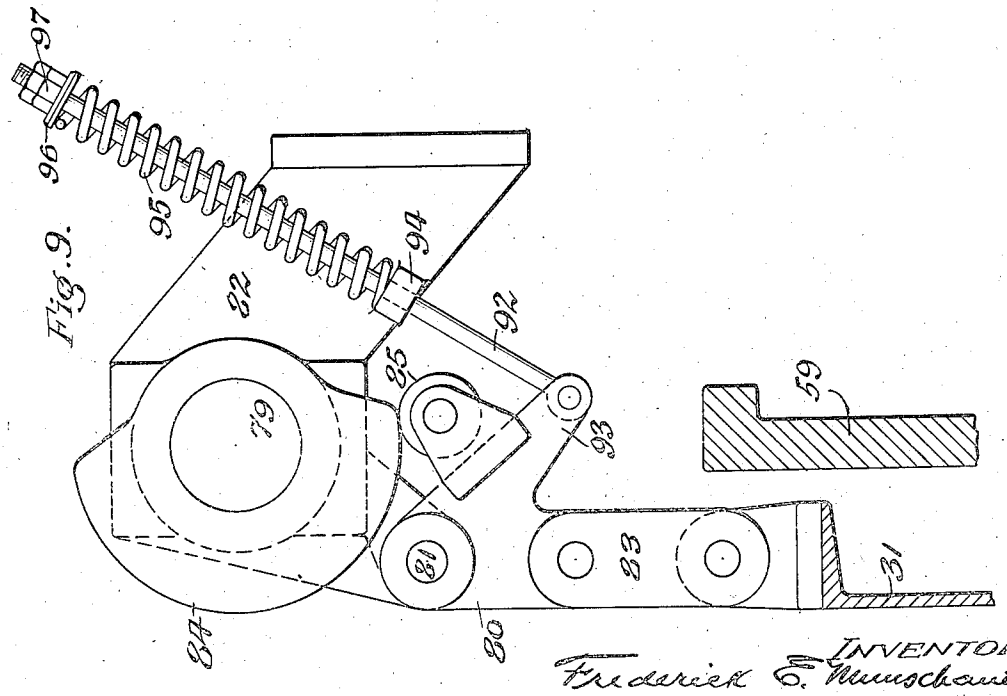


Fig. 9.



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UNITED STATES PATENT OFFICE.

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HOLDDOWN MECHANISM FOR SHEARING MACHINES.

Application filed February 4, 1924. Serial No. 690,372.

This invention relates to a holddown mechanism for shearing machines.

In holddown mechanisms for this purpose as heretofore constructed it has been impossible to always maintain the same grip or hold upon the sheet throughout the width thereof, this being due to the fact that the holddown mechanism would not always bear evenly upon the sheet along that portion which was being cut, with the result that the sheet would often slip out of place and not be cut properly.

It is the object of this invention to provide a holddown mechanism for shearing machines which will always bear uniformly against the sheet or material throughout the width thereof and hold the same reliably in place during the shearing or cutting operation regardless of any unevenness in the thickness of the material and thereby permit of always cutting the sheets perfectly and along the line it was intended to be cut.

In the accompanying drawings:

Figure 1 is a front elevation of a shearing machine having an under-drive and equipped with my improved holddown mechanism, and showing the latter in its depressed or operative position.

Figure 2 is an end elevation thereof.

Figure 3 is a fragmentary front elevation of the same showing the holddown mechanism elevated or in its inoperative position.

Figure 4 is a fragmentary vertical longitudinal section taken on line 4—4, Figure 3.

Figure 5 is a fragmentary horizontal section taken on line 5—5, Figure 1.

Figure 6 is a fragmentary front elevation of a shearing machine having an overhead drive and equipped with a modified form of my holddown mechanism.

Figure 7 is a fragmentary vertical longitudinal section, taken on line 7—7, Figure 6.

Figures 8 and 9 are fragmentary vertical longitudinal sections showing other variations in detail of construction of the holddown mechanism containing my invention.

Referring to the machine illustrated in Figures 1 to 5, the numeral 10 represents the bed or table of the shearing machine which is supported at its opposite ends upon standards or legs 11, 12 and provided on its rear side with a lower knife 13 which is arranged transversely and has its upper edge arranged flush with the top of the bed, as shown in Figure 4. Arranged transversely above the bed is a vertically movable cross head 14 which is guided at its opposite ends in vertical ways 15 on the upper parts of the standards and provided on its front side with an upper knife 16 which is adapted to cooperate with the lower knife 13 for the purpose of shearing the plate or sheet of metal 17 which is supported upon the bed and projects across the cutting line between the upper and lower knives. This cross head may be raised and lowered by any suitable and well-known means, those shown in the drawings being well-known and approved and comprising a main shaft 18 arranged horizontally and transversely below the bed and journaled at its opposite ends in bearings 19 and 20 on the lower parts of the standards, cranks 21, 21 mounted at opposite ends of the main shaft outside of the standards, and connecting rods 22, 22 which are pivotally connected at their lower ends with the cranks 21, while their upper ends are pivotally connected with opposite ends of the cross head by means of the pins 23. Due to this construction the cross head will be raised and lowered during each rotation of the main shaft 18 and produce a cutting operation of the machine.

The main shaft may be driven in various ways, for instance, by means of a driving shaft 24 journaled in a bearing 25 on one of the standards and an out-bearing 26 arranged on the pedestal 27 and provided at its inner end with a gear pinion 28 which meshes with the gear wheel 29 on the main shaft and also provided adjacent to the pedestal 27 with a pulley 30 adapted to receive a belt whereby power is transmitted to the machine from any suitable source.

The form of holddown mechanism shown in Figures 1 to 5 which embodies my invention is constructed as follows:

Arranged transversely in front of the cross head 14 is a horizontal holddown bar which is preferably constructed of U-shaped form in cross section and has a vertical web 31 and upper and lower flanges 32, 33 which project rearwardly from the upper and lower edges of this web. This holddown bar is guided on the standards so as to be capable of moving vertically thereon toward and from the bed, this being preferably effected by means of guide blocks 34 secured to opposite ends of the holddown bar and guide bolts 35 passing through vertical slots 36 in the outer edges of

the guide blocks 34 and engaging their rear threaded ends with the adjacent parts of the standards while the heads 37 at their front ends engage with the front sides of the guide blocks 34, as shown in Figures 1 and 5. The vertical movement of the holddown bar and the parts associated therewith is preferably imparted thereto by motion derived from the main shaft 18 for which purpose an intermediate actuating mechanism is provided which in the example shown in the Figures 1 to 5 is constructed as follows:

Arranged adjacent to opposite ends of the holddown bar and above the latter are two intermediate levers each of which is of L-shaped or bell-crank form and each fulcrumed on a fixed center by means of a longitudinal horizontal pin 38 and having an upper horizontal arm 39 which projects laterally outward from this fulcrum and a vertical lower arm 40 which depends from this fulcrum, a link 41 connecting the lower end of the vertical arm 40 of each intermediate lever with the upper end of the guide block on the adjacent end of the holddown bar, two elbow levers 42 pivotally mounted by means of horizontal transverse pins 43 on the outer sides of the lower parts of the standards so that each is capable of swinging in a vertical plane, a connecting rod 44 connecting one arm of each elbow lever with the upper horizontal arm 39 of the intermediate lever on the same side of the machine, and two cams 45 arranged on opposite ends of the main shaft 18 and each engaging with a roller 46 on the other arm of the adjacent elbow lever. The numeral 47 represents two vertical guide rods arranged in front of the upper parts of the standards and each pivotally connected at its upper end with the horizontal arm of the adjacent intermediate lever while its lower end is guided in a lug 48 on the adjacent part of the respective standard. Each of these guide rods is surrounded by a spring 49 which bears at its lower end against the guide lug 48 and at its upper end against the underside of the respective horizontal arm 39.

During each rotation of the main shaft 18 the cams 45 by engaging their high surfaces with the rollers 46 of the elbow levers cause the latter to be turned in a direction which will produce a positive downward motion of the holddown bar 31, 32, 33 toward the bed of the machine, this being caused by the two intermediate levers at this time turning in a direction which will cause the lower arms 40 of these levers and the links 41 to be straightened in the form of a toggle, as shown in Figure 1 and thereby produce a powerful lowering effect upon the holddown bar. As the low faces of the cams 45 are presented to the rollers 46 of the elbow levers, the resilience of the springs 49 operate to turn the intermediate levers in the opposite direction so as to cause the lower arms 40 of these levers and the links 41 between the same and the holddown bar to be folded with a toggle action, as shown in Figure 3 and thereby move the holddown bar upwardly away from the bed.

On the holddown bar are mounted a plurality of individually yieldable retaining members which are adapted to engage with the upper side of the sheet, plate or other material which is resting upon the bed and thereby hold the same reliably in place preparatory to severing the same. These retaining members are preferably arranged in a transverse row on the holddown bar and each of these members preferably is constructed in the form of a pin having a lower enlarged part 50 and an upper reduced part 51 thereby forming an upwardly facing shoulder 52 between the enlarged lower and the reduced upper part of this pin. The lower and upper flanges of the holddown bar are provided with a plurality of pairs of guide openings, the lower opening 53 and the upper opening 54 of each pair being arranged vertically in line, and the respective lower opening being comparatively large and receiving the enlarged lower part 50 of the retaining pin and the companion upper opening 54 receiving the reduced upper part of the same retaining pin, as shown in Figure 4. Each of the retaining pins is projected with its lower end yieldingly below the lower end of the holddown bar, this being preferably accomplished by means of a spring 55 surrounding the upper reduced part 51 of the retaining pin and bearing at its lower end against the shoulder 52 of this pin while its upper end bears against the underside of the upper flange 32 of the holddown bar, as shown in Figure 4. The downward movement of each retaining pin is limited by a stop device which is preferably capable of adjustment so as to be capable of varying the position of the lower end of the retaining pin relatively to the holddown bar in the projected position of this pin.

In the preferred construction this stop device consists of a screw nut 56 which is arranged on the upper screw threaded end of the reduced part of the retaining pin and adapted to engage with the upper side of the upper flange of the holddown bar. This stop nut is held in place after adjustment by means of a clamping nut 57 applied to the reduced part of this retaining pin and engaging with the upper side of the adjusting nut 56.

In the operation of the machine the cross head and the holddown bar are both elevated while the attendant is pushing or feeding the sheet of metal forwardly into the position in which it is to be cut. Thereafter the holding bar is moved downwardly and during the first part of this downward movement the lower ends of the retaining pins engage with the upper side of the sheet which is to be cut, at different points in the

width thereof, and during the final part of the downward movement of the holding bar the same moves independently of the retaining pins so that the tension on the springs 55 which are applied to these pins is increased. During this downward movement of the holddown bar the retaining pins engage with the sheet independently of each other which permits each pin as it comes in contact with the sheet to be arrested thereby and permit the other retaining pins to subsequently also engage with the respective parts of the sheet and be arrested thereby independently of each other until all of the several pins are thus engaged with the sheet. It follows from this construction that all parts of the sheet are thus firmly engaged by the several pins regardless of any irregularity or variation in the thickness of the sheet throughout the width thereof and also regardless of whether or not the lower ends of the several pins are horizontally in line and equidistant from the bed when the holddown bar is in its elevated or retracted position. As a result of this organizaiton and operation the sheet will be firmly and reliably gripped throughout its width and held in place on the bed so that during the subsequent operation of cutting the sheet by reason of the downward movement of the cross head which follows the descent of the holddown bar and causes the sheet to be severed between the lower fixed and upper movable knives and produce a cut of the sheet which is absolutely perfect and in accord with the line on which it was intended to sever the same.

After the sheet has been cut by the shearing knives the cross head is first moved so as to raise the upper knife out of the path of the sheet and then the holddown bar is raised for the purpose of disengaging the lower ends of the retaining pins from the sheet and permitting the latter to be advanced for cutting the same at another place or enabling the same to be replaced by another sheet to be cut. During such upward movement of the holddown bar, the same moves idly during the first part of this movement independently of the retaining pins until the upper side of the flange 32 of this bar engages with the stop nuts 56 of the several retaining pins and thereafter during the last part of the upward movement of this bar the several retaining pins are carried upwardly therewith into their uppermost or fully retracted position. By turning the stop screw nuts 56 on the upper ends of the several retaining pins the latter may be adjusted vertically on the holddown bar so as to adapt the lower ends of these pins to the sheets which are to be cut or sheared.

In Figures 6 and 7 my invention is embodied in an overhead driven shears in which the main shaft 58 is arranged horizontally and transversely above the cross head 59 and journaled in bearings 60 at the upper ends of the standards, motion being transmitted from this shaft to this cross head by means which comprise an eccentric 61 arranged on the shaft 58 and surrounded by an eccentric strap 62 which is connected by means of a rod 63 with a pivot 64 on the adjacent end of the cross head 59, and power being applied to this shaft by means of a belt passing around a pulley 99 on one end thereof.

In this modified form of my improved holddown mechanism for overhead driven shears mechanism employed for raising the holddown bar is constructed as follows:

The numeral 65 represents an intermediate rock lever which is pivoted at its rear end by means of a pin 66 on a cross bar 67 arranged on the upper ends of the standards, a link 68 connecting the front end of the intermediate lever with the upper side of the holddown bar 31, an upper actuating lever preferably of elbow form pivoted by means of a pin 69 to the upper part of the cross bar 67 and having its front arm 70 connected by means of a link 71 with the intermediate lever 65 and having its rear arm 72 constantly pressed downwardly by means of the spring 73 which is interposed between the upper side of the arm 72 and a screw nut 74 which is connected by means of a rod 75 with the cross bar 67, and a cam 76 arranged on the main shaft 58 and operating against a roller 77 which is mounted on the pivot 78 which pivotally connects the front arm 70 of the actuating lever and the link 71.

When the cam 76 presents its low face to the front arm 70 the spring 73 depresses the rear arm 72 of the actuating lever and causes the front arm 70 of this lever to be raised which results in a folding action of this front arm 70 and the link 71 in the form of a toggle, whereby the holddown bar 31 is elevated together with its retaining pins into an inoperative or retracted position. As the shaft 58 rotates and engages the high face of the cam 76 with the roller 77, then the link 71 and the front arm 70 of the actuating lever are straightened in the form of a toggle whereby the spring 73 is compressed and the intermediate lever 65 is swung downwardly so that the holddown bar together with its retaining pins is moved downwardly for effecting the operation of clamping the sheet at different points of its width against the bed in the same manner previously described in the explanation of Figures 1 to 5 prior to effecting the shearing on the sheet.

In the modified form of my invention, shown in Figure 8, the holddown bar 31 is raised and lowered by motion derived from an overhead shaft 79 by means of a pin 81 on an overhead bracket 82 forming part of the main frame, a link 83 connecting the low-

er arm of the lever 80 with the upper part of the holddown bar, a cam 84 arranged on the shaft 79 and operating upon a roller 85 arranged on the upper arm of the lever 80, a tension rod 86 pivotally connected at its lower end by means of a pin 87 with the link 83, while its central part slides through a guide lug 88 on the central part of the lever 80 and a spring 89 surrounding the upper part of the tension rod 86 and bearing with its lower end against the guide lug 88 and at its upper end against a washer 90 which is held in place on the upper part of the tension rod 86 by means of a screw nut 91 thereon.

In this construction the high part of the face of the cam 84 operates to depress the arm of the lever 80 which carries the roller 85 and thereby carries the other arm of this lever in the direction in which it will produce a straightening effect of the same in relation to the link 83, in the manner of a toggle, and thereby causes the holddown bar 31 to be lowered. As the low face of the cam 84 is presented to the roller 85 of the lever 80 the resilience of the spring 89 will cause the link 83 and the lever 80 to be turned rearwardly into a folded position similar to the action of a toggle and thereby cause the holddown bar 31 together with the retaining pins mounted thereon to be elevated and thus clear the path above the bed or the table for releasing the sheet resting thereon preparatory to forming another cutting operation.

Instead of arranging this spring mechanism in an overhead driven machine for raising the holddown bar in front of the main shaft 79, this spring mechanism may be arranged in rear of this shaft as shown in Figure 9. In such a construction the tension rod 92 is pivotally connected at its lower end with the rear arm 93 of the elbow lever 80 and guided with its central part in a lug 94 on the overhead bracket 82 of the main frame and a spring 95 surrounds the upper part of the tension rod and bears at its lower end against the lug 94, while its upper end bears against a washer or shoulder 96 which is held in place on the upper end of the tension rod 92 by means of screw nuts 97 applied to this end of the rod.

In the several constructions herein shown embodying my improved holddown mechanism the holddown bar is raised and lowered by a toggle action which is straightened by means of cams for the purpose of producing a powerful pressure upon the retaining pins whereby the sheet of metal to be cut is reliably held in place and the folding of the toggle members is effected by means of a return spring, thereby furnishing an apparatus for this purpose which is comparatively simple in construction and capable of being operated with a minimum amount of power, while at the same time enabling a firm and reliable hold or grip to be obtained upon the sheet which is to be cut, which will positively hold the same in its proper place preparatory to being cut and thereby avoid the necessity of repeated trimming of the sheet or wasting material.

Due to this toggle mechanism for moving the holddown pins into their operative position the main part of the load for doing this work is taken up by this toggle mechanism with comparative ease and thus relieves the holddown cams from undue wear while this work is performed.

I claim as my invention:

1. A shearing machine comprising a bed adapted to support the material to be cut, a holddown mechanism having a bar movable toward and from said material, and means for actuating said bar comprising two upper levers each having a lateral projecting arm and a downwardly projecting toggle arm, two toggle links each connecting one of said toggle arms with one end of said bar, two lower levers, two rods each connecting one arm of each lower lever with the laterally projecting arm of one of said upper levers, and two rotary cams each operating on the other arm of one of said lower levers.

2. A shearing machine comprising shearing means, a bed adapted to support the material to be sheared, and a holddown mechanism having a holddown bar which is a channel shaped in cross section and movable toward and from the bed, and having an upright longitudinal web and horiozntal flanges at the upper and lower edges of said web and said flanges being provided with corresponding pairs of upper and lower guide openings, respectively, a plurality of holddown pins each having an enlarged lower part which is guided in a lower guide opening of said lower flange and a reduced upper part which is guided in an upper guide opening of said upper flange and said pin being provided with an upwardly facing shoulder between its enlarged lower and reduced upper part, a spring surrounding this reduced part of each pin between the shoulder thereof and the underside of said upper flange, and a stop screw nut arranged on the upper end of the reduced part of each pin and adapted to engage the upper side of said upper flange for limiting the downward movement of the pin thereon, the downward movement of said holddown bar being stopped before the same engages the material being cut.

3. A shearing machine comprising shearing means, a bed adapted to support the material to be sheared, and a holddown mechanism having a holddown bar movable toward and from the bed, a holddown pin guided on said bar to slide thereon perpendicular to the plane of said bed, yielding means operating to hold said pin yieldingly in a projected position relatively to said bar, and means for actuating said bar comprising

an intermediate lever turning on a fixed fulcrum, a link connecting said lever with said bar, a cam for shifting said lever in the direction for moving said bar toward said bed, and a spring for shifting said lever in the direction for moving said bar away from said bed.

4. A shearing machine comprising shearing means, a bed adapted to support the material to be sheared, and a holddown mechanism having a holddown bar movable toward and from the bed, a holddown pin guided on said bar to slide thereon perpendicular to the plane of said bed, yielding means operating to hold said pin yieldingly in a projected position relatively to said bar, and means for actuating said bar comprising an intermediate lever turning on a fixed fulcrum and having a horizontal upper arm projecting laterally from said fulcrum and a vertical lower arm depending from said fulcrum, a link connecting said lower arm with said bar, a rotary cam for shifting said lever in the direction for moving said bar toward said bed, an elbow lever having one of its arms operated upon by said cam, a connecting rod connecting the other arm of said elbow lever with the horizontal arm of said intermediate lever, a guide rod connected at one end with said horizontal arm, a stationary guide for the other end of said rod, and a spring surrounding said rod between said guide and said horizontal arm and operating to turn said intermediate lever in the direction for moving said bar away from said bed.

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