This invention relates to improvements in leather cutting machines. The present invention is of the "clicker" machine type which comprises a flywheel operated punch controlled by a suitable clutch. In use the leather to be cut is adjusted to a proper position on a chopping block, a die is placed in position on the leather, the "clicker" head is swung into position above the die, and the clutch is actuated to cause one or more (usually several) blows to be delivered to the die to cut the leather. In use there is a very considerable shock experienced as the one or more blows are delivered and under the impact the die is severely stressed, and in a short time becomes "sprung" or damaged and must be replaced. In addition the die is continually being driven through the leather and into the chopping block to varying depths and the surface of the block becomes chewed and worn in turn adversely affecting the die which is being pounded against the uneven surface. Thus the block must be resurfaced or replaced from time to time at considerable expense.

Because of the actual physical shock which is imparted through to the operator as well as the noise and also because of the fact the operator must be continually shifting and adjusting the leather hide, the operation of the present "clickers" is extremely fatiguing and time consuming, particularly where a large hide has to be manipulated.

Further, the severe shock or jar imparted through the chopping block to the table, floor, or other support surface necessitates a heavily reinforced support surface, particularly if the shock is not to be transmitted undiminished through to the floor below to the detriment of the personnel or some operation being carried on beneath the clicker. It is therefore one of the prime objects of the present invention to eliminate the nuisance and problems of impact lever cutting experienced with present machines.

It is another important object to eliminate the tedious handling of the leather presently required and to enable all parts of the hide to be easily and quickly cut to provide an important saving in time.

Again it is an important object to provide a leather cutter which will substantially eliminate the distortion of the die and the chewing or scoring of the under material on which the leather is laid to provide important economies in the manufacture of leather articles.

Still a further object is to enable even the largest leather blanks to be cut with a single operation of the machine to again provide an important saving of time.

According to the invention the apparatus for cutting leather or the like comprises a pair of vertically separated parallel rigid surfaces or platforms between which is arranged, on a suitable movable support, a power operated extensible mechanism arranged to extend perpendicularly to the parallel surfaces, the one surface forming an abutment surface to limit movement in one direction and the other surface forming a leather supporting table whereby the extensible mechanism on movement towards the table is adapted to force a cutting die placed on a hide supported on the table through the leather.

More particularly in the preferred embodiment of the invention herein illustrated, the extensible mechanism comprises an upright toggle mechanism including pressure plates at its upper and lower extremities, the toggle being supported to move freely over the table into vertical registry with a cutting die set at any desired position on a hide placed on the table on top of a suitable underlay material, the toggle on being moved to the desired position being operated by a power mechanism to extend the toggle to bring the top pressure plate against the abutment surface and the lower pressure plate adjacent or against the die and to thereafter apply pressure on the die to force it through the leather with a controlled steadily increasing pressure and into the under material beneath the leather to a gauged distance.

Another feature of the invention resides in providing means to adjust the "thickness" of the pressure plate at the upper end of the toggle to adjust the penetration of the die into the under material.

Still another important feature resides in forming the toggle mechanism as a multiple toggle system and applying pressure to the pressure plates, one against the abutment platform and the other against the die, at a number of points simultaneously to provide an even distribution of stress for mechanical safety and balanced pressure.

Again it is a feature to carry the toggle mechanism and its actuating device on an arm supported for "universal" movement allowing the toggle to be guided over all portions of the lower platform or table, and utilizing the toggle actuating device to maintain the toggle pressure plates clear of the fixed platform throughout movement of the arm.

These and other objects and features of the invention will be apparent from the following description taken in conjunction with the accompanying drawings, in which:

Figure 1 is a side-elevational view of a leather cutting machine constructed to embody the invention, the frame of the machine being partly broken away, and the machine being shown in the inoperative position.

Figure 2 is a horizontal section taken on the line 2-2 of Figure 1.

Figures 3, 4, 5 and 6 are fragmentary part-elevational, part-sectional views showing the sequence of steps as the extending mechanism of the machine is actuated to effect leather cutting.

Figure 7 is a perspective view partly broken away of the machine of Figures 1 to 6.

Figure 8 is a part plan, part horizontal sectional view showing details of the hydraulic cylinder for operating the extending mechanism.

Figure 9 is a side-elevational view of an alternative form of the machine also embodying the invention.

Figure 10 is an end-elevational view of the machine of Figure 9.

Figure 11 is an enlarged side-elevational view of the upper presser plate of the extending mechanism of the machine of Figures 1 to 6 and 9.

Figure 12 is a view similar to Figure 11 taken at right angles thereto.

With reference to the embodiment of the invention shown in Figures 1 to 8, and with particular reference to Figures 1 and 7, the machine comprises a frame generally designated at 1 shown as of generally rectilinear formation.

The actual construction of the frame is not important other than it must be as rigid as possible to accommodate the operation of the extending mechanism generally designated as 2, as hereinafter more fully described.
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As illustrated, the frame 1 is shown as comprising angle iron uprights 3 between which are arranged top bars 4 while bridging across the longitudinal top bars are reinforcing beams 5 welded to the top bars to provide reinforcement further increasing the rigidity of the structure. On the underside of the top bars 4 backed by the 1 beams 5 is a composite platform or surface 6 made up of a series of laminations. A similar platform 8 is supported below and in parallel relation to the platform 6 on cross-bars 9 supported from the uprights 3.

With the platform 6 adapted to form an abutment surface for the extending mechanism 2 while the lower platform 8 is adapted to form a work supporting table on which the leather such as the hide indicated at 10 is adapted to be placed to overlie a suitable underlay material 11 which may be a heavy paper, cardboard, or other replaceable sheet material into which the cutting die indicated at 12 in Figures 3 to 6 may penetrate in the blanking out of the desired shape from the hide 10.

Supported by suitable collars 13 is an upright 14 arranged at one end of the frame 1 adjacent one corner and this upright 14 is free to rotate about a vertical axis. The upright 14 supports a horizontal cantilever support arm or frame 15 comprising a first arm section 16 welded to the upright and extending horizontally between the platforms 6 and 8.

The free end of the first arm section 16 carries an upright bracket or clevis 17 pivotally receivable in an upright pin 18 forming a pivotal connection between the first arm section 16 and the second arm section 19.

Thus the cantilever support arm 15 comprises a jointed structure which enables the free end of the second arm section 19 to sweep over the working supporting table 8. Secured to the free end of the second arm section 19 is an upright tube 20. Arranged at the upper end of the tube 20 is a presser plate assembly 21 carrying a central pin 22 telescoped into the tube 20 to form a guide arrangement for guiding the plate 21 vertically while maintaining the surface of the plate horizontal and parallel to the abutment surface 6.

Secured to the underside of the plate 21 are reinforcing and attaching ribs 23 to which the upper extremities of a toggle mechanism generally designated at 24 are connected.

Arranged at the lower end of the tube 20 is a die pressing plate 25 which like the plate assembly 21 carries a central upright pin 26 snugly fitting within the lower end of the tube 20 to guide the plate 25 to move in a vertical path while maintaining the plane of its surface parallel to the work supporting table 8.

Secured to the underside of the plate 25 is a plate 27 preferably formed of aluminum so that the die pressing plate can be used with reversible dies without damaging the cutting edges of the dies when brought into contact with them under pressure.

The toggle mechanism 24 comprises on each side of the upright tube 20 two sets of toggle arms 28 pivoted together as at 29 to form a toggle joint and having their extremities remote from the toggle joint 29 pivotally connected to the reinforcing ribs 23 and 30 respectively of the presser plate 21 and die pressing plate 25. A pair of links 31 connects the toggle joints 29 of the toggle members on each side of the upright tube 20.

The means for operating the toggle mechanism 24 comprises a hydraulic cylinder 32, the piston 33 of which is connected to a cross bar 34 carrying lugs 35 at the end thereof to which are pivotally connected rods 36 as best seen in Figures 2, 7 and 8. The rods 36 extend on either side of the cylinder 32 towards the toggle mechanism and are provided at their ends opposite to the cross bar 34 with clevises 37 straddling and pivotally secured to the adjacent toggle joint 29.

The hydraulic cylinder 32 may be of any suitable double acting type commercially available, as for instance, an air motor such as manufactured by the Bellows Com-

pany and is connected to a suitable source of compressed air (not shown), the compressed air being delivered to the cylinder through the inlet tube 38. The cylinder 32 is provided with a suitable control valve controlling air flow into either end of the cylinder, the valve being designated at 39.

Connected between a suitable coupling 40 in the air inlet line 38 is a flexible tube 41 which is led to a valve 42 mounted on the die pressing plate 25 and controlled by a suitable control or lever 43. A flexible tube 44 is connected back from the control valve 42 on the die pressing plate and coupled through a suitable connection 45 to the valve 39 to control the introduction of the compressed air from the line 41 into the adjacent end of the cylinder or through the exterior tube 46 to the opposite end of the cylinder.

It will be understood that the operation and construction of the valves are standard and form no part of the present invention.

In operation of the machine compressed air is delivered to the cylinder 32 through the exterior tube 46 to force the cylinder piston 33 inwardly to the solid line position of Figure 8. This movement of the plunger operates through the rods 36 connected to the toggle joints 29 to fold the toggle mechanism drawing the upper presser plate 21 and lower die pressing plate 25 towards each other until they substantially abut the upper and lower ends of the upright tube 20 respectively.

In this position, the plates 21 and 25 are maintained free of the engagement of the abutment surface 6 and work supporting table 8 respectively, and the toggle mechanism, including the die die pressing plate 25, can be moved freely over the table 8 to bring the die pressing plate into vertical registration with the die 12 as shown in Figure 3, which has been set on the hide 10 in any desired position.

The control lever 43 is then operated to introduce air into the opposite end of the cylinder 32 to force the piston 33 outwardly straightening the toggle joint 29. As shown in Figure 4, the initial movement of the toggle as a result of the outward movement of the cylinder piston is a dropping of the die pressing plate 25 onto the die 12 due to the weight of the plate being released on straightening of the toggle. The dropping of the plate 25 onto the die is accommodated by the rods 36 swinging on their pivots connecting the rods to the cross bar 34.

When the plate 25 meets the resistance of the die 12 the subsequent movement of the toggle mechanism on inward movement of the rods 36 as a result of the outward movement of the piston 33 is such as to bring the upper presser plate 21 into contact with the abutment surface 6. The plate 21 has thus reached the limit of its travel and forms the base from which pressure is applied downwardly on the die 12 as the rods 36 continue their inward movement. Thus from the very beginning of the application of appreciable pressure to the die 12 the cantilever support 15 is relieved of all reactive thrust and this reactive thrust is applied through the presser plate 21 to the rigid abutment surface 6.

The inward movement of the rods 36 continues until the cutting edges 47 of the die 12 have been forced through the hide 10 and into the underlay material 11 to a predetermined depth.

The control lever 43 can then be released effecting a retraction of the toggle mechanism to its unextended position of Figures 1 and 3 reversing the steps above described.

To effect a further cut, the operator can swing the toggle mechanism clear of the die 12, locate the die at any other desired point on the table on the hide 10, swing the toggle mechanism into vertical registration with the hide and repeat the operation. At no time is it necessary for him to move or manipulate the hide which has been previously placed on the table. In addition, there is no sudden shock or jar, but there is a steady increase of pressure effecting penetration of the hide by the die
with the reactive thrust being taken by the rigid abutment surface 6 and frame structure.

Since the measure of penetration of the underlay material 11 is accurately controlled, wear on the underlay material is not nearly as severe as that which occurs with the choosing block and the conventional "clicker" machine where the die is continually being driven to different depths in the underlay material. Moreover, the die itself is not subjected to the violent impact of blows to provide a very much extended die life when used with the machine of the present invention.

In the embodiment of the invention illustrated in Figures 9 to 12 the upper and lower platforms 48 and 49 corresponding to the abutment surface 6 and the table 8 are each formed of I beams 50 connected together flange to flange as shown in Figure 10 with the flanges being welded together to form a continuous surface. Preferably the under flanges of the upper platform 48 are machined to provide a smooth accurate horizontal surface while the upper flanges of the I beams of the table 49 are also machined or ground to provide a smooth work-supporting table on which a suitable underlay material 51 is located and on which a hide 52 is adapted to be placed.

The lower platform or table 49 is supported from a suitable under frame generally designated at 53, and the platforms are held in spaced parallel relation by corresponding posts 54 with the upper platform being held by suitable bolts 55 against vertical displacement. Longitudinal and transverse cross bars 56 overlying and welded to the I beam flanges of the upper platform 48 also serve to strengthen and unite the upper platform into a unitary rigid structure. As before, the extending mechanism illustrated as shown in preferred form is a toggle mechanism generally designated at 57 which corresponds to the toggle mechanism 24, and this toggle mechanism is carried on a suitable jointed cantilever support arm 58 corresponding to the support arm or frame 15 of Figures 1 to 7, whereby the toggle mechanism 57 is free to swing over the table 49 to bring its lower die pressing plate 59 into vertical registration with a suitable cutting die 60.

The toggle mechanism as before is shown as comprising sets of toggle arms 61 pivoted together at the points of the die pressing plate 59 and a presser plate formation 62 adapted to contact the abutment surface or platform 48. The plates 59 and 62 again are supported at the extremities of a vertical upright 63 for vertical reciprocatory and are pivotally connected to the extremities of the respective toggle arms 61.

In the arrangement shown in Figure 9, in the inoperative position, the toggle joints 64 formed by the pivot connections of the toggle arms intermediate between the plates 59 and 62 extend inwardly of the free end of the cantilever support arm 58 as opposed to outwardly of the support arm, as shown in the arrangement of Figures 1 to 6.

The means for operating the toggle mechanism 57 is a hydraulic system comprising a double acting cylinder 65 pivoted at 66 from the support arm 58. Hydraulic fluid, conventionally oil, is directed to opposite ends of the cylinder 65 by means of a control valve shown in block form 67, which valve is operated by a solenoid 68 controlled by a suitable switch 69 shown in diagrammatic form mounted on the die pressing plate 59. Hydraulic pressure for operating the piston 70 of the cylinder 65 is obtained by means of a motor 71 driving a pump 72 to circulate the hydraulic liquid to the cylinder 65 and back to the reservoir tank 73.

Power to operate the motor 71 and to energize the solenoid 68 is supplied through suitable feed lines 74 connected through a switch and fuse box indicated in block form at 75.

The toggle joints 64 of the extending or toggle mechanism 57 are coupled by links 76 with a cross bar 77 connecting the adjoining toggle knuckles or joints adjacent to the hydraulic cylinder 65 as seen in Figure 10. The piston 70 of the cylinder is provided with a suitable 78 to engage the cross bar 77 to control movement of the toggle mechanism under piston reciprocation. It will be understood that the operation of the toggle mechanism 57 will be the same as that described in connection with the toggle mechanism 24 as shown in Figures 3 to 6.

The presser plate assemblies 21 and 62 are similar and their details are shown in Figures 11 and 12. With reference to these figures, it will be seen that each of the presser plate assemblies 21 and 62 comprises two plate sections, an upper plate section 79 and a lower plate section 80. These sections are provided with complementary bevelled contacting surfaces 81 and are provided with complementary grooves and dovetailed formations indicated at 82 whereby relative sliding movement of the plate sections effects in addition to a lateral displacement of the upper plate section relative to the lower plate section, a vertical displacement of the upper horizontal surface of the upper plate section 79. A bracket 83 carried by the lower section 80 supports an adjustable screw operator 84 which controls displacement of the upper plate section 79 relative to the lower plate section as illustrated in Figure 11.

By means of the adjustment of the plate sections, the final position of the die pressing plate 59 can be controlled precisely to effect the exact degree of penetration of the die into the underlay material 51 desired.

While the embodiments of the invention disclosed illustrate particular applications of the invention and particular mechanisms, it will be understood that various changes in detail as well as various alterations of structure may be resorted to without departing from the spirit of the invention as set forth in the appended claims.

What I claim as my invention is:

1. In an apparatus for cutting leather or the like, a pair of vertically separated parallel rigid surfaces, the upper to form an abutment surface and the lower to form a work supporting surface to receive leather to be cut, a jointed cantilever arm supported to extend between said surfaces and movable in a direction transversely of said surfaces to bring its free end to substantially any position between said surfaces, an extendible mechanism carried by said cantilever arm at the free end thereof, said extendible mechanism being extensible in opposite directions perpendicular to the planes of said surfaces and including at its upper extremity a presser surface to engage said abutment surface and at its lower extremity a presser surface to engage a die disposed on a hide placed on said work supporting surface, and power means for actuating said extendible mechanism.

2. A device as claimed in claim 1 in which said upper presser surface is adjustable relative to said extensible mechanism to move in a direction perpendicular to the planes of said rigid surfaces.

3. In apparatus for cutting leather or the like, a pair of vertically separated parallel rigid surfaces, the upper to form an abutment surface the lower to form a work supporting surface, an extendible cantilever arm disposed between said surfaces to move over substantially said entire work supporting surface, an extensible mechanism carried at the free end of said extendible cantilever arm, the axis of said extendible mechanism being disposed perpendicularly to the planes of said surfaces and extensible in two directions and including at its upper extremity a presser surface to engage said abutment surface and at its lower extremity a presser surface to engage a die disposed on a hide placed on said work supporting surface, and power means for actuating said extensible mechanism.

4. A machine for cutting leather comprising a pair of vertically separated rigid parallel generally coextensive surfaces, the upper of said surfaces forming an abut-
ment surface, the lower forming a work supporting table, an extensible cantilever support arm formation arranged between and extending generally parallel to said surfaces, an extensible mechanism extensible in opposite directions, the upper to the members of said abutment surface and table carried at the free end of said extensible cantilever support arm formation, said extensible cantilever support arm formation on being constructed and arranged to support and position said extensible mechanism for movement over substantially the entire area of said table, said means to extend said extensible member upwardly against said abutment surface and downwardly towards said table.

5. A machine for cutting leather or the like comprising a pair of superimposed parallel rigid surfaces, the upper forming an abutment surface and the lower a work supporting table, a jointed cantilever arm formation extending between and substantially parallel to said surfaces and movable in a direction transversely of said surfaces to bring its free end over substantially any point on said table, a substantially vertically disposed extensible mechanism carried at the free end of said arm formation and extensible upwardly against said abutment surface and downwardly towards said table, and means for extending said extensible mechanism.

6. Apparatus for cutting leather or the like comprising in combination a pair of vertically separated rigid parallel surfaces, the upper forming an abutment surface and the lower a work supporting table, an extensible cantilever support extending between and substantially parallel to said surfaces and moveable in a direction transversely of said surfaces to bring its free end over different parts of said table, a toggle mechanism carried at the free end of said extensible cantilever support and operable to move upwardly towards and into abutment with said abutment surface and downwardly towards said table to force a die through a fabric disposed on said table, and means for operating said toggle mechanism.

7. Apparatus for cutting leather or the like comprising in combination a pair of vertically separated rigid parallel surfaces, the upper forming an abutment surface and the lower a work supporting table, a cantilever support extending between and substantially parallel to said surfaces and moveable in a direction transversely of said surfaces to bring its free end over different parts of said table, a vertical member carried at the free end of said cantilever support, a plate supported at each of the upper and lower extremities of said vertical member to move vertically relative to said vertical member to- ward and from said abutment surface and table respectively, a toggle mechanism connecting said plates, fluid pressure operated means pivoted to said cantilever support and to said toggle mechanism for actuating said toggle mechanism to move said plates towards and from said abutment surface and table respectively, and means for applying fluid pressure to said fluid pressure operated means.

9. Apparatus for cutting leather or the like comprising in combination a pair of vertically separated rigid parallel surfaces, the upper forming an abutment surface and the lower a work supporting table, a cantilever support extending between and substantially parallel to said surfaces and moveable in a direction transversely of said surfaces to bring its free end over different parts of said table, a vertical member carried at the free end of said cantilever support, a plate supported at each of the upper and lower extremities of said vertical member to move vertically relative to said vertical member to- ward and from said abutment surface and table respectively, a plurality of toggle bars pivotally connected to said plates and to each other to form a plurality of toggle joints, fluid pressure operated means pivotally supported from said cantilever support and pivotally connected to said toggle joints for actuating said toggle bars to move the upper of said plates into and out of contact with said abutment surface and the lower of said plates towards and from said table, and means for controlling the operation of said fluid pressure operated means.

10. A device as claimed in claim 9 in which said fluid pressure operated means comprises a cylinder carried by said cantilever support, a plunger operating in said cylinder in a direction substantially transversely of said toggle joints.

11. A device as claimed in claim 9 in which said upper plate comprises a pair of plate sections having the one superimposed on the other and with the contacting surfaces of the plate sections being complementarily tapered, and means for moving said plate sections relatively to displace the upper surface of the upper plate section perpendicularly to said vertical member carried by the free end of said cantilever support.

12. A device as claimed in claim 9 in which said means for controlling the operation of said fluid pressure operated means comprises a control device mounted adjacent to said lower plate.

13. A device as claimed in claim 9 in which said cantilever support comprises a first arm section pivoted at one end to said cantilever support and a second arm section pivotally supported from the free end of said first arm section to swing about a vertical axis.

14. Apparatus for cutting leather or the like comprising a pair of superimposed vertically spaced, rigid horizontal platforms, the upper forming in abutment surface, the lower a work supporting table, a cantilever support disposed between said platforms comprising at least two arm sections, the first extending between and parallel to said platforms and pivotally supported from the free end of said vertical axis the second section also extending between and parallel to said platforms and pivotally supported from the free end of the first section, a vertical support carried at the free end of said second section, an upper presser plate slidably supported from the upper end of said vertical support for vertical movement into and out of engagement with said abutment surface, a lower plate slidably supported from the lower end of said vertical support for vertical movement towards and from said table, a plurality of toggle bars pivotally connected to said plates and to each other to form a plurality of toggle joints, fluid pressure operated means pivotally supported from said cantilever support and pivotally connected to said toggle joints for actuating said toggle joints for actuating said toggle bars to move the upper of said plates into and out of contact with said abutment surface and the lower of said plates towards
and from said table, and means for controlling the operation of said fluid pressure operated means.

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