March 7, 1944. J. OPIE 2,343,697

SHEARING AND PUNCHING MACHINE

Filed Dec. 18, 1942 3 Sheets-Sheet 1

Fig. 1.

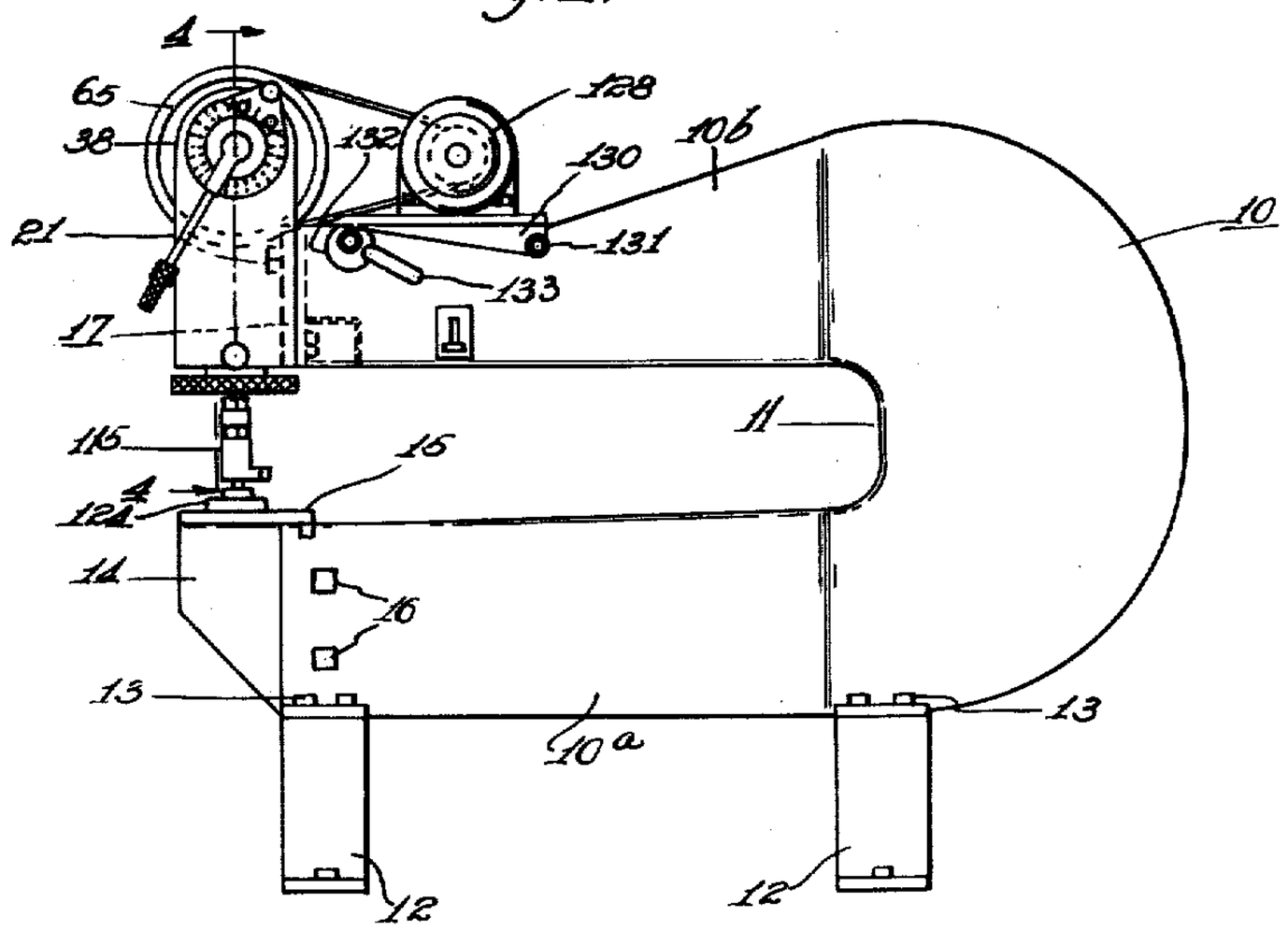



Fig. 2.

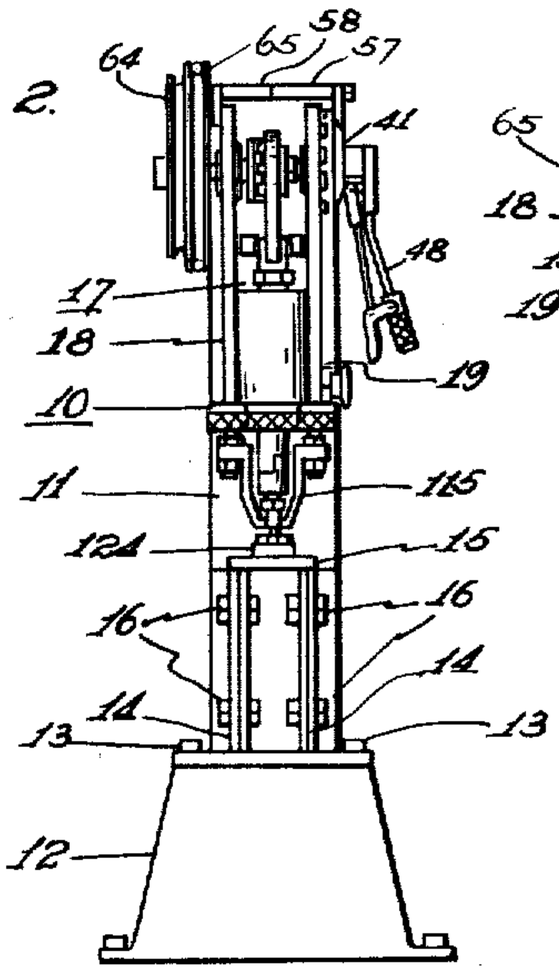
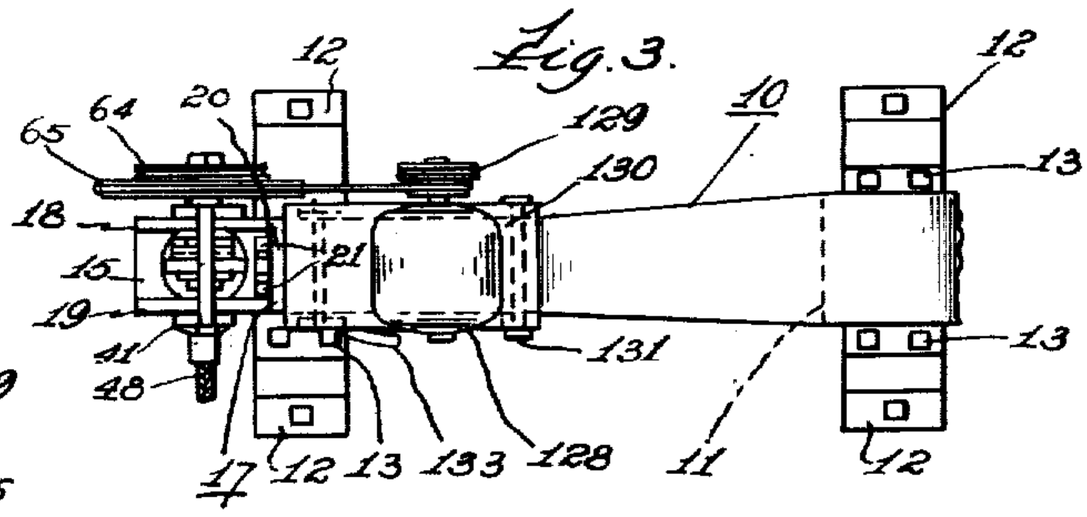



Fig. 3.




Inventor.
John Opie.
by John F. Brezina.
Attorney.

March 7, 1944. J. OPIE 2,343,697

SHEARING AND PUNCHING MACHINE

Filed Dec. 18, 1942 3 Sheets-Sheet 2

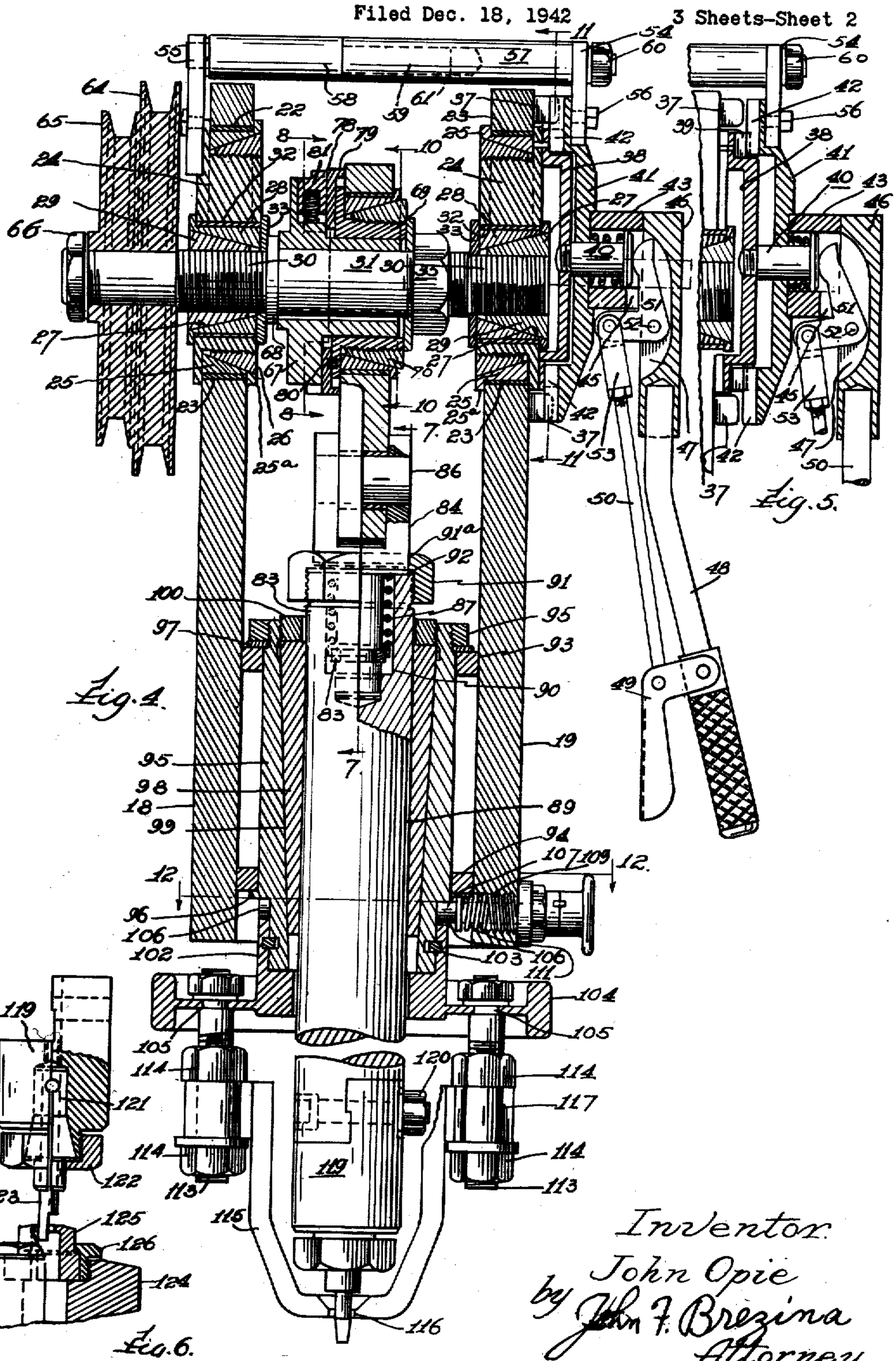


Fig. 4.



Fig. 5.

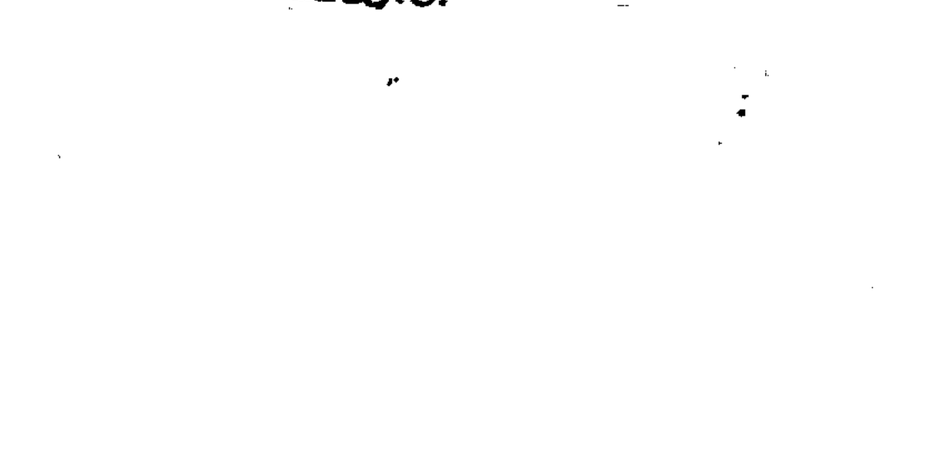


Fig. 6.

Inventor:
John Opie
by John F. Brezina
Attorney.

March 7, 1944. J. OPIE 2,343,697

SHEARING AND PUNCHING MACHINE

Filed Dec. 18, 1942 3 Sheets-Sheet 3

Fig. 9.

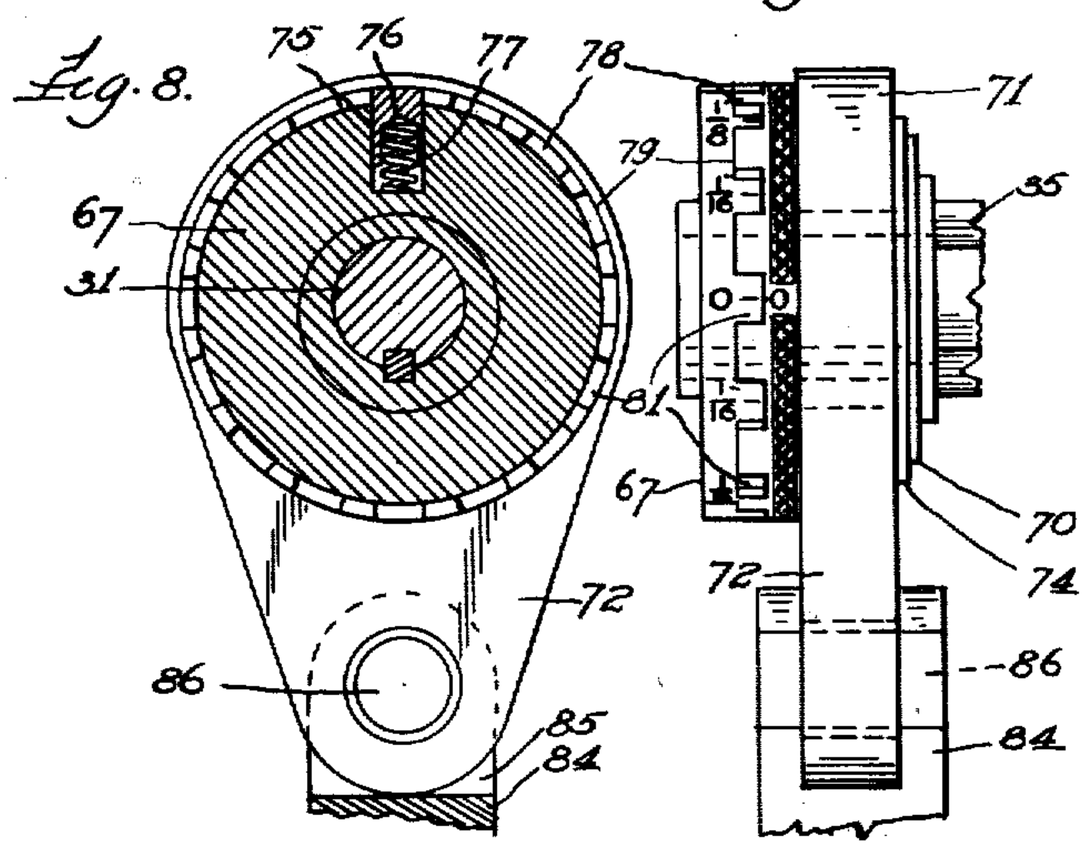



Fig. 10.

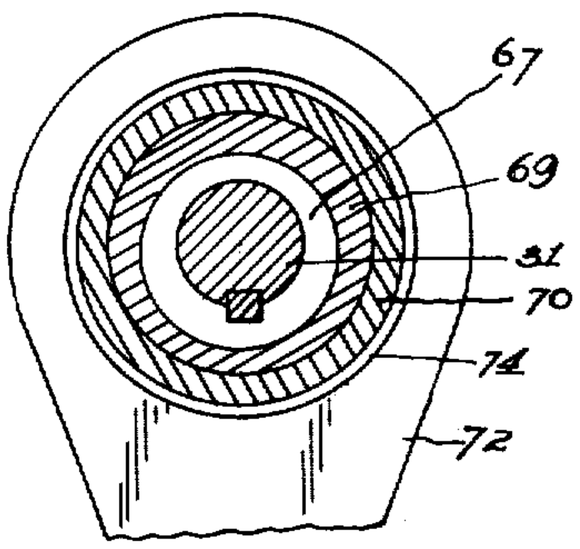



Fig. 11.

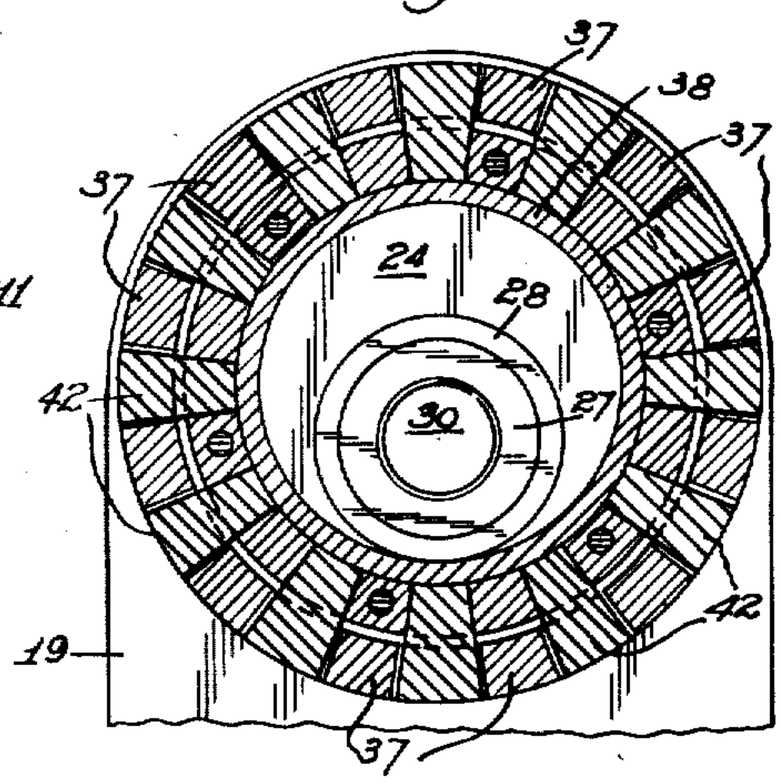



Fig. 12.

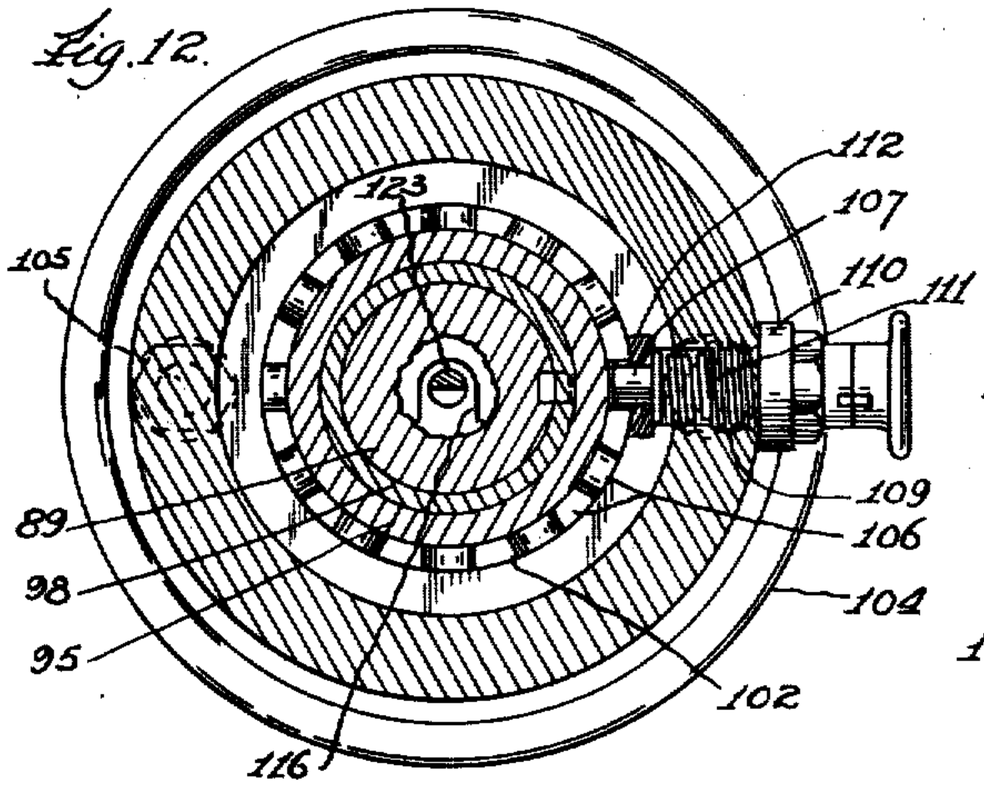
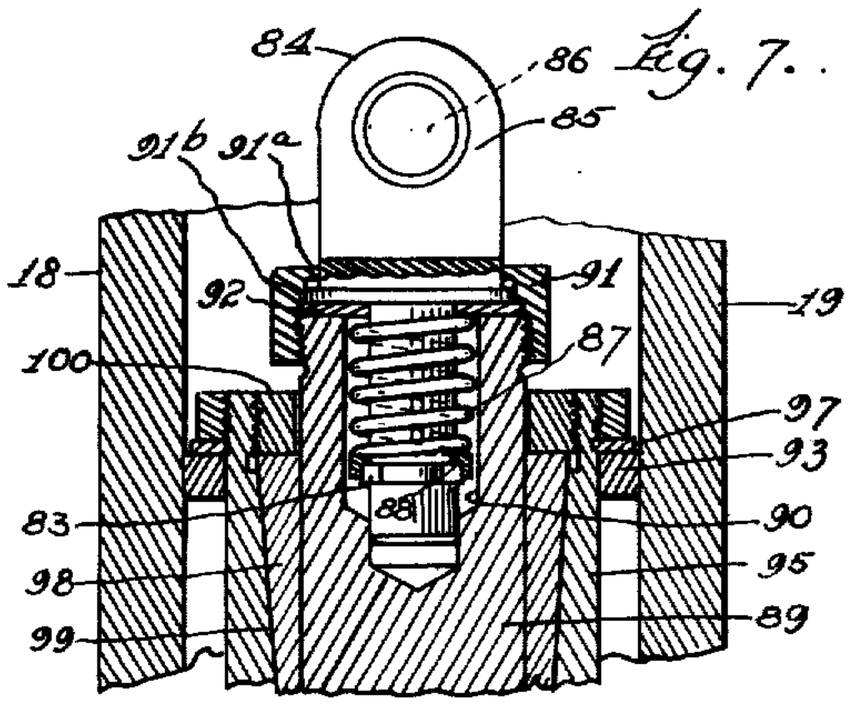



Fig. 7.




Inventor:
John Opie:
By John F. Brezina
Attorney.

Patented Mar. 7, 1944



# UNITED STATES PATENT OFFICE

2,343,697

## SHEARING AND PUNCHING MACHINE

John Opie, Riverside, Ill.

Application December 18, 1942, Serial No. 469,739

14 Claims. (Cl. 164—86)

This invention is directed to a novel shearing, nibbling and punching machine adapted for use in shearing, nibbling or punching sheet metals or the like.

Presently known shearing and nibbling machines of the general class to which my invention pertains possess certain objectionable features in construction and operation, among which are the means of transmitting the power from an electric motor which is usually mounted upon the upper arm of the throated frame. Presently known shearing machines are driven either by an electric motor secured on the frame with its armature axle parallel to the longitudinal axis of the arm of the V shaped frame, and wherein the electrically driven motive means is connected either directly or by couplings to the cam-carrying transverse shaft means, or wherein a motor is mounted on one or the other side of the foremost portion of the upper arm of the frame and has a suitable belt connecting the motor pulley on the drive shaft of the head. In other words, presently known structures of this type are so constructed that the direction of rotation of the electric motor is transverse or perpendicular to the longitudinal centers of the two arms of the throated frame.

Particularly in the shearing, cutting, nibbling and/or punching sheet metals of thicker gauges, the motor and the power transmission means operatively connected thereto set up a definite and objectionable vibration of the frame and part of the upper arm thereof to which the motor and power transmission parts are connected, said objectionable vibration being a transverse one in respect to the longitudinal axis of the frame arms. This is caused partly by the "push and pull" force exerted by the driven power transmission means in a direction crosswise or transversely of the head. Such definite and often pronounced vibrations correspondingly move the head reciprocating mechanism and the cutting, shearing, nibbling or punching tools which may be reciprocably mounted therein, and said transverse vibration and movements prevent and make impossible accuracy in the particular process being carried out.

Another objectionable feature in presently known shearing and cutting machines of this class is that the reciprocating mechanism shaft and connected parts are so mounted that the length of the vertical reciprocating movements or strokes thereof are constant and invariable as to length and direction, and when the shearing or cutting must follow substantially curved paths upon metal sheets, the metal sheets must be manually moved or guided so that the required pattern to be cut would be followed. It is also known that in presently known machines used for shearing, nibbling and punching operations, the upward movements of the tool itself causes an intermittent though substantially constant upward pull of the work or metal sheet, and unless extraordinary downward manual pressure is maintained upon the sheet, the metal sheet will jump up and down to follow the tool because of friction.

Presently known machines of this class do not have easily and quickly operable, vertically adjustable, and outwardly swingable means associated with or connected to the punch head for preventing substantial and undesirable upward movements of the metal sheet or other work being cut or punched, which upward movements are caused by friction between the cutting or punching tool and the work itself. This results in undesirable upward and downward movement on the work particularly on relatively thicker metal sheets in which substantial friction between the tool and the work is encountered. Any attempt to secure a work "hold down" member presents the problem that the thickness of the sheets being worked on varies repeatedly during the course of every workday period, and any ordinary arm secured to the head would necessitate constant removal and remounting of such arm each time the work unit was inserted. Further, any arm connected to the head would remain at one given angle and position and would prevent watching progress of cuts in certain directions. Such process of removal and remounting would take up so much time each time the machine was used for a different thickness of work, that it would be immediately discarded.

A further problem which has heretofore been unsolved is to provide a means of the proper shape for holding down the sheet being worked on and so that it would press or engage the work sheet on diametrically opposite sides of the punch or other tool being repeatedly driven into and through the sheet. Any attempt to hold the work sheet down merely at one point near the punching or shearing tool would frequently cause distortion and undesirable unevenness of the surrounding areas of the sheet.

Therefore, it is an object of my invention to provide a stripper or holding member which will effectively and satisfactorily hold the work down over an area substantially encompassing the re-

ciprocating tool so that in operation on relatively thin sheets the friction-imparted upward pull of the sheet will not cause only one point or limited area of the sheet to engage the hold down stripper, but which will cause substantially the entire area surrounding the reciprocating tool to push relatively lightly against the lower portion of the stripper member and without giving the sheet an opportunity to rise to strike the stripper, the stripper having portions thereof substantially about the reciprocating tool.

Another undesirable feature in shearing, punching or cutting operations with reciprocating tools is that where the sheet being worked upon is permitted to be lifted from the supporting base any substantial height, the return down strokes of the punching tool sheets produce a very substantial vibration of the sheet, thus making it all the more difficult, and in some instances impossible, to guide and to move the work in the exact path in which the cutting or punching is to be made. This pronounced vertical movement and "impact" of the sheet results in consequent destruction of accuracy and in creation of relatively rough and irregular edges as well as producing cut edges which are bent or otherwise distorted due to the sudden impacts of the sheet against the base produced by the friction of the rapid down strokes of the punch. I have overcome this objectionable feature, and it is an accomplishment of my invention to provide an adjustable stripper or "hold down" member of a construction which may be adjustably and removably mounted on the punch head on the turret thereof, and it is a further accomplishment of my invention to provide an easily adjustable means for raising or lowering a stripper or hold down member to accord with the requirements of thickness of the sheet being worked upon.

A further novel feature and accomplishment of my invention is to provide a vertically, adjustably pivotally mounted stripper in association with a novel rotatable turret which is rotatably mounted on the punch head so that the operator may selectively and easily move said turret and said stripper to various positions, and if desired, constantly change the relative position and angle of the stripper by rotating such turret and connected stripper so that the lower portion of the stripper in which the tool reciprocates may be held in the most desirable position to hold down the area of the sheet being worked upon on either one or both sides of the punchings or cut being made. In the case of metal sheets of relatively thicker gauges, it is desirable to maintain said hold down member or stripper in positions to engage the area of the sheet only on one side of the cut being made, and as the larger majority of cuts must be made along curved paths, often with relatively sharp turns, the rotatable turret and adjustable stripper mounting means may be constantly guided and maintained in the most desirable positions by the operator, with one hand if desired, during the progress of the cutting and without obstructing his view of lines which may define the path to be followed.

A further object and accomplishment of my invention is a provision of a novel rotatable turret in which the plunger or ram is slidably mounted, and reciprocable and manually retractable means in the punch head for selectively and releasably locking the rotatable turret in any one of a number of desired positions so that thereby the position of the stripper may be releasably held in desired position to accord with the particular operation being performed and to the metal sheet being worked upon and to the part of the cut being formed. A further object is the provision of an adjustable take-up bearing in the turret in which the ram is reciprocated which includes a bearing sleeve and adjustable locking means therefor so that the progressive wear upon the external bearing surface of the plunger and such sleeve may be taken up and the bearing maintained at the proper adjustment.

Further objects of my invention include the provision, in association with a punch head or frame suspended upon a driven rotatable shaft having cam or eccentric bearings between said frame or head and said shaft, of manually adjustable and releasable locking and clutch means adapted to rotate the cam or eccentric bearings to selectively change and adjust the height or vertical position of the head or head frame with respect to the work and the main parts of the machine.

A further object is the provision, in cooperation with rotatable adjustable eccentric suitably journalled bearings, of adjustable take-up bearings in said eccentric bearings, in which take-up bearings a shaft is adapted to be journalled to thereby provide a double adjustable bearing means.

A further object of my invention is the provision of manually adjustable stroke adjusting means whereby the stroke of the reciprocable member and tool-mounting parts may be regulated.

A further object and accomplishment of my invention is the provision of a yieldable or resilient connection between a reciprocable connecting rod and a slidable plunger or ram whereby sudden jerks or objectionably abrupt return movements of the ram and cutting tools held thereby are eliminated. In devices presently known and used, the tools held in the collet of the ram are frequently broken because of the sudden impacts between the cutting parts of the tools and the work. My shock-absorbing connection means reduces the breakage of tools which frequently occur as above explained, and also reduces the vibratory movements of the sheet being worked upon.

Other and further important objects of my invention will be apparent from the following description and the appended claims.

On the drawings:

Fig. 1 is a side elevation of nibbling, punching and shearing machine.

Fig. 2 is a front elevation of said machine.

Fig. 3 is a top plan view of a portion thereof showing driving motor mounted in position.

Fig. 4 is a vertical section of punch head taken on line 4—4 of Fig. 1.

Fig. 5 is a detail sectional view of releasable clutch means for selectively rotating the cam bearings, showing same in open or operating position for raising or lowering the drive shaft.

Fig. 6 is an enlarged sectional view of the tool holding member and of the lower die and base thereof.

Fig. 7 is a detail sectional view of the wrist connection between the connecting rod and reciprocable plunger and showing the shock absorbing and cushioning means.

Fig. 8 is a detail cross-sectional view taken on line 8—8 of Fig. 4 and showing a manually adjustable and manually releasable locking

means for the cooperating adjusting cams which regulate the length of stroke.

Fig. 9 is an enlarged elevational view looking at the right hand side of Fig. 8 and showing the external parts of the stroke adjusting cams and connecting rod.

Fig. 10 is an enlarged detail cross-sectional view taken on line 10—10 of Fig. 4 and showing portions of the cooperating stroke adjusting cams.

Fig. 11 is a detail cross-sectional view taken on line 11—11 of Fig. 4 and illustrating parts of the releasable clutch mechanism by means of which the position of the shaft-supporting cam bearings are positioned.

Fig. 12 is a detail sectional view taken on line 12—12 of Fig. 4 and showing the interior parts of the releasable and retractable locking means of the rotatable turret within which the reciprocable ram is slidably mounted.

Referring to Figs. 1 to 3 inclusive, reference numeral 10 designates a substantially U-shaped metal frame which substantially defines a relatively long horizontally extending throat 11 which is of adequate length to permit varied movements of metal sheets of substantial size in the cutting operations performed with the aid of this machine. Said frame 10 may be composed of a plurality of suitably formed metal blanks which are welded together at their adjoining edges, or said frame may be case or otherwise assembled.

Numerals 12 designate a pair of spaced apart metal bases which have suitable apertured integral flanges along their respective lateral edges to provide for securing said bases to the floor or other supporting surfaces by means of bolts or the like as illustrated in Figs. 1 to 3. Frame 10 is secured to and upon the upper flat top portions of bases 12 by suitable spaced bolts or screws 13 which pass through suitable apertures (not shown) of the lower portion of said frame and into the upper parts respectively of said bases to thereby securely connect said frame and said bases.

On the forward end of the lower arm 10*a* of frame 10, shown at the left of Fig. 1, either by suitable bolts 16, or by welding, are secured a pair of relatively strong vertically extending metal brackets 14, each of which, as illustrated in Fig. 2, are composed of two secured-together metal bracket plates. A horizontally extending metal shelf or base 15 is secured on the upper ends respectively of the brackets 14 and in position slightly higher than the upper surface of the lower frame arm 10—*a*, as illustrated in Fig. 1. A portion of said plate or base 15 preferably extends over and lies upon the foremost or forward portion of the frame arm 10—*a*, and has an angularly bent end (shown in dotted lines in Fig. 1) engaging a suitable aperture (not shown) in said frame arm 10—*a*. Said supporting plate or base 15 is adapted to have mounted thereon one portion of a die, usually the passaged female portion. The mounting plate on shelf 15 is also centrally apertured (though such aperture is not shown) so that in punching out operations, the punched out or otherwise severed parts of the sheet being worked upon may fall downward through the space between the spaced brackets 14.

A U-shaped metal mounting frame 17 is composed of substantially flat vertically extending side members or standards 18 and 19, which are connected together at the lower portion of their corresponding lateral edges by an apertured integral connecting member 20. The side members 18 and 19 of the mounting frame 17 extend substantially vertically and substantially above the connecting member 20 and above the upper face of the frame arm 10—*b*, and said standards 18 and 19 have relatively large correspondingly positioned apertures 22 in their upper ends respectively which are adapted to receive bearing means which are hereinafter more fully described. Said mounting frame may be securely mounted to the end face of the frame arm 10—*b* by a plurality of screws or bolts 21, one of which is shown in dotted lines in Fig. 1.

As illustrated in Fig. 4, two metal collars or bushings 23 are mounted snugly in the respective apertures 22 of the two vertically extending standards 18 and 19. Within said collars or bushings are mounted eccentrically apertured adjustable cam bearings 24 and 25 respectively, each of which cam bearings include an outer annular bushing 25—*a* and 24—*a* having an annular flange as indicated, an intermediate internally threaded adjustable locking collar or nut 26 which has an inclined external annular surface engaging a correspondingly inclined inner annular surface of the outer annular bushing 24—*a* and 25—*a* respectively. As stated, 24 and 25 designates the eccentrically apertured cam bearings, and said bearings are externally threaded as indicated and being secured in position by locking rings 26 respectively, which thread thereon.

The cam bearings 24 and 25 have mounted in their non-axial or eccentrically positioned aperture a suitable journalling bearing 27, each of which journalling bearings are preferably composed of an opposed member or bushing 28 and an inner internally threaded cone-shaped nut 29. Each of said inner cone-shaped nuts 29 is threaded upon the right hand threads 30 of the rotatable shaft 31, said respective threads 30 being spaced apart substantially as indicated in Fig. 4. Between the bushings 28 and the eccentric or cam bearing members 24 and 25 are interposed suitable metal annular linings or sleeves 32.

In mounting the shaft and the aforedescribed parts, the bushings 28 are inserted from the outside and within the sleeves 32, whereupon the cone-shaped nuts 29 are threaded upon the respective sets of threads 39 of the shaft 31 until a snug and non-sliding engagement is effected between the conical surface of the cone-shaped nuts 29 and the correspondingly inclined and curved inner surface of bushings 28. The two washers 33 are first mounted on the shaft 31 and about said shaft before the mounting of the bushings 28 and cone-shaped nuts 29 aforesaid. Said washers 33 are secured as indicated in Fig. 4 against the inner annular surface of bushings 28 and sleeves 32 respectively. It will be understood from the foregoing that when the shaft 31 is rotated as will be hereinafter described, the cone-shaped locking nuts 29 or bushings 26 rotate therewith and that the sliding engagement and bearing surfaces are between the exterior surfaces respectively of the bushings 28 and linings or sleeves 32.

The shaft 31 is so formed that one of the threaded areas 39 is formed upon an end portion of shaft 31 which is slightly reduced in diameter from the intermediate portion of said shaft. As shown in Fig. 4, the intermediate portion of said shaft 31 has a second threaded section designated as 34 in Fig. 4, on which is threaded a lock nut 35 which normally secures cooperating cam elements hereinafter described in desired

relative positions, said lock nut being releasable by unthreading movement to change the relative position of cooperating cam means which control the length of stroke of the ram and connected parts as hereinafter described.

Referring to the bushings 24—*a* and 25—*a*, which are located in position by threaded cone-shaped lock nuts 26, I desire it to be understood that said bearing members 24 and 25 may be adjusted to various positions by release of lock nuts 26 and by rotation of said bearing members 24 and 25 to the desired corresponding positions to thereby lower or raise the entire head, turret, ram and connected parts as are shown in Fig. 4. After said adjusting movement so as to adjust the height or vertical position of the standards or side members 18 and 19 and connected parts to accord with the sheet or sheets being worked upon (in other words defining the upper and lower limits of movement of the punching or shearing tool), the lock nuts 26 are tightened so that said bearing members 24 and 25 will remain in the positions in which they are set. When said rotative adjusting movement of bearing members 24 and 25 is being made, the slidable movement may take place between bushings 24—*a*, 25—*a* and the annular liners or sleeves 36 which are mounted in the two openings in the standards or side members 18 and 19.

A further accomplishment of my invention is the provision of easily operable means and mechanism for adjusting the bearing members 24 and 25 by rotation thereof to the desired position. As shown at the upper right hand portion of Fig. 4, the right hand side member or standard 19 has secured about its upper opening a ring gear or toothed or serrated ring 37 which is concentric to said opening, and whose teeth extend sidewise or in general horizontal direction. Mounted within said serrated ring 37 is a mounting plate 38 whose peripheral edge is bent angularly as indicated in Fig. 4 and which mounting plate 38 is suitably secured by rivets, welding or the like, to the peripheral portion of the eccentrically apertured bearing member 25. Said mounting plate 38 has a plurality of horizontally extending integral equally spaced teeth 39 which are shown particularly in Fig. 5.

Said mounting plate 38 has a central side aperture therein in which is threaded the inner threaded end of a stud bolt 40, which has its outer end headed or flanged as indicated in Figs. 4 and 5.

An annular clutch plate 41 which has sidewise extending integral teeth 42 on its periphery, and which is centrally apertured, is journalled on stud bolt 40, said stud bolt passing through the central aperture of said clutch plate as illustrated. Interposed between the headed portion of said stud bolt and the central area of said clutch plate 41 is a compressible spring 43 as illustrated in Figs. 4 and 5, said spring normally exerting its expensive pressure against the clutch plate 41 to interlock or mesh the clutch plate teeth 42 and the correspondingly spaced teeth 39 which are on the outer peripheral surface of the mounting plate 38.

Secured upon the central area of the slidably mounted clutch plate 41 is a relatively short sleeve 44 which has an edge opening recess 45 therein as indicated and whose internal passage is sufficient to provide for sliding of said sleeve 44 along the periphery of the head of the stud bolt 40.

Secured by welding or the like upon the outer end of the sleeve 44 is a metal handle-mounting plate 46 which has a longitudinally extending slot or recess 47 therein, said handle mounting member 46 extending in the radial direction and terminating in a socket-like end portion 46—*a*. Secured by welding or suitable means in the opening of the socket-like ends 46—*a* of mounting plate 46 is a suitable metal handle 48, which is preferably bent slightly outwardly as indicated in Fig. 4, and which handle or lever 48 has pivoted near its outer end an angularly bent substantially L-shaped pivoting arm 49 substantially as illustrated in Fig. 4. Pivoting arm 49 has a suitable transverse aperture formed in its intermediate portion at the juncture of the two angularly disposed portions of said hand lever 49, and a metal connecting link 50 is pivotally connected to the intermediate portion of the pivoting arm 49 by a suitable rivet or the like, as illustrated in Fig. 4.

Referring to the upper right hand portion of Fig. 4, numeral 51 designates a substantially L-shaped lever or pawl whose intermediate portion is apertured and is pivotally mounted upon a pin, rivet or the like 52 which passes through the mounting member 46 in a general transverse direction, and which connection thereby pivotally mounts said pawl 51 substantially in the recess or slot 47. The transversely or horizontally extending portion of pawl 51, and which is indicated in Fig. 4 as extending to the left, is apertured and is connected to metal link 50 by link member 53 whose end portion is preferably threaded and which adjustably and threadingly engages the upper threaded end of link 50. A suitable optional lock nut is illustrated in Fig. 4 as threaded on connecting link 50 to secure the link 50 in desired position after the length of the link 50 has been adjusted to the desired degree.

In order that both of the bearing members 24 and 25 will be rotated simultaneously and to the same extent in either direction and maintained with their bearings in alignment, I provide a suitable connection member between said bearing members so that both thereof will always be moved to the same degree and maintained in alignment. This connection member, illustrated in my preferred form in Fig. 4, comprises a pair of metal arms or members 54 and 55 which are correspondingly apertured at their upper ends, and which are secured, either by welding or by suitable bolt 56, to bearing member 24. Metal arm 54 has its lower end secured by a suitable bolt 56, and by welding or equivalent means, to the upper peripheral portion of the toothed clutch plate 41, both of said arms being correspondingly positioned so that their apertures are aligned. Elongated longitudinally passaged metal member 57 has one reduced end thereof secured in the aperture of arm 54 so as to mount said member 57 perpendicularly to said arm 54. The outer end of member 57 has a passaged end portion to receive integral pin or shaft 58.

Longitudinally extending metal pin or shaft 58 having a reduced end 59 is secured perpendicularly to arm 55 in any suitable manner, as for example by a suitable nut 60 which may be threaded upon a reduced threaded end portion of the member 58 which extends through the upper aperture of arm 55. The longitudinal passage of member 57 is designated by numeral 61, and is of a size to form a slidable fit with reduced end portion 59 of the pin or shaft 58.

It will be apparent that when the slidably mounted clutch plate is moved in an outward direction to disengage the clutch plate teeth 42 from locking engagement with teeth 39, such outward movement will move outer arm 54 and member 57 to thereby partially separate members 58 and 57, and that when the handle 48 and connected parts are partially rotated, the rotative movement imparted to clutch plate 41 will be correspondingly transmitted through arms 54 and 55 and interfitting members 57 and 58 to the cam bearing member 24 so that the latter will be moved a corresponding degree in the step of adjusting the height of the unit shown in Fig. 4 with respect to the frame of the machine and with respect to the work.

Reference numerals 64 and 65 designate grooved pulleys of different relative sizes which are secured upon the projecting end of the shaft 31 by means of suitable nut 66 threaded on the end of said shaft. Said pulleys are adapted to receive and to be driven by suitable V belts from the power source hereinafter described.

As shown in cross section in Fig. 4, the adjustable connection means for the connecting arm, which is in turn connected to the ram or plunger and which reciprocates such ram or plunger, comprises two cooperating interfitting eccentric cam members, one being rotatable with relation to the other so as to provide adjustable and changeable variations of the stroke imparted to the ram or plunger and tools secured thereon.

Referring to Fig. 4, reference numeral 67 designates a bushing-like metal cam member whose central portion is securely mounted upon shaft 31 and adapted to be locked between washer 68 on shaft 31 and the lock nut 35 as hereinafter described. The annular cylindrical surface of the intermediate portion of the cam element 67 is non-concentric to the axis of shaft 31. An eccentric bushing 69, which is non-concentric to its center, is slidably mounted or journalled upon the intermediate portion of the cam member 67. Said eccentric bushing 69 has an integral radially extending flange as indicated and its exterior surface is threaded as shown. Cone-shaped ring or nut 70 is releasably threaded upon the exterior threaded surface of cam or bushing member 69 as shown in Fig. 4.

As illustrated in Figs. 4, 5, 8 and 9, (Fig. 8 being a vertical cross section on line 8—8 of Fig. 4), the extending annular portion of the bearing member 67 has a radially extending recess or well 75 formed therein and opening upon the periphery thereof. Said well 75 has slidably mounted therein a plunger-like key 76 which is normally pressed outwardly by a metal expansion spring 77 which is positioned in said well 75 substantially as illustrated in Figs. 4 and 8. An annular metal ring 78, preferably having its periphery 79 formed to extend annularly and substantially perpendicularly to the main portion of said ring, is mounted about the bearing member 67 and is secured by a key 80 against the annular side face of bushing 69 as shown in cross section in Fig. 4. Said ring member 78 has its annular rim-like portion recessed to form a plurality of spaced apart locking teeth 81, said recesses or serrations being preferably of rectangular form and of such shape to receive the upper end portion of the slidably mounted adjusting and locking key 76. The peripheral face of bearing member 67 preferably has formed thereon a plurality of uniformly spaced apart indicia substantially as indicated in Fig. 9, in which view the said indicia are indicated as fractions and which are so spaced as to indicate the degree to which the vertical limits of movement of the connecting rod and connected reciprocating ram are moved from dead center.

I desire it to be understood that when the operator desires to either lengthen or shorten the stroke of the slidably mounted tool-holding ram, he will first release the lock nut 35, preferably partially unthread and release the cone nut 70, and then depress the key 76 against the action of spring 77 to disengage said key from a position in a recess between two of the teeth 81, and then rotate ring member 78 and connected bushing member 69 to the desired degree. In such adjusting movement the operator may be guided by the indicia or marks upon the peripheral face 79 of the ring member 78. As eccentric bushing 69 is secured by key 80 to ring member 78, the former will rotate with said ring member. When the said adjusting cam bearing or bushing 69 has been positioned relative to cam bearing member 67 as desired, the key 76 is allowed to reseat itself into one of the recesses or serrations between two of the teeth 81 and the operator will then tighten the cone nut 70 and thence the lock nut 35. Cam or eccentric bearing 67 is keyed to shaft 31 as previously stated.

A studded U-shaped shackle or connecting yoke 84 having an upper apertured bifurcated end 85 is removably connected to the connecting rod 72 by a suitable wrist pin 86 which extends through said transverse apertures and through a correspondingly aligned hole in the lower end of said connecting rod. As illustrated in Figs. 4 and 7, the downwardly extending studded portion of said shackle or yoke 84 is reduced and has mounted thereabout an expansion spring 87 and which is normally secured thereon by a washer 88 over which said spring is preferably maintained in position by two half washers 83 interposed between the lower end of said spring and said lock nut, one of said half washers being illustrated in Fig. 7.

The cylindrical ram or plunger 89 has an end opening or well 90 therein, and its upper end is externally threaded as indicated. Said ram 89 is removably connected to yoke or shackle 84 by a bushing nut 91 which threads upon the upper threaded end of ram 89 and whose inwardly extending flange portion 91—*a* overlies the intermediate annular flange of shackle 84. The bushing nut 91 is secured in such position that a space or clearance is preferably provided between the annular flange of said yoke 84 and the inwardly extending flange portion of said bushing nut 91, as illustrated in Fig. 7.

Interposed between the annular flange portion of yoke 84 and the end face of ram 89, is a suitable washer 92 whose periphery is impinged between an annular inwardly extending shoulder 91—*b* of the bushing nut 91 and the end face of said ram 89. The annular flange of yoke 84 is disposed within the area defined by shoulder 91—*b* as shown in Fig. 7. This construction permits a substantial tightening of said bushing nut 91, and provides a snug frictional engagement between the upper face of washer 92 and lower face of the flange of yoke 84 so that the ram (and connected parts) may be manually rotated as hereinafter described and also remain in the position in which it is placed by the operator after rotation so that it will not freely and of itself rotate. Ram 89 may be manually rotated after releasing bushing nut 91 and may be then resecured by again tightening said bushing nut 91.

The ram or plunger 89 is mounted with respect to the depending standards or side members 19 and 18 in the following manner. Secured in vertically spaced apart planes by welding, by screws or the like on the inner opposing faces of standards 18 and 19 and of the lower connection portion 20 thereof, are upper and lower inwardly extending flanges, rings or collars 93 and 94 respectively, these being shown in cross section in Fig. 4. A cylindrical metal turret 95 which has a substantially cone-shaped inner surface is threaded at its upper end both inwardly and externally as shown in Fig. 4. A thrust collar 95 is threaded upon the externally threaded upper end of cylindrical turret 95. The turret 95 has an annular bead or flange 96 near its lower end which engages the lower surface of the lower flange or collar 94, and said turret is rotatably mounted in said mounting frame 17 so that its external surface slides on the inner faces of collars 93 and 94 and said turret locked in position by the lock nut or locking collar 95*a* which normally bears against a ring 97 interposed between said lock nut or locking collar 95*a* and upper flange or collar 93 substantially as illustrated in Fig. 4.

A metal longitudinally split sleeve 98 having a cone-shaped exterior surface 99 is mounted so that its exterior surface engages the opposed inclined inner face of turret 95. Said sleeve is shorter than the opening within turret 95 and is normally held locked in the properly adjusted position by locking ring or lock nut 100, the downward threading of which will move the bearing sleeve 98 downward to take up from time to time such wear as takes place on the slidable face of the ram and said sleeve. It will be understood that by downward movement of said sleeve 98, the ram can be maintained at the proper degree of tightness and slidable engagement to prevent undesirable vibration and noise.

A centrally apertured bushing member 102 of substantially cylindrical cup-like shape is secured upon the lower end of turret 95 by means of a split annular key 103 which is seated in opposed annular grooves formed in the lower end of a turret 95 and in the upper flanged portion of bushing member 102. The lower portion of bushing member 102 defines an annular bearing surface which slidably engages the reciprocable ram 89.

A hand wheel 104, which is preferably externally knurled, is secured in a plane perpendicular to the longitudinal axis of ram 89 and such securance is by welding or the like, or integral with the bushing or hub member 102. The outermost peripheral portion of said hand wheel 104 is of a dimension sufficient to form a conveniently gripping element which is connected to the hub or bushing member 102 by a relatively thinner wheel portion which has a pair of diametrically opposite apertures 105 therein. It will be understood that said hand wheel provides a grippable means for selectively rotating the turret 95.

I provide means for releasably locking said turret 95 in any one of a plurality of positions, this for the purpose of selectively positioning the hereinafter described stripper with respect to the reciprocating tool and with respect to the sheet being worked upon. As shown in Figs. 4, 11 and 12, the lower portion of said turret 95 is provided with a plurality of spaced apart holes, apertures or recesses 106 which extend radially or open outwardly and which are positioned in the same horizontal plane. Spring pressed manually grippable plunger 107 forming an exposed convenient hand gripping portion, and which has its inner end reduced to form a slidable and retractable stud, is slidably mounted in transversely extending passage 109 formed in the lower end of the standard or frame member 19. Said plunger 107 is internally threaded and has correspondingly threaded therein a bushing 110. A metal expansion spring 111 is mounted about the inner stud portion of plunger 107 and has one end normally pressing against thrust collar 112 which is secured by welding or the like on said stud portion of plunger 107 a short distance from the inner end thereof. The opposite end of said spring 109 engages the inner surface of the enlarged portion of plunger 107 so as to normally exert spring pressure to hold said plunger projected inwardly and seated in one of the recesses or openings 106 of rotatable turret 95. It will be apparent that the operator may adjust said turret by rotation and the hereinafter described stripper means to any one of a number of desired positions to cause a more efficient operation and hold-down functioning of the stripper.

A pair of externally threaded bolts 113 have their upper end securely mounted in apertures 105 respectively, preferably by means of suitable nuts threaded thereon as illustrated in Fig. 4. Said perpendicularly depending bolts 113 each have a pair of nuts 114 threaded thereon in spaced apart and selectively adjustable positions. A metal substantially yoke-shaped stripper 115 having integral passage portion 116 is slidably, adjustably and removably mounted on one of the bolts 113, and between the two adjusting nuts 114 thereon, said nuts being positionable at various heights so as to releasably and hingedly mount the arm portion of said stripper at the desired height to accord with the particular work.

The opposite arm of stripper 115 has an integral longitudinally extending vertically slotted or recessed portion 117 whose recess opens upon the side or annular surface thereof as illustrated in Fig. 4. Said slotted stripper portion 117 is adapted to be mounted at the desired height similarly to the portion 116 so as to aid in mounting the stripper 115 at the desired height. Where, in some operations, particularly in changing from one thickness of work sheet to another, it is desirable to move the stripper away from the shearing or punching tool, I have provided adjustable pivotal means so that the stripper need not be entirely removed from the machine, but instead the two nuts on the opposite faces of the stripper portion 117 may be rotated and released by the operator relatively quickly, and then the stripper pivoted or hinged in a horizontal plane entirely away from the reciprocating tool and from the clamping means directly holding the tool. It will also be apparent that this construction permits the average operator to adjust the height of the stripper for more efficient operation for the thicknesses of respective sheets thereof upon which the shearing or punching operation is being or to be performed.

The lowermost horizontal extended portions of the stripper has a central side opening recess formed therethrough, which slot or recess is preferably defined by opposite inwardly facing conical faces so that the stripper portions surrounding said recess may be relatively close to the reciprocating tool and thereby exert downward pressure against area of the metal sheet relatively near the cuts or openings being formed in the sheet by the tool.

As illustrated in Figs. 4 and 6, the lower end of the ram 89 has a transverse bolt receiving passage and has removably mounted thereon a substantially cylindrical punch holder 119 by means of a suitable releasable bolt 120. The punch holder has its lower end reduced and externally threaded as shown and has a longitudinally extending and downwardly opening passage therein which over a substantial area thereof is of conoidal shape. Longitudinal slit or split collet 121 is removably mounted in said conoidal passage of tool holder 119, and is normally held therein by an internally threaded bushing or nut 122 which threadingly engages the external threads of the lower end of tool holder 119. Cutting, shearing or punching tools, illustrated in the drawings by the so-called nibbler tool 123, are removably mountable in the collet 121 and impinged therein due to the clamping action of the opposite portions of said collet, which clamping action is effected and regulated by the position of nut 122.

Mounted on the base 15 which overlies supporting brackets 14 is a mounting block 124 which has an internally threaded upper opening in which is mounted a die 125 which has its upper opening of such form as to co-act with the particular tool in collet 121 to perform the desired operation. The vertically passaged die 125 is adapted to be securely and removably mounted in mounting block 124 by a suitable externally threaded bushing 126 whose inner flanged portion grips said die in a conventional manner.

In shearing operations, a suitable blade-bearing unit having a shearing edge and of conventional type is substituted for die 126, and in punching operations suitable male and female dies are mounted in their respective conventional positions.

As illustrated in Figs. 1 and 3, the preferred form of driving means comprises a suitable all electric motor 128 which is connected in circuit with the source of power in conventional manner. A pair of concentric adjacent groove pulleys 129, or a cone pulley, is secured upon the armature shaft of motor 128 so that their plane of rotation is parallel to the longitudinal axis of the throated frame 10. Motor 128 is preferably, though not necessarily, secured by bolts or the like to an adjustably mounted base 130 which is pivotally mounted at one side edge thereof by pins or bolts 131 which extend into the upper arm 10—*b* of frame 10. Said pivotal mounting of the base and of the motor connected thereto is such that the free unsecured end portion of the pivoted base 130 extends in the direction of the head and aforedescribed reciprocating mechanism. An apertured cam 132 is mounted for pivotal movement upon the side face of the arm 10—*b* by means of a suitable bolt or screw as illustrated in Fig. 1, said cam having an integral or connected handle 133 to provide for convenient rotation of said eccentric cam 132 to thereby raise or lower the platform or base 130 and adjust the tightness of the transmission belt. Either of the pulleys 129 are drivingly connected to the correspondingly aligned pulley on shaft 31, in other words either to pulley 64 or pulley 65 hereinbefore described.

It is known that in machines wherein the driving motor is mounted to rotate in a direction transversely of the upper projecting arm of the frame, especially in long-throated frames of the type herein illustrated, such motor rotation and the pushes and pulls incident to the transmission of power set up a vibration of the upper portion of the frame above the throat which likewise vibrates the head in directions transverse or crosswise of the machine and of the upper arm of the machine frame, reciprocating mechanism and all connected parts which hold and reciprocate the cutting and punching tool. Such usual transverse vibration is undesirable in that the upper cutting, punching or shearing tool is correspondingly moved and also because the vibratory movement is imparted through the friction of the tool to the metal sheet being worked upon.

My provision of a mounting of the head with reciprocably mounted ram, of the power transmission means and mechanism, and also of the motor in such a manner that the stroke and pull of the power is longitudinally of the frame and parallel to the longitudinal axis of the frame, substantially eliminates vibration of the upper frame arm, of the head, and of the parts mounted thereon, this being because the pushing and pulling stresses are in the same direction as the stronger and rigid longitudinal parts of the frame which in such direction are sufficient in strength to prevent any noticeable vibrating during normal operation.

I am aware that various changes may be made in the embodiment of the invention herein specifically described without departing from or sacrificing any of the advantages of the invention or any features thereof, and nothing herein shall be construed as limitations upon the invention, its concept or structural embodiment as to the whole or any part thereof.

I claim as my invention:

1. In a machine for shearing or punching sheet metal or the like, and having a throated frame; a head frame; a horizontal rotatably mounted power drivable shaft; cam-mounted bearing members rotatably mounted in the opposite side portions of said frame; manually operable clutch mechanism operatively connected to said cam-mounted bearing members for selectively rotating the cams of said bearing members to adjust the height of said driven shaft; a connecting rod; adjustable cams connecting said connecting rod to said shaft whereby said rod will be reciprocated; a reciprocable ram connected to said connecting rod; adjustable bearing means in which said ram is slidably mounted; and releasable tool holding means on the lower end of said ram, the rotation of said shaft being adapted to reciprocate said ram.

2. In a machine for shearing or punching sheet metal or the like; a frame-like head; a horizontal rotatably mounted power drivable shaft; cam-mounted bearing members rotatably mounted in the oppostie side portions of said frame; manually operable clutch mechanism operatively connected to said cam-mounted bearing members for selectively rotating the cams of said bearing members to adjust the height of said driven shaft; a connecting rod; adjustable inner and outer cooperating cams forming a bearing means between said connecting rod and said shaft; a slidably mounted reciprocating ram connected to said connecting rod; releasable tool holding means on the lower end of said ram; and releasable locking means for locking said inner cam against rotation with respect to the outer cam of said connecting rod bearing.

3. In a punching and shearing machine having a horizontally throated frame, a frame-like head; a horizontally driven shaft journalled in said head; a slidably mounted vertically reciprocable plunger and a connecting rod journalled non-ec-

centrically with said shaft whereby rotation of said shaft causes reciprocation of said plunger; a rotatable turret on said head having an adjustable bearing member in which said plunger is slidably mounted; manually retractable mechanism for releasably locking said turret in desired position; and a yoke-like stripper depending from and connected to said turret and adjustably mounted for vertical movement whereby said stripper may be selectively mounted at the desired height in relation to the work; and means on the lower end of said plunger for releasably clamping a cutting or shearing tool therein.

4. In a machine of the described class having a throated frame and a head; a drivable shaft journalled in said head; a reciprocating ram; bearing members in which said reciprocable ram is slidably mounted; adjustable cam bearings on said shaft and a connecting rod connecting the upper end of said ram and said cam bearings whereby rotation of said shaft reciprocates said ram vertically; a hand wheel on the lower end of said ram bearing member; a substantially U-shaped stripper having a recess in its lower end within which a tool connected to said ram is reciprocated; and a pair of vertically extending externally threaded posts connected to and depending from said hand wheel and having adjustable securing members thereon for adjustably and releasably mounting said stripper on said posts and whereby said stripper may be selectively secured at the desired height.

5. In a machine of the described class having a throated frame and a head; a drivable shaft journalled in said head; a reciprocating ram; adjustable cam bearings on said shaft and a connecting rod connecting the upper end of said ram and said cam bearings whereby rotation of said shaft reciprocates said ram vertically; a rotatable turret mounted on said head and adapted to be rotated in a horizontal direction; an adjustable bearing member in said turret, said ram being slidably mounted in said bearing member; means for selectively securing said turret against rotation and in varied positions; a hand wheel on the lower end of said ram bearing member; a substantially U-shaped stripper having a recess in its lower end within which a tool connected to said ram is reciprocated; and a pair of vertically extending externally threaded posts connected to and depending from said hand wheel and having adjustable securing members thereon for adjustably and releasably mounting said stripper on said posts and whereby said stripper may be selectively secured at the desired height.

6. In a shearing, punching and cutting machine having a journalled drivable horizontal shaft a connecting rod eccentrically journalled on said shaft; a suspended head frame; a turret rotatably mounted in said head frame; an adjustable bearing member mounted in said turret; a ram slidably mounted in said bearing member, said adjustable bearing member being adapted to be adjusted to take up the wear between said ram and said turret; spring-pressed releasable connection means connecting the upper end of said ram and said connecting rod whereby said ram may be manually adjusted and secured in desired position and whereby said ram will normally remain in a position in which it has been secured; means secured on the lower end of said ram for releasably locking a tool therein; manually grippable means on the lower portion of said turret whereby said turret may be selectively rotated.

7. In a shearing, punching and cutting machine having a throated frame and having a derivable horizontal shaft and a connecting rod eccentrically journalled on said shaft; a reciprocable ram including a substantially cylindrical member; a pair of depending spaced apart side members, manually adjustable eccentric cam bearings in said side members; a cylindrical bearing member rotatably mounted between and on said depending side members and having a cone-shaped inner surface; an adjustable bearing sleeve in said cylindrical bearing member and forming a slidable bearing for said ram; a yoke element having a stud portion movably connected at its upper end to said connecting rod; said stud portion of said yoke having an adjusting nut threaded therein; a bushing nut about said yoke element and threaded on the upper end of said ram; a spring about said stud portion of said yoke element, said spring, yoke and adjusting nut forming a yieldable and tension-adjustable connection between said ram and said connecting rod to cushion the upward strokes of said ram; adjustable means secured on the lower end of said ram for releasably locking a tool therein; a turret wheel on the lower end of said cylindrical bearing member; and a yoke-shaped stripper adjustably mounted below said turret wheel; said ram and stripper being manually rotatable and adjustable to the desired position with respect to the work.

8. In a shearing, punching and cutting machine having a throated frame; a head; rotatable eccentric bearing members in said head; and a horizontal shaft journalled on said bearing members, said rotatable bearing members providing for vertical adjustment and positioning of said shaft; a connecting rod eccentrically journalled on said shaft; a reciprocable ram comprising a substantially cylindrical member; a bearing member in which said ram is slidably mounted; a spring-pressed connecting element connecting the upper end of said ram and said connecting rod whereby upward and downward thrusts are transmitted from said connecting rod to said ram; and means on the lower end of said ram for releasably locking a tool therein.

9. In a shearing, punching and cutting machine having a throated frame; a head; rotatable eccentric bearing members in said head; and a horizontal shaft journalled on said bearing members, said rotatable bearing members providing for vertical adjustment and positioning of said shaft; a connecting rod eccentrically journalled on said shaft; a reciprocable ram comprising a substantially cylindrical member; a bearing member in which said ram is slidably mounted; means on the lower end of said ram for reelasably locking a tool therein; and a manually operable clutch mechanism operatively connected to said rotatable eccentric bearing members and adapted, when operated, to rotate and to secure said bearing members to position said shaft at varied heights to regulate the vertical position to the strokes of said reciprocable ram.

10. In a shearing, punching and cutting machine having a throated frame; a head; rotatable eccentric bearing members in said head; and a horizontal shaft journalled on said bearing members, said rotatable bearing members providing for vertical adjustment and position-

ing of said shaft; a connecting rod eccentrically journalled on said shaft; adjustable cam bearings forming an operative connection between said shaft and said connecting rod whereby the stroke imparted to said connecting rod may be varied; a reciprocable ram comprising a substantially cylindrical member; a bearing member in which said ram is slidably mounted; means on the lower end of said ram for releasably locking a tool therein; and a manually operable clutch mechanism operatively connected to said rotatable eccentric bearing members and adapted, when operated, to rotate and to secure said bearing members to position said shaft at varied heights to regulate the vertical position to the strokes of said reciprocable ram.

11. In a shearing, punching and cutting machine having a throated frame; a head; rotatable eccentric bearing members in said head; and a horizontal shaft journalled on said bearing members, said rotatable bearing members providing for vertical adjustment and positioning of said shaft; a connecting rod eccentrically journalled on said shaft; a reciprocable ram comprising a substantially cylindrical member; a bearing member in which said ram is slidably mounted; means on the lower end of said ram for releasably locking a tool therein; a manually operable clutch mechanism operatively connected to said rotatable eccentric bearing members and adapted, when operated, to rotate and to secure said bearing members to position said shaft at varied heights to regulate the vertical position to the strokes of said reciprocable ram; and a pivotal stripper operatively, removably and adjustably connected to said ram bearing member and adapted to selectively engage and hold down a metal sheet or the like during cutting operations.

12. In a shearing, punching and cutting machine having a throated frame; a head, rotatable eccentric bearing members in said head; and a horizontal shaft journalled on said bearing members, said rotatable bearing members providing for vertical adjustment and positioning of said shaft; a connecting rod eccentrically journalled on said shaft; a reciprocable ram comprising a substantially cylindrical member; a bearing member in which said ram is slidably mounted; means on the lower end of said ram for releasably locking a tool therein; and a pivotal stripper operatively, removably and adjustably connected to said ram bearing member and adapted to selectively engage and hold down a metal sheet or the like during cutting operations.

13. In a shearing, punching and cutting machine having a throated frame; a head including depending side members, and having a drivable horizontal shaft; adjustable eccentric cam bearings between said head side members and said shaft; the adjustable rotation of said eccentric cam bearings being adapted to raise or lower said shaft in said head with respect to the work and with respect to said frame, and providing means whereby the limits of the range of stroke may be selectively adjusted; a connecting rod eccentrically journalled on said shaft; manually adjustable cam means between said connecting rod and said shaft and providing for changes of length of stroke imparted to said connecting rod; a reciprocable ram having a bearing connection with said connecting rod; a rotatable turret supported in said head having a bearing surface in which said ram is slidably mounted; adjustable means secured on the lower end of said ram for releasably locking a tool therein; and releasable locking means mounted adjacent said turret for locking said turret in varying positions.

14. In a shearing and punching machine having a supported throated frame with an elongated integral horizontally extending upper frame arm; a head including depending mounting standards secured on the forward end of said frame arm; a substantially horizontal drive shaft journalled in said standards and extending in a direction transverse with respect to the longitudinal center of said frame arm; a manually adjustable cam bearing mounted on said shaft; a connecting rod rotatably mounted at one end to said cam bearing, the adjustment of said connecting rod being adapted to rotate in a direction substantially parallel to the longitudinal axis of said frame; a reciprocable ram slidably mounted in said head and operatively connected to said connecting rod; a tool-holding means on the lower end of said ram; and power transmission pulleys on one end of said shaft and adapted to be belt-driven from a motor mounted on said upper frame arm.

JOHN OPIE.