(No Model.) 2 Sheets—Sheet 1.

C. A. BERTSCH.

SHEARING MACHINE.

No. 420,986. Patented Feb. 11, 1890.

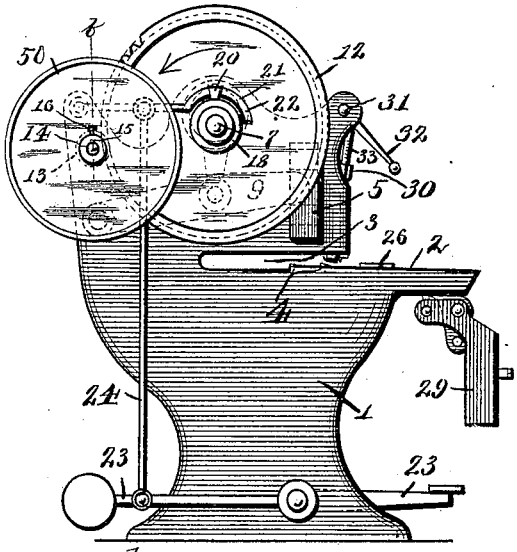

Fig. 1.

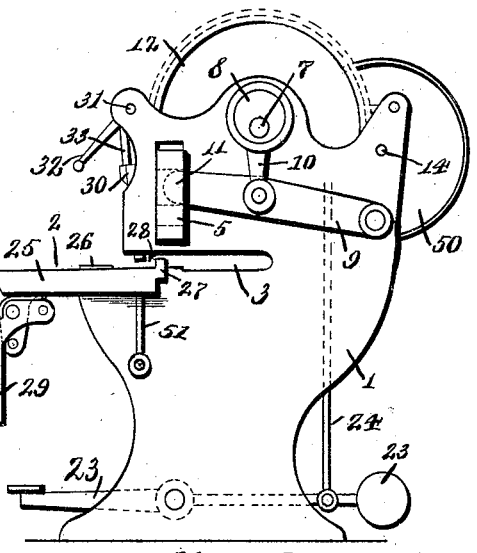

Fig. 2.

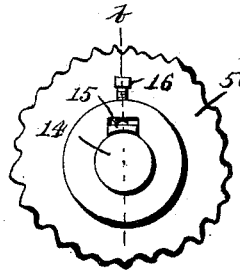

Fig. 7.

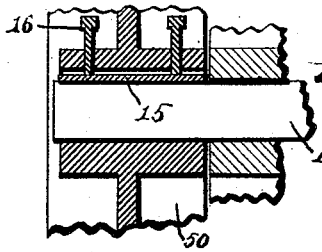

Fig. 8.

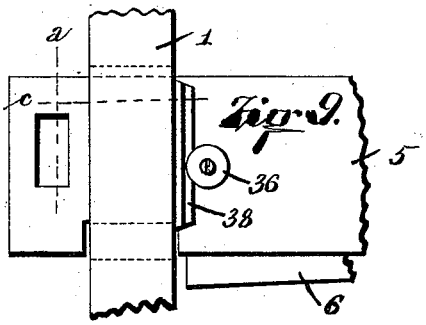

Fig. 9.

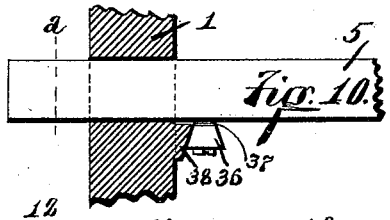

Fig. 10.

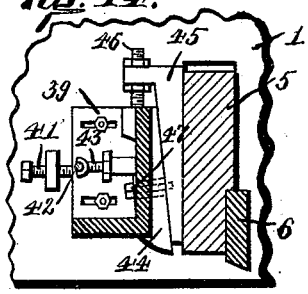

Fig. 14.

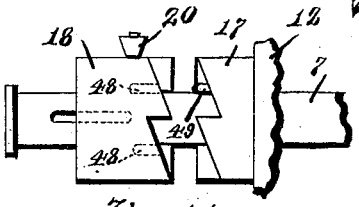

Fig. 11.

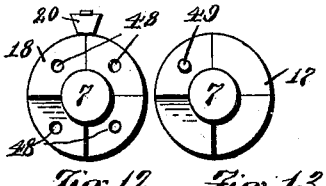

Fig. 12. Fig. 13.

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(No Model.) 2 Sheets—Sheet 2.

C. A. BERTSCH.

SHEARING MACHINE.

No. 420,986. Patented Feb. 11, 1890.

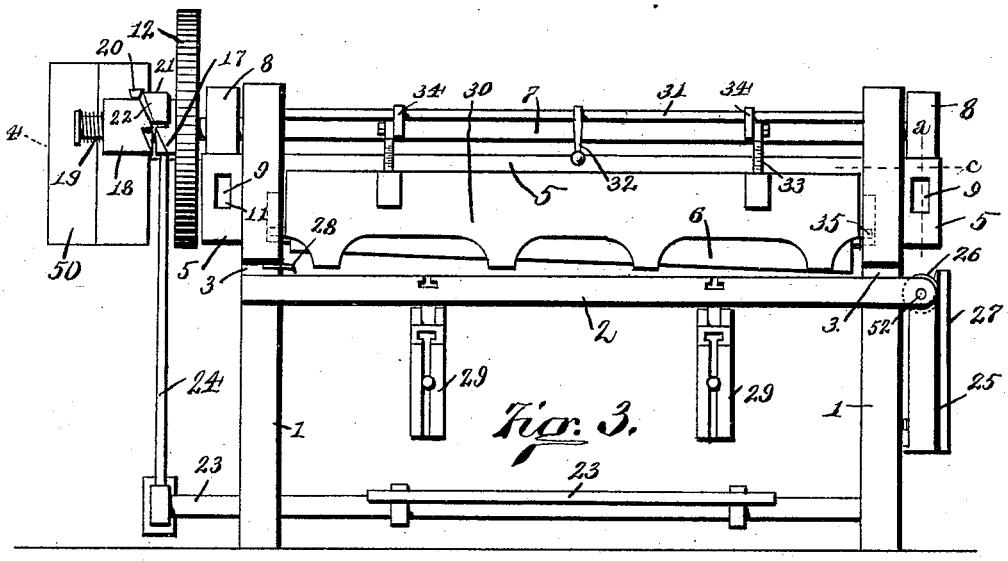

Fig. 3.

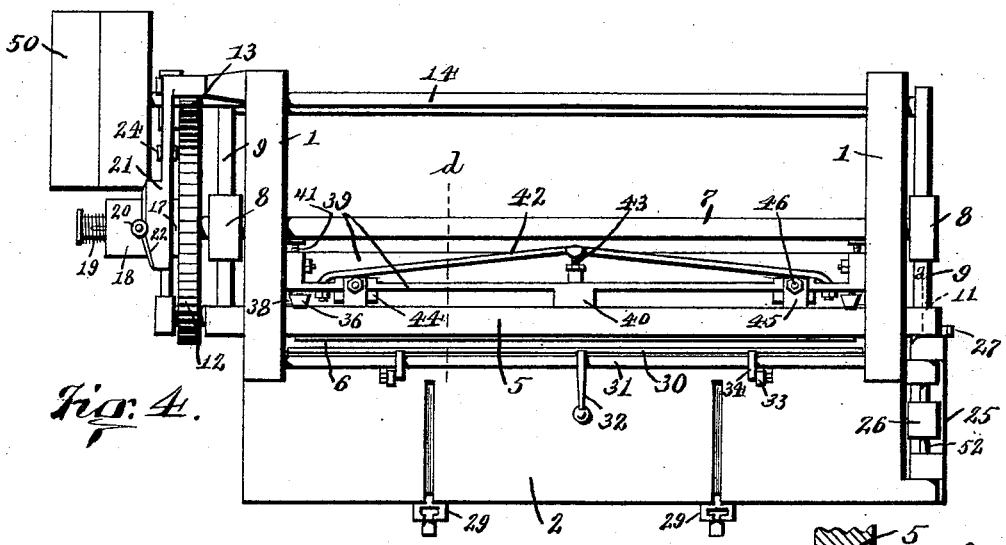

Fig. 4.

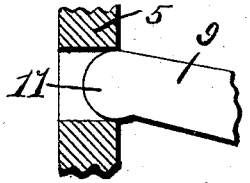

Fig. 5.

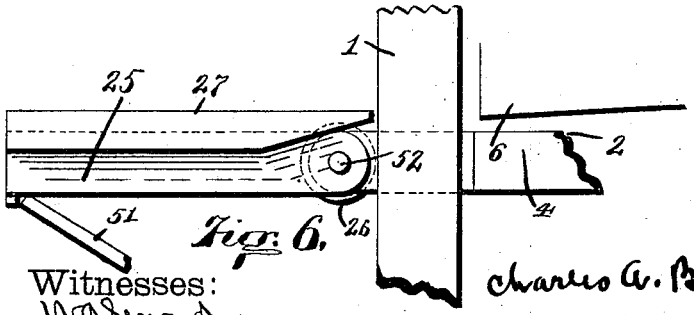

Fig. 6.

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UNITED STATES PATENT OFFICE.

CHARLES A. BERTSCH, OF CAMBRIDGE CITY, INDIANA.

SHEARING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 420,986, dated February 11, 1890.

Application filed April 19, 1889. Serial No. 307,769. (No model.)

To all whom it may concern:

Be it known that I, CHARLES ADAM BERTSCH, of Cambridge City, Wayne county, Indiana, have invented certain new and useful Improvements in Shearing-Machines, of which the following is a specification.

This invention relates to shearing-machines for metal, &c., and the improvements will be readily understood from the following description, taken in connection with the accompanying drawings, in which—

Figure 1 is a side elevation of a metal-shearing machine exemplifying my improvements; Fig. 2, an elevation of the other side of the machine; Fig. 3, a front elevation; Fig. 4, a plan; Fig. 5, a vertical transverse section of the shear-stock or blade-carrier, this section being taken in the plane of line *a* and serving to illustrate the connection between the shear-stock and the arms which move it up and down; Fig. 6, a rear elevation of the hinged table at one side of the machine, shown in connection with a portion of one of the housings and a portion of the main table of the machine; Fig. 7, an elevation at the hub of the driving-pulley, exhibiting the friction-key; Fig. 8, a vertical diametrical section in plane of line *b* through the hub of the driving-pulley; Fig. 9, a rear elevation of a portion of the shear-stock and one of the housings in which it vertically works, the bridge-tree to the rear of the stock being removed to exhibit the guide-roller upon the stock; Fig. 10, a plan of a portion of the stock and the guide-roller, a portion of one of the housings appearing in horizontal section in plane of line *c* of Fig. 9; Fig. 11, a front elevation at one end of the main cam-shaft, exhibiting the clutches thereon, the clutch-spring and the stop-motion lever being omitted; Fig. 12, an end view of the main cam-shaft exhibiting the face of the sliding clutch; Fig. 13, a similar view exhibiting the face of the non-sliding clutch; and Fig. 14, a vertical transverse section in plane of line *d* of Fig. 4, exhibiting the stock and movable blade and bridge-tree in section.

In the drawings, 1, Fig. 1, indicates the two housings for the general support of the parts; 2, the table extending from housing to housing and projecting forwardly therefrom and having a slight downward slope toward the front, as indicated in Figs. 1 and 2; 3, Fig. 3, horizontal slots through the housings open at the front and at the level of the table, so as to permit the passage lengthwise of the sheet of comparatively wide sheets to be slitted without being interfered with by the housings; 4, the usual bed-knife formed at the rear edge of the table, with its top or shearing edge substantially even with the table-surface; 5, the shear-stock, consisting of a strong bar disposed horizontally, with its ends projecting through vertical slots in the housings, so that the stock can be moved up and down; 6, Fig. 3, the movable shear-blade rigidly secured at the lower edge of the shear-stock and adapted to engage in the usual manner with the bed-knife as the stock descends; 7, Fig. 2, the cam-shaft disposed across the machine parallel with the stock, the disposition being in the exemplification above the level of the table; 8, the usual eccentrics on the cam-shaft; 9, horizontal arms pivoted at their rear ends to the housings and engaging their forward ends in mortises in the ends of the shear-stock; 10, pitmen connecting the eccentrics of the cam-shaft with the arms and serving as a means by which the eccentrics oscillate the arms; 11, (see Fig. 5,) the knuckle ends of the arms, engaging the mortises of the stock, the lower surfaces of these knuckles bearing upon the mortise-floors at the rear of the stock; 12, Figs. 1 and 3, the usual spur-gear, loose on the cam-shaft; 13, the usual pinion on the counter-shaft, engaging this spur-gear; 14, the counter-shaft on which this pinion is secured, the counter-shaft being driven by belt-pulleys, as usual; 15, a key loosely seated in a key-seat of the driving-pulley on the counter-shaft and having a concave inner surface fitting the cylindrical surface of the counter-shaft; 16, Figs. 7 and 8, set-screws in the hub of the counter-shaft pulley, impinging upon this key and serving to press it to the counter-shaft; 17, Fig. 11, a clutch formed upon the hub of the spur-gear; 18, a similar clutch splined to the cam-shaft and adapted to engage the clutch of the spur-gear; 19, Fig. 3, a spring serving to press the sliding clutch toward the clutch of the spur-gear and hold the same engaged; 20, a roller mounted

upon a stud projecting from the periphery of the sliding clutch; 21, Figs. 1 and 3, a pivoted lever having its forward end curved partially around the clutches, the curved end of the lever being capable of the rising-and-falling motion, so as to occupy a position either close to or some distance from the clutches, one edge of the curved portion of this lever normally engaging the roller upon the sliding clutch; 22, the free extremity of this lever, the same being beveled in the direction of the motion of the roller as the clutch revolves, so that as the clutch revolves the roller will engage the bevel of the lever, and in passing along the edge of the lever to move sidewise, so as to disengage the clutch; 23, a treadle adapted to occupy normally a raised position, being counterweighted or otherwise loaded for that purpose; 24, a connection from the treadle to the lever 21 to serve as a means by which, when the treadle is depressed, the lever is raised clear of the roller 20; 25, an extension at one end of the table beyond the housing, this extension being pivoted to the table, so as to form a drop-leaf capable of hanging down out of the way or of being raised to form an extension of the table; 26, Fig. 3, a roller upon the hinge-pin, which unites the extension of the table to the table, the periphery of this roller projecting a trifle above the surface of the table, the object of the roller being to facilitate the shifting of heavy plates upon the table; 27, Fig. 6, a gage-ledge upon the rear of the extension of the table, this gage-ledge projecting upwardly therefrom and being in line with the cut of the shear-blades, so that long work being slitted by being passed endwise through the machine may be guided by having the cut edge of the sheet pressed against this gage-ledge, the end of this gage-ledge which is toward the housing being beveled below, as clearly indicated in Fig. 6, so that the separated portion of the sheet may by turning down slightly proceed onwardly with the sheet without being interfered with by the gage-ledge; 28, a gage-pointer secured to one of the housings a short distance above the table and pointing to the line of the shear-cut, this gage-point being attached to that one of the housings corresponding with the most elevated portion of the shear-blade on the stock, the shear-blade being oblique, as usual; 29, Figs. 1 and 3, brackets pivoted to the front edge of the table and capable of hanging down out of the way or of being turned up to form horizontal extensions at the front of the table, these brackets containing T-slots, forming extensions of T-slots in the main table to serve in holding gages on the table; 30, a hold-down bar disposed in front of the stock and adapted to be pressed down on the sheet being sheared and clamp the same during the shearing operation; 31, Figs. 2 and 3, a shaft journaled in the housings over the hold-down bar; 32, a handle for rotating this shaft; 33, eyebolts screwing into the hold-down bar and projecting upwardly therefrom to engage cranks on the shaft 31; 34, cranks on the shaft 31, whose wrists engage the eyebolts; 35, trunnions projecting endwise from the hold-down bar into slots in the housings and serving to guide the hold-down bar in its vertical motion; 36, Figs. 9 and 10, two rollers upon the rear face of the shear-stock, one at each end of the stock just within the housings, these two rollers being in the same horizontal plane and having a tapering form, with the small end toward the shear-stock; 37, (see Fig. 10,) washers interposed between the shear-stock and the rollers; 38, Fig. 4, guide-ledges upon the inner face of the housings, engaged by the rollers of the shear-stock and having a tapering section to correspond with the taper of the rollers; 39, a bridge-tree reaching from housing to housing to the rear of the shear-stock and attached to the housings by bolts in slots, so as to permit the bridge-tree to be adjusted to and from the shear-stock; 40, Fig. 4, a guide-bearing projecting forwardly from the bridge-tree to engage the rear face of the shear-stock, and serving to prevent the backward deflection of the center of the shear-stock when the shear-blades are in action; 41, Fig. 14, set-screws through lugs in the housings, engaging the rear of the bridge-tree and serving as a means for adjusting the bridge-tree toward the shear-stock and into proper facial relation thereto; 42, a truss-rod with its ends secured to the ends of the bridge-tree and trussed backwardly at its center; 43, a screw-jack engaging the bridge-tree and the truss-rod and serving to strain the truss-rod; 44, (see Fig. 4,) wedge-shaped seats upon the forward face of the bridge-tree, there being as many of these seats as their intended purpose (hereinafter mentioned) will call for when the length of given shear-stock is considered; 45, a wedge at each of these seats, this wedge bearing at its vertical front against the rear face of the shear-stock and bearing with its inclined rear face against the wedge-seats; 46, screws for vertically adjusting the wedges; 47, screws projecting forwardly through vertical slots in the bridge-tree and screwed into the wedges and serving to hold the wedges rigidly to the wedge-seats; 48, (see Fig. 12,) a series of holes in the face of the sliding clutch, there being one of these holes for each jaw in the clutch-face; 49, a single pin projecting from the face of the non-sliding clutch, this pin being adapted to engage an appropriate one of the holes in the other clutch when the clutch is thrown into engagement; 50, Fig. 1, the driven pulley on the counter-shaft, there being, if desired, two of these pulleys, one loose and one secured to the counter-shaft; 51, Fig. 2, the brace for holding the table-extension up when raised, and 52 the hinge-pin which unites the extension-table to the main table, and serving also as the axle for the roller 26.

The rollers 36, Fig. 9, on the back of the shear-stock serve to prevent end motion of

the shear-stock as the shear-stock rises and falls.

By removing one or more of the washers 37, Fig. 10, and setting the tapering rollers farther toward the shear-stock, the horizontal distance from out to out of both rollers may be increased, and wear thus compensated for.

If instead of the rollers vertical ribs were provided on the rear of the shear-stock to engage the inner face of the housings, the end motion of the shear-stock would be provided against; but it often happens in heavy work that with these machines something breaks at one end of the machine and the other end of the knife continues to descend, thus canting the shear-stock, prying the housings apart, and doing damage generally. The extremely short guide elements formed by the rollers and disposed in a common horizontal plane prevents any separating tendency in case of such accident, and this office of the short guide elements would be performed were the rollers not rollers in fact, but simply convex lugs bearing against the inner facings of the housings. In other words, the short guide elements 36 are, broadly viewed, shallow lugs both in a common plane and engaging the inner faces of the housings, and would be nothing more were they bolted rigidly to the shear-stock. They become rollers in fact by simply being left at liberty to revolve upon their bolts.

The gage 27 upon the drop-table, Fig. 3, serves as a slitting-gage to guide the cut edge of the sheet without interfering with the part being cut from the sheet, the part being cut from the sheet running under the downwardly-beveled inner end of the gage-ledge.

The roller 26, Fig. 3, is supported by the same hinge-pin which supports the drop-leaf table, and this roller is in working position whether the drop-leaf be up or down.

The adjustment of the wedges 45, Fig. 14, of which there may be as many as the length of the shear-stock calls for, serves to bring the guiding-pressure upon the rear of the shear-stock and hold the movable shear-blade neatly to the cutting-line against the bed-blade, and thus compensate for spring in the shear-stock and in the bridge-tree, and also compensate for wear at the bearing-point.

The screws 47 serve to clamp the wedges firmly to the bridge-tree in adjusted position.

The set-screws 41 serve to adjust and hold the bridge-tree toward the shear-stock the proper distance from the shear-stock to come within the adjusted range of the wedges and to bring the center bearing 40 into proper engagement with the shear-stock.

The truss-rod, with its adjusting-jack, serves in strengthening the bridge-tree and as a means for delicately adjusting the central guide 40, Fig. 4.

The set-screws 16 in the driving-pulley are to be so adjusted that the friction-key will grasp the counter-shaft with sufficient force to drive the machine when at its proper work, but with such maximum force that the driving-pulley will slip upon the shaft before serious damage will occur in case extraordinary strains are brought upon the machine, the device thus forming a simple safety device.

The knuckle of the driving-arms bearing at the rear of the shear-stock, as indicated in Fig. 5, causes the shear-stock, when urged downwardly by the arms, to be pried forwardly at its lower edge, thus holding the movable shear-blade closely to the cutting-line while under the strains of work.

The top of the main table, being sloped a trifle, serves to a considerable extent in preventing the sheet being drawn inwardly as the shear-blade descends. The shear-blade has the usual obliquity, and begins its cut at one end long before it does at the other end, and during the continuation of the shearing along the length of the work the tendency to draw the sheet inward is resisted by the weight of the sheet, which is inclined to slide down the sloping table away from the knife, and the bevel edge or cut which would apparently result is only a correct compensation for the off-drag of the blade.

The arms 9 and the cam-shaft which operates them are located above the housing-slot 3, and therefore permit the passage of wide work endwise through the machine.

A stop-motion is provided by means of which, while the spur-gear runs continuously, the machine is normally at rest, and may be put in motion by a motion of the foot-treadle, after which the shear-blade makes one descent and then rises and rests again until the foot-treadle is again pressed. The spur-gear revolves continuously in the direction of the arrow. The spring 19 tends to press the sliding clutch into engagement with the spur-gear and thereby lock the spur-gear to the cam-shaft. The lever 21, interposed before the roller 20, prevents the sliding clutch coming into engagement, and causes the cam-shaft to remain stationary. A depression of the foot-treadle lifts the lever out of the way and permits the clutch to go into engagement and the cam-shaft to revolve and the knife to make its stroke. The lever 21 drops to its normal position when the foot is removed, and the roller, riding up the bevel of the lever, draws the clutch out of engagement and leaves the shear-blade at rest at the top of its stroke. Another stroke will be made if the treadle be pressed again, or the machine will run continuously if pressure be kept upon the treadle, so as to keep the lever in a raised position. As the roller 20 engages the table of the lever it exerts a lifting tendency on the lever, and without other provision the lever would need to be heavily loaded to resist this lifting tendency. I therefore make the roller 20 largest at the outer end and bevel the edge of the lever, or its extremity rather, to correspond. The roller, therefore, has a hooking engagement with the edge of the lever

and prevents its rising accidentally, and at the same time the lever may be readily raised by the foot-treadle, the bevel of the lever being greatest at its wedge-shaped extremity, where the lifting tendency of the lever is greatest.

The clutches shown in Fig. 11 have ratchet-shaped teeth or jaws, which is the most desirable form for strength. An objection to this form is that the loose element of the clutch is not prevented from running forwardly in advance, as might be the tendency where such clutches are used in producing reciprocating motion in a part which has a tendency to fall and produce an advance motion of one of the clutch parts. I avoid this defect in such clutches by the use of the pin 49 in one of the clutch parts and the series of holes 48 in the other clutch part. Whenever the clutch is thrown into engagement this pin also goes into engagement with the hole. All of the working strains in the working direction of motion are of course taken by the heavy teeth of the clutch; but the pin is sufficiently strong to prevent backlash, and it, of course, has none of the qualities of the rigid-shaped tooth.

The hold-down bar is connected with its operating-cranks 34 without the intermediacy of links pivoted above and below, the hold-down bar rocking on its trunnions to compensate for the transverse vibrations due to the sweep of the crank-wrists. The intention is that the cranks shall be at about their lower dead-point when the sheet is being pinched. The two eyebolts 33, screwing into the hold-down bar, serve as a means for adjusting the height of the hold-down bar for different thicknesses of metal.

In a heavy shearing-machine with the shear-blade ten feet long the obliquity of the top shear-blade may be about five inches, the lower end of the shear-blade being elevated from the table only enough to admit the sheet freely. The other end of the shear-blade would, therefore, stand about five inches above the sheet.

When a mark is made upon a sheet, as a line to cut by it, it is difficult to adjust such line vertically under a shear-blade which stands several inches above it at one end. In my machine the lower end of the shear-blade serves as one point to set the cutting-mark by and the gage-point 28 at the high end of the shear-blade serves as the other point, and this latter point cannot become covered and hidden by the long sheet, as would be the case with the gage-mark on the table.

I claim as my invention—

1. In a metal-shearing machine, the combination, substantially as set forth, of a pair of housings vertically slotted to receive a shear-stock, a shear-stock engaging such slots, and two short guide-lugs, one at each end of the shear-stock and both in the same horizontal plane, projecting from the surface of the shear-stock and presenting convex bearing-surfaces against the inner faces of the housings.

2. In a metal-shearing machine, the combination, substantially as set forth, of a pair of housings vertically slotted to receive a shear-stock, a shear-stock engaging such slots, and two rollers, one at each end of the shear-stock and both in the same horizontal plane, projecting from the surface of the shear-stock and engaging with their peripheries the inner faces of the housings.

3. In a metal-shearing machine, the combination, substantially as set forth, of a pair of housings vertically slotted to receive a shear-stock, a shear-stock engaging such slots, and two tapering rollers, one at each end of the shear-stock and both in the same horizontal plane, projecting from the surface of the shear-stock and engaging with their peripheries the inner faces of the housings.

4. In a metal-shearing machine, the combination, substantially as set forth, of a table, a shear-blade at the rear edge thereof, a shear-stock provided with a shear-blade arranged to coact with the table-blade, an extension of the table lengthwise beyond the shear-blades, and a gage-ledge projecting upwardly from the top surface of the table-extension in the line of cut of the shear-blades and presenting at the end toward the shear-blades an under surface beveled downwardly from above the level of the table.

5. In a metal-shearing machine, the combination, substantially as set forth, of a table provided with a shear-blade, a shear-stock provided with a shear-blade, a hinge-pin across one end of the table, a table-extension hinged to said pin, and a roller on said hinge-pin with its periphery projecting above the table surface.

6. In a metal-shearing machine, the combination, substantially as set forth, of a table provided with a shear-blade and with transverse slots for the reception of gages, a shear-stock provided with a shear-blade, and brackets hinged to the front edge of the table and provided with gage-slots corresponding and coinciding with the slots in the table.

7. In a metal-shearing machine, the combination, substantially as set forth, of a shear-stock provided with a shear-blade and a table disposed at an obtuse angle to the path of said stock and provided at its rear edge with a shear-blade arranged to coact with the shear-blade of the shear-stock.

8. In a metal-shearing machine, the combination, substantially as set forth, of a pair of housings, a table supported thereby, a shear-blade on the rear edge thereof, a movable shear-stock, a shear-blade on the shear-stock arranged to coact with the table-blade and having one of its ends lower than the other, and a gage-point in the line of cut on the housing at the high end of the shear-stock blade.

9. In a metal-shearing machine, the combi-

nation, substantially as set forth, of a pair of horizontally-slotted housings, a table provided with a shear-blade at the level of the housing-slots, a shear-stock arranged for vertical motion in the housings and provided with a shear-blade above the table, an arm at each housing and pivoted thereto at its rear end and engaging the shear-stock with its forward end, a cam-shaft carried by the housings above the arms, and pitmen connecting the cam-shaft with intermediate portions of the arms.

10. In a metal-shearing machine, the combination, substantially as set forth, of a pair of housings, a table provided with a shear-blade, a shear-stock provided with a shear-blade at its front and arranged to move vertically in slots in the housing and provided with transverse mortises at its ends, arms pivoted at their rear ends to the housings and provided at their front ends with knuckles bearing on the floors of said mortises at the rear edge of the shear-stock, and a cam-shaft and connecting mechanism for oscillating said arms.

11. In a metal-shearing machine, the combination, substantially as set forth, of a table having a shear-blade, a shear-stock having a shear-blade, a cam-shaft and connecting mechanism for imparting motion to the shear-stock, a counter-shaft geared to the cam-shaft, a wheel on the counter-shaft provided with a key-seat, a friction-key disposed in said key-seat and having a frictional bearing-surface engaging the periphery of the counter-shaft, and set-screws in the wheel for adjusting the pressure of said key on the counter-shaft.

12. In a metal-shearing machine, the combination, substantially as set forth, of a pair of housings, a table having a shear-blade, a shear-stock having a shear-blade, a hold-down bar disposed in front of the shear-stock over the table and having trunnions engaging slots in the housings, a shaft journaled in the housings over and parallel with the hold-down bar and provided with cranks and a handle, and eyebolts screwed into the hold-down bar and engaging said cranks.

13. In a metal-shearing machine, the combination, substantially as set forth, of a pair of housings, a table having a shear-blade, a stock having a shear-blade, a bridge-tree behind the stock and engaging the rear face thereof and secured at its ends to the housings by bolts in horizontal slots, and set-screws, through lugs on the housings, engaging the rear of the bridge-tree.

14. In a metal-shearing machine, the combination, substantially as set forth, of a pair of housings, a table having a shear-blade, a stock having a shear-blade, a bridge-tree behind the stock and bearing against the center thereof and secured at its ends to the housings, a truss-rod upon the back of the bridge-tree, and a screw-jack at the center of and between the bridge-tree and truss-rod.

15. In a metal-shearing machine, the combination, substantially as set forth, of a pair of housings, a table having a shear-blade, a stock having a shear-blade, a bridge-tree disposed behind the stock and secured at its ends to the housings and having one or more wedge-seats upon its front face, a wedge at each of such seats, with its front face bearing against the rear face of the stock, a screw for vertically adjusting each of the wedges on its seat, and a screw for clamping each of the wedges to the bridge-tree.

16. The combination, substantially as set forth, with a stock and a rotary shaft and intermediate mechanism for vertically reciprocating the stock, of a wheel loose on such shaft and provided with a clutch-face, a clutch splined to the shaft, a spring arranged to press the sliding clutch into engagement with the wheel-clutch, a roller projecting radially from the sliding clutch, a lever lying normally on or near the periphery of the sliding clutch and with its edge engaging the roller and holding the clutch out of engagement and having a beveled end to engage the roller when the clutch is engaged, and a treadle connected with said lever to serve in lifting it out of range of the roller.

17. The combination, substantially as set forth, with a stock and a rotary shaft and intermediate mechanism for vertically reciprocating the stock, of a wheel loose on such shaft and provided with a clutch-face, a clutch splined to the shaft, a spring arranged to press the sliding clutch into engagement with the wheel-clutch, a roller projecting radially from the sliding clutch, a lever lying normally on or near the periphery of the sliding clutch and with its edge engaging the roller and holding the clutch out of engagement and having a beveled end to engage the roller when the clutch is engaged, and a treadle connected with said lever to serve in lifting it out of range of the roller, said roller being tapered with its large end outward, and the beveled end of said lever being transversely beveled to engage the roller hookwise.

18. The combination, substantially as set forth, with a stock and a rotary shaft and intermediate mechanism for vertically reciprocating the stock, of a wheel loose on such shaft and provided with a face-clutch having ratchet-shaped teeth, a sliding clutch splined to such shaft and having corresponding ratchet-shaped teeth, a series of holes in one of said clutches, one hole for each of its teeth, the holes being parallel with the shaft, and a pin projecting from the face of the other clutch and adapted to engage any one of said holes.

CHARLES A. BERTSCH.

Witnesses:
J. W. SEE,
U. A. SEWARD.