C. E. MACBETH.

MULTIPLE PUNCHING MACHINE.

APPLICATION FILED OCT. 9, 1908.

**942,272.** Patented Dec. 7, 1909.

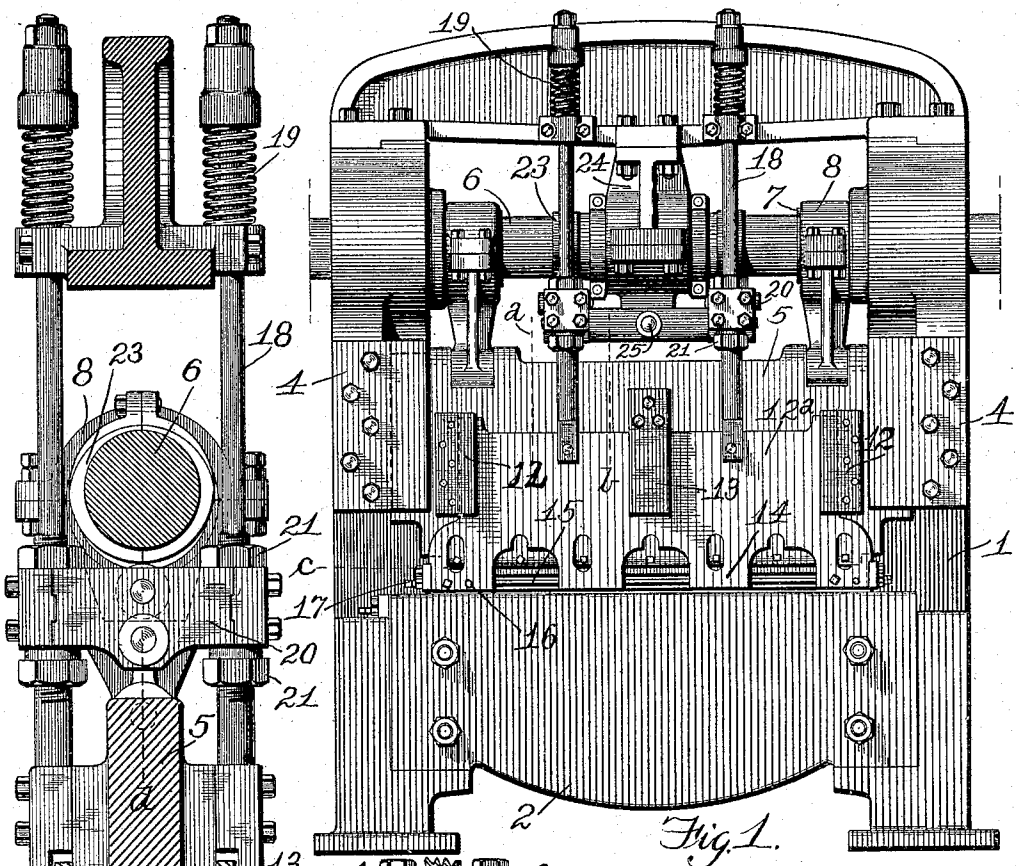

Fig. 1.

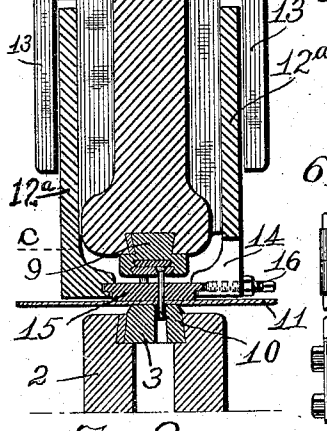

Fig. 2.

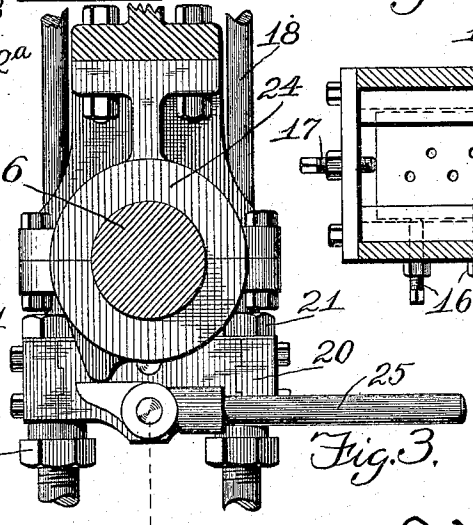

Fig. 3.

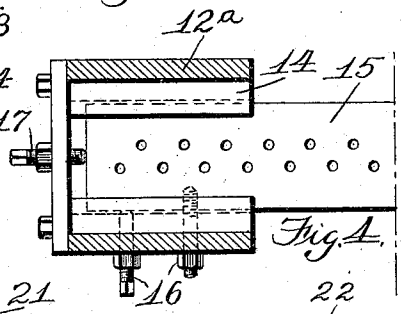

Fig. 4.

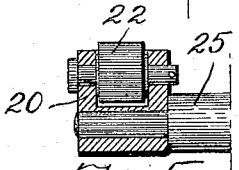

Fig. 5.

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# UNITED STATES PATENT OFFICE.

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## MULTIPLE PUNCHING-MACHINE.

942,272. Specification of Letters Patent. Patented Dec. 7, 1909.

Application filed October 9, 1908. Serial No. 457,007.

*To all whom it may concern:*

Be it known that I, CHARLES E. MACBETH, a citizen of the United States, residing at Hamilton, Butler county, Ohio, have invented certain new and useful Improvements in Multiple Punching-Machines, of which the following is a specification.

In multiple punching machines, especially those designed for accurate punching in thin metal, it is desirable that there not only be a stripper to hold the metal down while the punches are rising from it, but that there shall be in addition some means for firmly clamping the metal down to the dies before the punches enter it, the purpose being to hold the sheet firmly and to straighten it before the punches enter it, and to continue the pressure on the sheet until the punches shall have become entirely withdrawn from the sheet.

My present invention has to do with improved mechanism for accomplishing the desirable results above indicated, and it will be readily understood from the following description taken in connection with the accompanying drawing in which:—

Figure 1 is a front elevation of a machine exemplifying my invention: Fig. 2 a vertical transverse section of portions of the machine in the plane of line *a* of Fig. 1: Fig. 3 a vertical transverse section of portions in the plane of line *b* of Fig. 1: Fig. 4 a horizontal section of parts in the plane of line *c* of Figs. 1 and 2; and Fig. 5 a vertical longitudinal section of parts in the plane of line *d* of Figs. 2 and 3.

In the drawing:—1, indicates the side housings of the machine: 2, the bed, forming the fixed lower jaw of the machine: 3, the die-bar supported by the bed: 4, vertical gate-guides carried by the housings over the die-bar, or over its ends: 5, the gate sliding vertically in the gate-guides: 6, the cam-shaft, journaled in the housings over the gate and parallel therewith and designed to be turned by power: 7, the gate-actuating cams on the cam-shaft: 8, the pitmen connecting these cams with the gate: 9, the punch-holding bar secured in the lower edge of the gate: 10, the punches secured in the punch-bar and coöperating with the die-bar: and 11, the sheet of metal being operated upon by the punches.

All of the parts thus far referred to are, or may be, of the usual construction and are subject to any of the usual suitable variations in the construction of those parts in machines of this general class, and the arrangement and operation of those parts are as usual.

Proceeding with the drawing:—12, indicates vertical guides at each end of the gate and on each of its faces: $12^a$, a holddown-gate disposed near each face of the main gate and adapted for vertical movement in the guides 12: 13, center guides carried by the main gate and serving to steady and guide the intermediate portion of the holddown-gates: 14, feet formed on the lower edges of the holddown-gates and projecting below the punch-bar, the inner surfaces of these feet being longitudinally grooved: 15, a holddown-bar disposed below the punch-bar and having its edges seated in the grooves of the feet of the holddown-gates, the holddown-bar being perforated for the passage of the punches to serve in guiding the punches: 16, screws carried by the feet of one holddown-gate and engaging the holddown-bar and serving to accurately position it sidewise and properly hold it so that its perforations will have proper relationship to the punches: 17, adjusting screws carried by the ends of the holddown-gate and engaging the ends of the holddown-bar for the purpose of accurately adjusting the holddown-bar endwise: 18, a pair of rods having their lower ends firmly secured to one of the holddown-gates, there being a pair of these rods for each of the holddown-gates: 19, springs connected with the upper ends of these rods and serving to urge the rods and holddown-gates upwardly, the rods being provided with nuts for adjusting the tension of the springs: 20, a cross-bar mounted on each of the front rods 18 and extending back across over the gate and below the cam-shaft and attached to the appropriate rear rod: 21, nuts disposed on all of the rods, above and below the cross-bars, to serve in adjusting the cross-bars vertically on the rods and in firmly securing them to the rods: 22, a

roller carried by each cross-bar under the cam-shaft, and with its axis parallel with the cam-shaft: 23, a cam mounted on the cam-shaft over each of the rollers and engaging the rollers, these cams being angularly adjustable on the cam-shaft, the peripheral contour of these cams being such as to produce a concentric portion of considerable angular extent, the remaining portion being eccentric: 24, a center-bearing supported by the frame of the machine and engaging the intermediate portion of the cam-shaft, this center-bearing, while not essential in all cases, being of particular value in machines of considerable width: and 25, a lever trunnioned in the two cross-bars and having its short rear end engaging under a rigid portion carried by the general machine frame, in the present case a projection from the center-bearing 24.

In Fig. 2 the punches have completed their work while the sheet is held straight and tightly down to the die-bar by the holddown-bar, the holddown-bar being held down by cams 23 engaging the rollers with their concentric portions. The punches now begin to rise and withdraw from the metal, the holddown-bar still holding the sheet firmly to the die-bar. After the punches have risen entirely free of the metal then the termination of the concentric portion of the holddown-cams is reached and the holddown-bar rises as fast as the holddown-cams will permit the springs to act. At the same time the punches are or may be continuing their upward movement, and the differential movement of the main gate and holddown-gates takes place in the guides 12 and 13. Eventually the punches and the holddown-bar reach their uppermost position and, all is ready for the insertion of a new sheet to be punched, or for the shifting of the old sheet to be punched in a new place. The cams cause the holddown-bar to first go down and straighten and firmly clamp the sheet, after which the punches descend and do their work.

The holddown-bar can be adjusted vertically, to suit the thickness of metal being dealt with, by means of the nuts 21. As, during the movements of the vertically reciprocating parts, there is necessarily some relative motion of punches and holddown-bar, and as this might produce more or less damaging wear of the punches where they work through the perforations of the holddown-bar, it is important to reduce this relative movement to the minimum, and the minimum is obviously represented by the maximum degree of projection of the punches through the holddown-bar. The throw of the holddown-cams having been designed so as to produce this minimum, with some reasonable degree of excess, then the holddown-cams may be angularly adjusted so that with the exception of the relative movement necessary to withdraw the punches to such extent that they will not project through the holddown-bar, then the movements of punches and punch-bar may be simultaneous for most of the time thus avoiding, to a very great extent, the evils of the wearing above referred to.

The holddown-bar is inserted into and removed from the feet of the holddown-gates by sliding endwise. This cannot be done while the punches are engaging the perforations of the holddown-bar, which they always do when the parts are in normal condition. In the present case, when the holddown-bar is to be removed, the main gate is to be set in some upper position, say its topmost position, the springs drawing the holddown-bar up with the puches and still in engagement with them. Lever 25 is now to be depressed, thus forcing all the holddown devices downwardly till the holddown-bar is free of the ends of the punches, whereupon the holddown-bar may be withdrawn endwise.

It is to be noted in the illustration that all of the features pertaining to the holddown are removable bodily without disturbing any of the main punching parts. The cross-bars are held to their rods by removable caps, and there are caps to the top guides of the rods, and the guides 12 and 13 are removable, and by removing these parts then everything pertaining to the holddown comes away bodily, except the holddown-cams which, on their part, are divided diametrically so that they may be readily removed from the cam-shaft.

I claim:—

1. A punching machine comprising, a vertically reciprocating main gate to carry the punches, vertically reciprocating holddown-gates mounted in guides at the opposite faces of the main gate and having feet provided with inwardly presenting longitudinal grooves, a holddown-bar fitted to slide longitudinally in the feet of the holddown-gates and perforated for the punches, and mechanism for reciprocating all the gates, combined substantially as set forth.

2. A punching machine comprising, a vertically reciprocating main gate to carry the punches, vertically reciprocating holddown-gates mounted in guides at the opposite faces of the main gate, a holddown-bar carried by the feet of the holddown-gates and perforated for the punches, a cam-shaft, cams thereon for reciprocating the main gate, rods extending vertically from the holddown-gates, springs connected with the rods to serve in raising the holddown-gates, cross-bars extending from the front to the rear rods and below the cam-shaft, and cams

on the cam-shaft over the cross-bars to co-act therewith in moving the holddown-gates downward, combined substantially as set forth.

3. A punching machine comprising, a vertically reciprocating main gate to carry the punches, vertically reciprocating holddown-gates mounted in guides at the opposite faces of the main gate, a holddown-bar carried by the feet of the holddown-gates and perforated for the punches, a cam-shaft, cams thereon for reciprocating the main gate, rods extending vertically from the holddown-gates, springs connected with the rods to serve in raising the holddown-gates, cross-bars extending from the front to the rear rods and below the cam-shaft, cams on the cam-shaft over the cross-bars to co-act therewith in moving the holddown-gates downward, and adjusting nuts on the rods above and below the cross-bars to serve in adjusting the distance between the cross-bars and the holddown-bar, combined substantially as set forth.

4. A punching machine comprising, a vertically reciprocating main gate to carry the punches, vertically reciprocating holddown-gates mounted in guides at the opposite faces of the main gate, a holddown-bar carried by the feet of the holddown-gates and perforated for the punches, a cam-shaft, cams thereon for reciprocating the main gate, rods extending vertically from the holddown-gates, springs connected with the rods to serve in raising the holddown-gates, cross-bars extending from the front to the rear rods and below the cam-shaft, cams on the cam-shaft over the cross-bars to co-act therewith in moving the holddown-gates downward, and a hand-lever coöperating with the holddown-gates and a fixed part of the machine to serve in depressing the holddown-bar independent of the power-mechanism of the machine, combined substantially as set forth.

5. A punching machine comprising, a vertically reciprocating main gate to carry the punches, vertically reciprocating holddown-gates mounted in guides at the opposite faces of the main gate, a holddown-bar carried by the feet of the holddown-gates and perforated for the punches, a cam-shaft, cams thereon for reciprocating the main gate, rods extending vertically from the holddown-gates, springs connected with the rods to serve in raising the holddown-gates, cross-bars extending from the front to the rear rods and below the cam-shaft, cams on the cam-shaft over the cross-bars to co-act therewith in moving the holddown-gates downward, and a hand-lever trunnioned in said cross-bars and adapted to engage with some fixed part of the machine to serve in depressing the holddown-bar independent of the power mechanism of the machine, combined substantially as set forth.

6. A punching machine comprising, a vertically reciprocating main gate to carry the punches, vertically reciprocating holddown-gates mounted in guides at the opposite faces of the main gate, a holddown-bar carried by the feet of the holddown-gates and perforated for the punches, a cam-shaft disposed over the main gate, a pair of cams thereon for reciprocating the main gate, a pair of cams on the cam-shaft between the first-mentioned cams, and connections between the last-mentioned cams and the holddown gates, combined substantially as set forth.

7. A punching machine comprising, a vertically reciprocating main gate to carry the punches, vertically reciprocating holddown-gates at the opposite faces of the main gate and provided with feet having inwardly presenting longitudinal grooves, a holddown-bar fitted to slide in the grooves of the holddown-gates and adapted for endwise and sidewise adjustment therein, adjusting screws carried by the holddown-gates for adjusting the holddown-bar longitudinally and transversely, and mechanism for reciprocating all of the gates, combined substantially as set forth.

8. A punching machine comprising, a vertically reciprocating main gate, a cam-shaft thereover, cams on the cam-shaft for reciprocating the main gate, holddown-gates disposed against the opposite faces of the main gate, guides disposed exterior to the holddown-gates and outwardly removable, rods projecting upwardly from the holddown-gates, cross-bars extending between the front and rear rods, outwardly removable caps connected with the ends of the cross-bars and engaging the exterior of the rods, and diametrically divided cams disposed on the cam-shaft over the cross-bars to coöperate with them in reciprocating the holddown-bar, combined substantially as set forth.

9. In a punching machine, a main gate adapted to carry the punches, holddown-gates slidably mounted on opposite sides of the main gate and having inwardly projecting feet, a holddown-bar slidably connected between the feet of the holddown-gates, and means for adjustably securing the holddown-bar in position between the feet.

10. A punching machine comprising a vertically reciprocating main gate to carry the punches, a shaft, cams on said shaft for reciprocating the main gate, guides on the opposite faces of the main gate, holddown-gates slidably mounted in said guides, a holddown-bar adjustably secured to said holddown-gates, guide rods projecting upwardly from each of the holddown-gates and disposed on opposite sides of the shaft,

springs on said rods tending normally to lift the holddown-gates, cross-bars disposed below the shaft and connecting the rods on opposite sides of the shaft, and cams on the shaft to engage said cross-bars and reciprocate the holddown-gates.

11. In combination with a punching machine, a vertically reciprocating main gate to carry the punches, holddown-gates slidably mounted on the opposite sides of the main gate, a holddown-bar adjustably secured between the lower ends of the holddown-gates, a shaft, cams on said shaft for reciprocating the main gate, and cams on said shaft for reciprocating the holddown-gates.

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