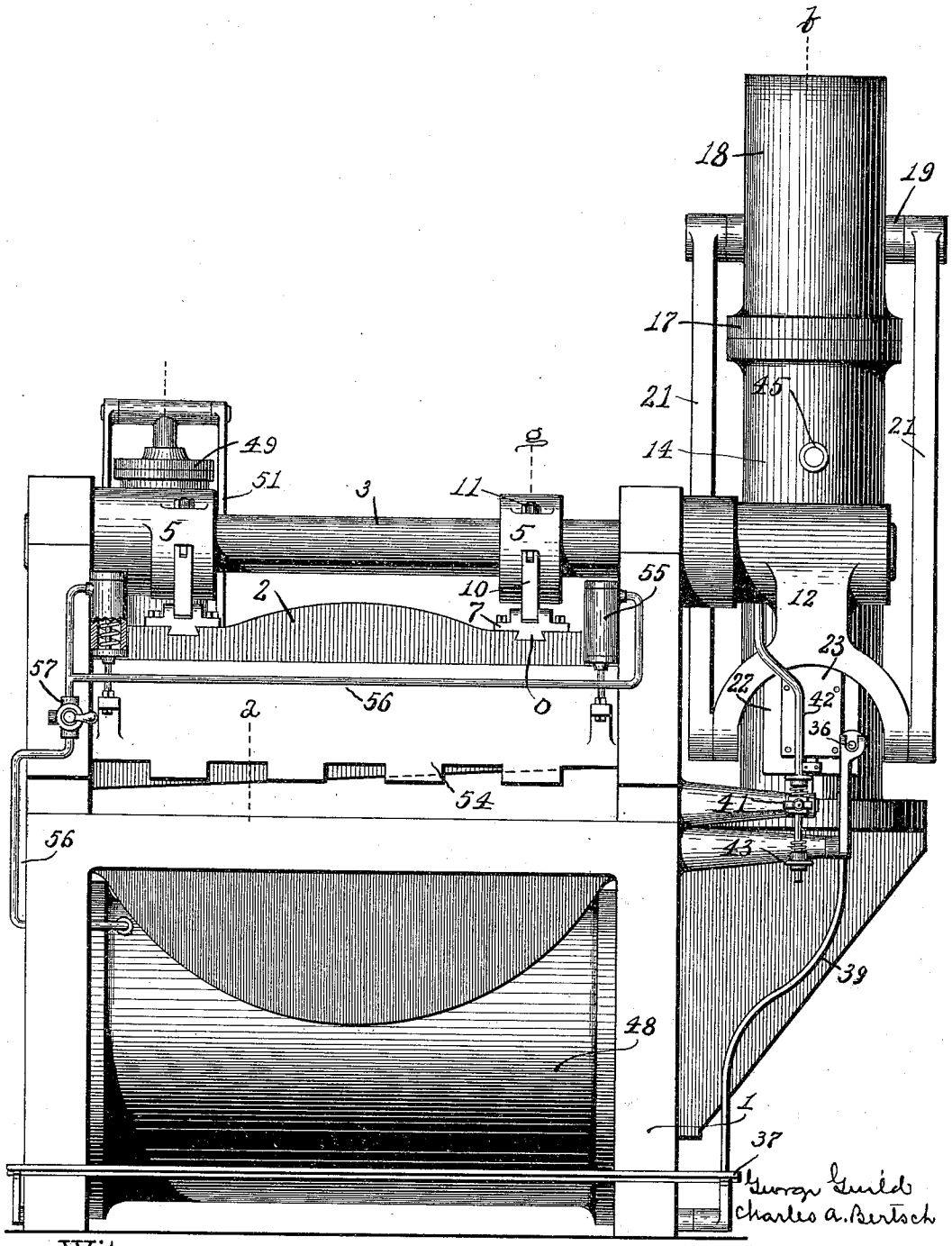
No. 610,584. Patented Sept. 13, 1898.

G. GUILD & C. A. BERTSCH.

PUNCHING AND SHEARING MACHINE.

(Application filed Sept. 20, 1897.)

(No Model.) 4 Sheets—Sheet 1.



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FIG. 1.

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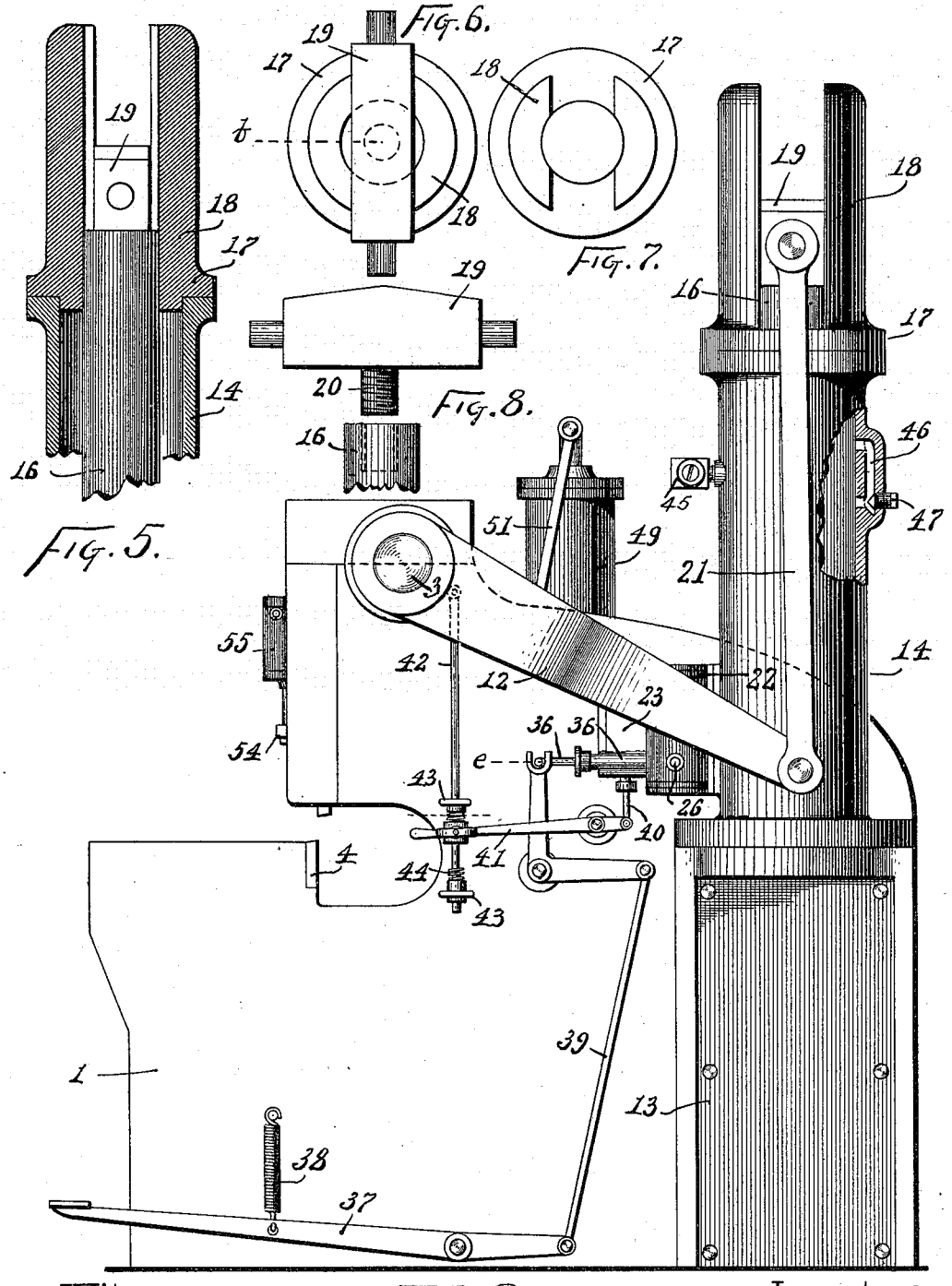


FIG. 5.

FIG. 6.

FIG. 7.

FIG. 8.

FIG. 2.

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(No Model.) 4 Sheets—Sheet 3.

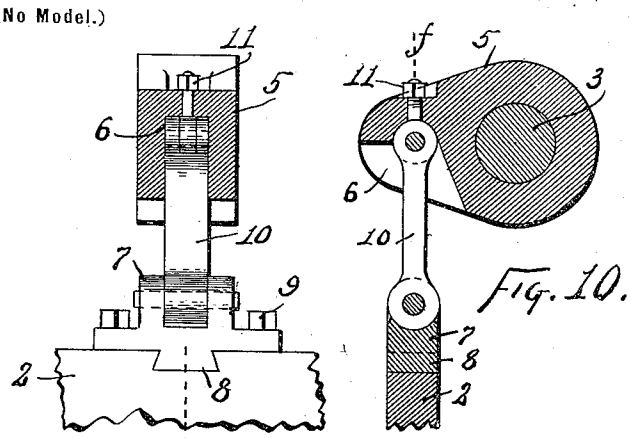


FIG. 9.

FIG. 10.

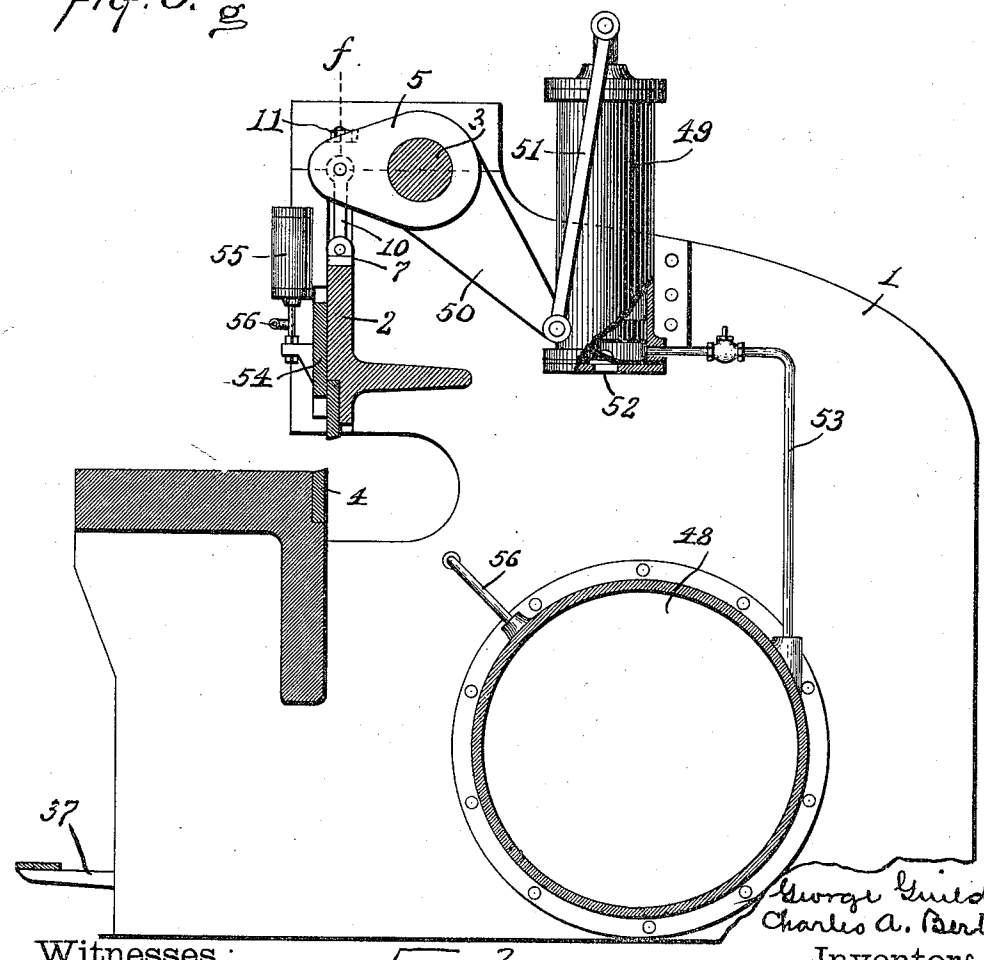


FIG. 3.

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(Application filed Sept. 20, 1897.)

(No Model.) 4 Sheets—Sheet 4.

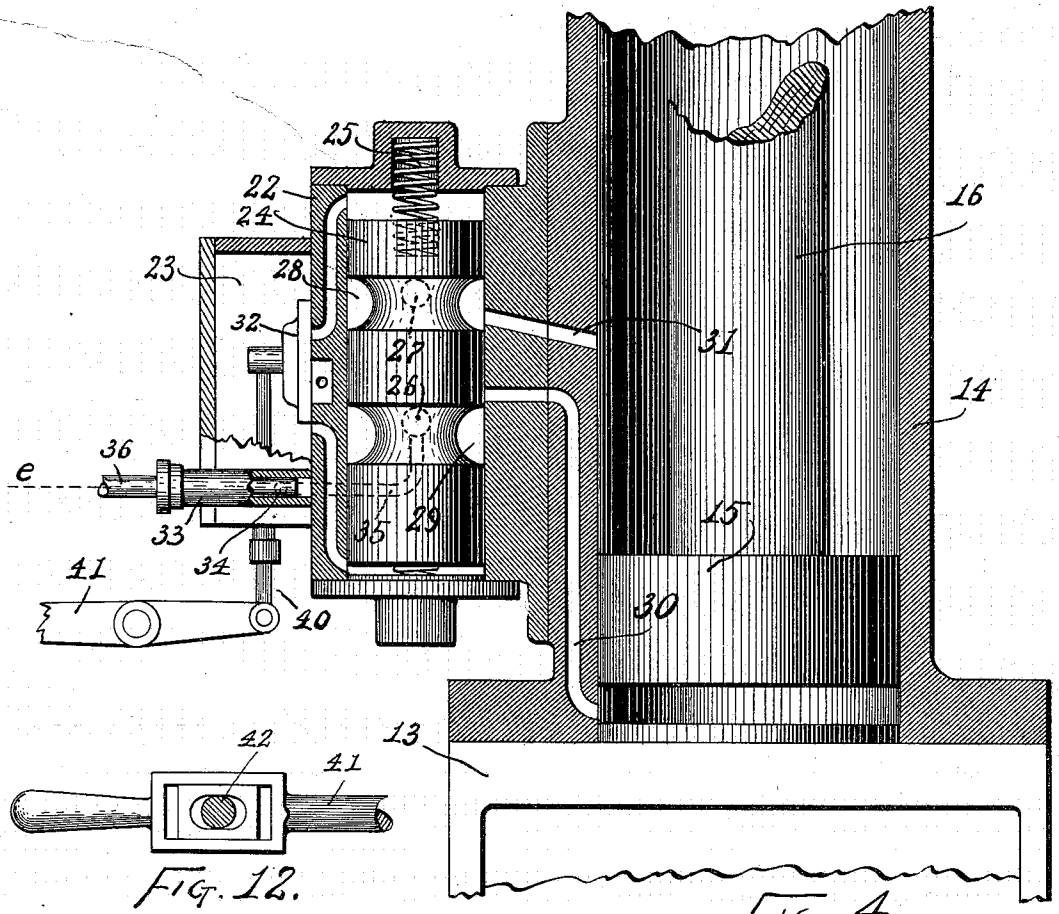


FIG. 4.

FIG. 12.

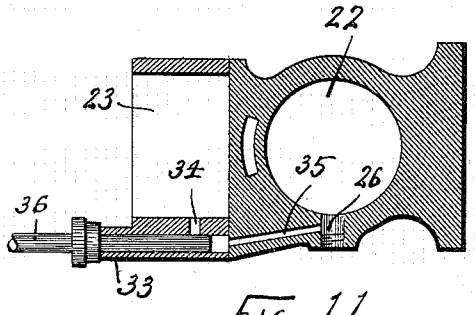


FIG. 11.

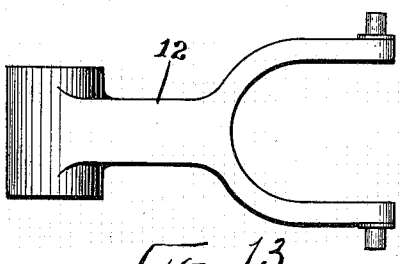


FIG. 13.

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UNITED STATES PATENT OFFICE.

GEORGE GUILD AND CHARLES A. BERTSCH, OF CAMBRIDGE CITY, INDIANA, ASSIGNORS TO BERTSCH & CO., OF SAME PLACE.

PUNCHING AND SHEARING MACHINE.

SPECIFICATION forming part of Letters Patent No. 610,584, dated September 13, 1898.

Application filed September 20, 1897. Serial No. 652,315. (No model.)

To all whom it may concern:

Be it known that we, GEORGE GUILD and CHARLES A. BERTSCH, citizens of the United States, and residents of Cambridge City, Wayne county, Indiana, have invented certain new and useful Improvements in Punching or Shearing Machines, of which the following is a specification.

This invention pertains to improvements in punching or shearing machines, and the improvements will be readily understood from the following description, taken in connection with the accompanying drawings, illustrating the improvements in connection with a shearing-machine, and in which—

Figure 1 is a front elevation of a shearing-machine exemplifying our invention; Fig. 2, a side elevation of the same, portions appearing in vertical section in the plane of line *b* of Fig. 1; Fig. 3, a vertical transverse section in the plane of line *a* of Fig. 1; Fig. 4, a vertical section of the valve-chests, &c., in the plane of line *b* of Fig. 1; Fig. 5, a vertical section of the cross-head guide in the plane of line *b* of Fig. 1; Fig. 6, a plan of the cross-head guide and cross-head; Fig. 7, a plan of the cross-head guide; Fig. 8, a front elevation of the cross-head and a portion of the piston-rod shown detached; Fig. 9, a vertical section of one of the gate-arms in the plane of line *f* of Figs. 3 and 10; Fig. 10, a vertical section of one of the gate-arms and its attachments in the plane of line *g* of Figs. 1 and 9; Fig. 11, a horizontal section of the valve-chests in the plane of line *e* of Figs. 2 and 4; Fig. 12, a plan of a portion of the valve-lever, and Fig. 13 a plan of the power-arm.

In the drawings, 1 indicates the housings; 2, the gate, disposed horizontally and sliding vertically in the housings and carrying the upper member of the operating-tools—a shear-blade in the example; 3, a rock-shaft journaled in the housings above and to the rear of the gate; 4, the lower shear-blade, supported by the housings below the gate and typifying the lower member of the pair of operating-tools; 5, Figs. 9 and 10, a pair of arms rigidly secured to rock-shaft 3, their forward ends projecting over the gate; 6, a recess in the upper front portion of each arm 5, the roof of the recess being a semicircle with its axis parallel with the rock-shaft; 7, a pivot-block carrying a horizontal pivot and mounted on the upper edge of the gate, one block below each arm 5; 8, a dovetail projection formed on the base of each pivot-block 7 and fitting in the dovetail recess disposed transversely in the upper edge of the gate; 9, screws securing the pivot-blocks firmly to the gate; 10, links with their lower ends pivoted to the pivot-blocks, their upper ends seating in the semicircular recesses in arm 5; 11, an eyebolt pivoted to the upper end of each link 10, the shank of the bolt passing up through the recess in arm 5 and having a nut at its upper end, the arrangement being obviously such that the upper end of the link may be drawn nicely up into its bearing-recess in arm 5 and be readily removed therefrom, the lower end of the link being somewhat adjustable back and forth on the gate to equalize the length of the links, dovetails 8 permitting such adjustment before bolts 9 are applied or made tight; 12, (turning to Fig. 2,) a power-arm rigidly secured to an outer end of rock-shaft 3 and projecting rearwardly, the rear end of the arm being bifurcated; 13, a bracket rigidly secured to the outer surface of the housing below the bifurcated end of arm 12; 14, a vertical power-cylinder with its base rigidly secured to bracket 13, the cylinder being straddled by the bifurcation of arm 12; 15, the piston of this cylinder; 16, the piston-rod, the same being of great size and stiffness and projecting upwardly from the cylinder; 17, the top cylinder-head bored to snugly fit the piston-rod; 18, a pair of guides projecting rigidly upward from this cylinder-head and bored the same size as the hole in the cylinder-head, so as to snugly fit the piston-rod; 19, a bar-shaped cross-head disposed across the upper end of piston-rod 16 and projecting sidewise through the slots between the guides, so that the ends of the cross-heads come over the members of the bifurcated end of arm 12; 20, a threaded shank projecting from the central lower surface of cross-head 19 and firmly screwed into a threaded socket in piston-rod 16; 21, links connecting the bifurcation members of arm 12 with the ends of cross-head

19; 22, Fig. 4, main-valve chest for the power-cylinder, the same having a cylindrical bore; 23, auxiliary-valve chest; 24, main valve; 25, helical springs engaging in axial recesses in the ends of the main valve and in the bonnets of the main-valve chest, these springs cushioning the movement of the main valve; 26, steam-supply port to main-valve chest, the same to be piped from any suitable source of steam-supply; 27, exhaust-port from the main-valve chest, the same to be piped away to some suitable point in case steam is used as the fluid for the actuation of the power-cylinder; 28, a groove in the main valve always in communication with exhaust-port 27, whatever be the position of valve 24; 29, a groove in the main valve always in communication with steam-port 26; 30, a live-steam port from main-valve chest to lower end of power-cylinder 14, this port being covered by the main valve when the valve is down and in communication with steam-port 26 when the valve is up; 31, an exhaust-port leading from near the lower end of the power-cylinder to the main-valve chest, this port being in communication with exhaust-port 27 when the valve is down and closed by the valve when the valve is up; 32, the auxiliary valve serving, when properly moved, to control the flow of steam from the auxiliary-valve chest to the ends of the main valve, so that the main valve will be forced up or down, according as the auxiliary valve is moved; 33, a tubular valve-seat cast on the wall of the auxiliary chest; 34, a port leading from the tubular valve-seat into the auxiliary chest; 35, a port leading into the tubular valve-seat from the steam-supply port 26 from any other source of steam-supply; 36, a piston-valve sliding within the tubular valve-seat and normally covering port 34 and preventing steam from entering the auxiliary chest; 37, Fig. 2, a treadle; 38, a spring holding the treadle normally up; 39, suitable connections from the treadle to piston-valve 36, whereby when the treadle is depressed the valve will move outwardly and uncover port 34; 40, stem of the auxiliary valve; 41, a lever pivoted to the housing and connected with the stem of the auxiliary valve; 42, a tappet-rod connected with power-arm 12; 43, adjustable tappets on the tappet-rod and adapted as the power-arm rises and falls to engage lever 41 and move the auxiliary valve; 44, springs surrounding the tappet-rod and interposed between the tappets and lever 41; 45, an exhaust-port in the upper portion of power-cylinder 14, in position to be passed by the power-piston as the piston approaches the upper end of its stroke, this exhaust-port being piped away to some proper point in case steam is used as the motive fluid, the port preferably being provided with a valve by means of which it may be closed; 46, a pair of connected ports in the upper portion of the power-cylinder 14, the ports being at somewhat greater distance apart than the thickness of the power-piston, the lower port being in such position that when the piston is near the upper end of its stroke steam below it will be free to enter the cylinder above the piston, the position of the upper port being such that the continued upward travel of the piston will quickly close this port, thus confining the steam above the piston and effecting a cushioning of the piston and connected parts; 47, a valve by means of which ports 46 may be closed or put out of operation; 48, an air-reservoir, forming a part of the framing of the machine, the cavities of the housings, if hollow housings are employed, being in free communication with this reservoir, so as to add to reservoir-volume; 49, an air-pump; 50, an arm mounted on rock-shaft 3 and being preferably formed on one of link-arms 5, as shown, this arm 50 being bifurcated to straddle the air-pump; 51, links connecting arm 50 with the cross-head of the air-pump; 52, inlet-valve to the air-pump, the pump drawing air on its upstroke, corresponding with the downstroke of the gate of the machine; 53, pipe connecting the discharge-pipe of the air-pump with reservoir 48; 54, the holddown-bar; 55, a pair of air-cylinders having their pistons connected with the holddown-bar, so that downward movement of the pistons results in downward movement of the holddown-bar, suitable springs, which may be within the air-cylinders, serving to elevate the holddown-bar; 56, a pipe connecting air-reservoir 48 with the upper ends of both of air-cylinders 55, and 57 a three-way valve in pipe 56 to serve in admitting compressed air from reservoir 48 to the upper ends of air-cylinders 55 or in permitting the air to discharge from those cylinders.

Turning to Figs. 2 and 4, the parts are in normal idle position, live steam being at groove 29 of the main valve. The auxiliary-valve chest 23 is empty. Depressing the treadle opens port 34 and admits steam to the auxiliary chest. This steam instantly passes below the main valve and moves the main valve upwardly, thus admitting steam below power-piston 15. The power-piston rises and the gate makes its cutting stroke. At the end of the cutting stroke the lower tappet causes the reversal of the auxiliary valve, thus placing the upper end of the main-valve cylinder in communication with the live steam in the auxiliary-valve chest and placing the lower end of the main-valve cylinder in communication with the exhaust-passage under the auxiliary valve, whereupon the main valve descends to the position shown in Fig. 4, and the steam under the power-piston exhausts through port 31, the power-piston then descending and, when it passes and closes port 31, confining and cushioning the steam below the power-piston. So long as the treadle is depressed the valve-gear and machine work automatically. The length of the gate stroke may be adjusted by adjusting tappets 43. If the treadle be depressed

for an instant only, then the power-piston will make a single excursion, the gate coming to rest in its upper position. When the power-piston nears the upper end of its stroke, it uncovers exhaust-port 45, giving a free and prompt exhaust supplemental to the exhausting function of the main valve. This supplemental exhaust-port 45 may be employed or not by opening or closing its valve. Connected ports 46 effect the cushioning of the power-piston at the upper end of its stroke, and these ports may be employed or not by opening or closing valve 47. The machine illustrated is a comparatively narrow one—that is to say, the gate is comparatively short. Under such condition there will be no need for a duplication of the power-cylinder and power-arm at the opposite end of the rock-shaft, as might be desirable with an extremely-wide machine. As the gate descends the air-pump draws in air, the air-pump forming no material increase to the work being done. As the gate makes its idle upstroke the air is compressed by the air-pump and discharged into reservoir 48, the air-pump thus forming a cushioning resistance to the idle upstroke of the gate. By properly adjusting valve 57 compressed air is admitted over the piston to air-cylinders 55, thus pressing down the hold-down-bar, the holddown-bar rising when the valve is appropriately readjusted. The hold-down-bar may have to clamp material of unequal thickness along its width, or, indeed, it may have all of its clamping work to do at or near one end of the holddown-bar, as when clamping narrow material. In such cases the two holddown-cylinders act as equalizers for each other.

We claim as our invention—

1. In a punching or shearing machine, the combination, substantially as set forth, of an oscillating power-arm, a power-cylinder having its piston connected therewith, a fluid-moved main valve controlling the flow of fluid to and from said power-cylinder, an auxiliary valve controlling the movements of said main valve, tappet connections between said auxiliary valve and said power-arm, a fluid-supply pipe open to said main valve, a fluid-supply passage to said auxiliary valve, a stop-valve in said last-mentioned passage, a treadle connected with said stop-valve and serving in opening the stop-valve, and a spring serving to hold the stop-valve normally in closed condition, the connection between said treadle and the valve system being to said stop-valve only, and the connection between said power-arm and the valve system being to said auxiliary valve only.

2. In a punching or shearing machine, the combination, substantially as set forth, of an oscillating power-arm, a power-cylinder having its piston connected therewith, a fluid-actuated main valve controlling the flow of fluid to and from said power-cylinder, an auxiliary valve controlling the movements of said main valve, a chest for said auxiliary valve, a cylinder formed in the wall of said chest and having a fluid-outlet port leading into said chest and having a fluid-inlet, a piston fitting within said cylinder and normally covering said outlet-port, a treadle connected with said piston, and a spring holding said piston in normal position.

3. In a punching or shearing machine, the combination, substantially as set forth, of a rock-shaft journaled in the top of the housing of the machine, a power-arm secured to the outer end of said rock-shaft outside the housing and having its outer end bifurcated, a bracket secured against the side of the housing below the bifurcated end of said power-arm, a vertical cylinder resting upon said bracket and having its body free from the housing and straddled by the bifurcated end of said power-arm, a piston-rod projecting upwardly from said cylinder, a cross-head on the upper end of said piston-rod, and links extending downwardly from said cross-head to the members of the bifurcated end of said power-arm.

4. In a punching or shearing machine, the combination, substantially as set forth, of a vertical power-cylinder, an oscillating power-arm having a bifurcated end straddling said cylinder, a top cylinder-head bored to fit the piston-rod of said power-cylinder, a pair of guides projecting rigidly upward from said cylinder-head and having a bore fitting said piston-rod, a cross-head at the top of said piston-rod and extending sidewise between said guides, and links connecting said cross-head with the bifurcation members of said power-arm.

5. In a punching or shearing machine, the combination, substantially as set forth, of a vertically-sliding gate, a rock-shaft mounted in the housings of the machine over the gate, arms fast on said rock-shaft and having downwardly-open concave knuckle-seats with their axes parallel with the axis of said rock-shaft and having apertures leading upwardly from said knuckle-seats, eyebolts in said knuckle-seats with their shanks secured in said apertures, and links having their lower ends pivoted to said gate and having their upper ends pivoted to said eyebolts and having their top surfaces engaging said knuckle-seats.

6. In a punching or shearing machine, the combination, substantially as set forth, of a vertically-sliding gate having transverse dovetail recesses in its upper edge, a rock-shaft mounted in the housings of the machine above the gate, arms fast on the rock-shaft, pivot-blocks bolted to the upper edge of said gate and having dovetail projections sliding in said dovetail recesses, and links connecting said pivot-blocks with said arms.

7. In a machine having a reciprocating part whose strokes in one direction are idle strokes, the combination, substantially as set forth, with such reciprocating part, of an air-compressor, mechanical connections between said reciprocating part and the piston of the air-

compressor whereby said piston is given its compressing strokes by and during the idle strokes of said reciprocating part, and a conduit leading from said air-compressor and adapted to convey the compressed air to a point of utilization, whereby said reciprocating part becomes cushioned during its idle strokes and whereby available energy results from the idle strokes of said reciprocating part.

8. In a punching or shearing machine, the combination, substantially as set forth, of a vertically-sliding gate, an air-compressor, connections between said air-compressor and said gate to cause the compression of air during the idle or up stroke of said gate, a reservoir for the compressed air, a vertically-moving holddown-bar, an air-cylinder arranged to give movement to said holddown-bar, a pipe connecting said air-engine with said reservoir, and a valve in said pipe.

9. In a punching or shearing machine, the combination, substantially as set forth, of a vertically-sliding gate, a power-cylinder having its piston mechanically connected with said gate, valves and valve-gearing for controlling the operation of the power-cylinder, an exhaust-port opening near the beginning of the active stroke of the piston and an exhaust-port through the wall of said power-cylinder in position to be uncovered by the piston of the cylinder as it nears the end of its active stroke.

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