(No Model.) 3 Sheets—Sheet 1.

G. GUILD & C. A. BERTSCH.

SHEARING MACHINE.

No. 590,041. Patented Sept. 14, 1897.

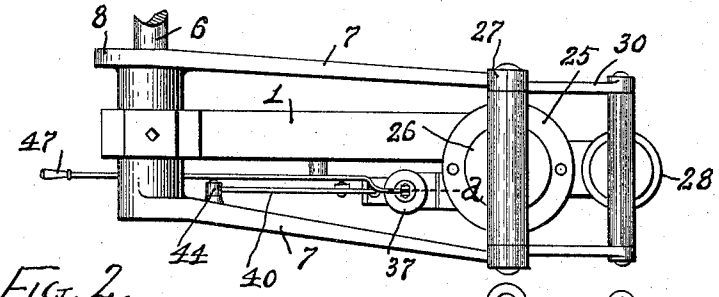


FIG. 2.

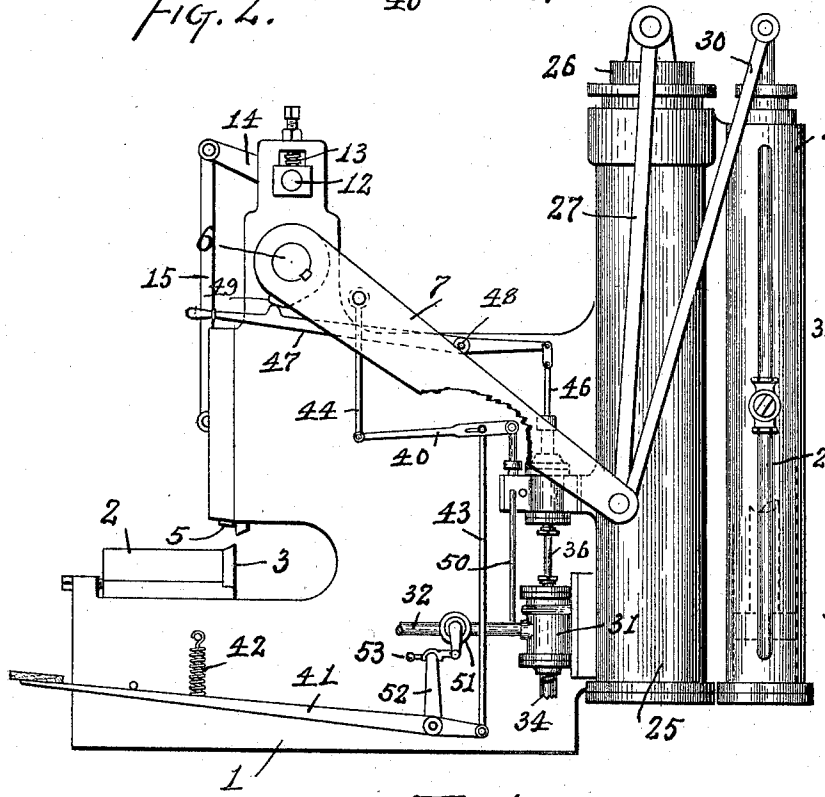


FIG. 1.

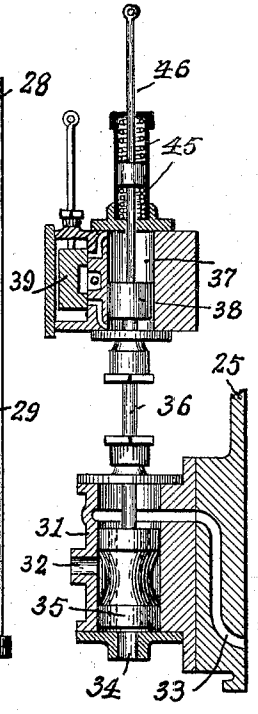


FIG. 3.

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THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

(No Model.) 3 Sheets—Sheet 2.

G. GUILD & C. A. BERTSCH.

SHEARING MACHINE.

No. 590,041. Patented Sept. 14, 1897.

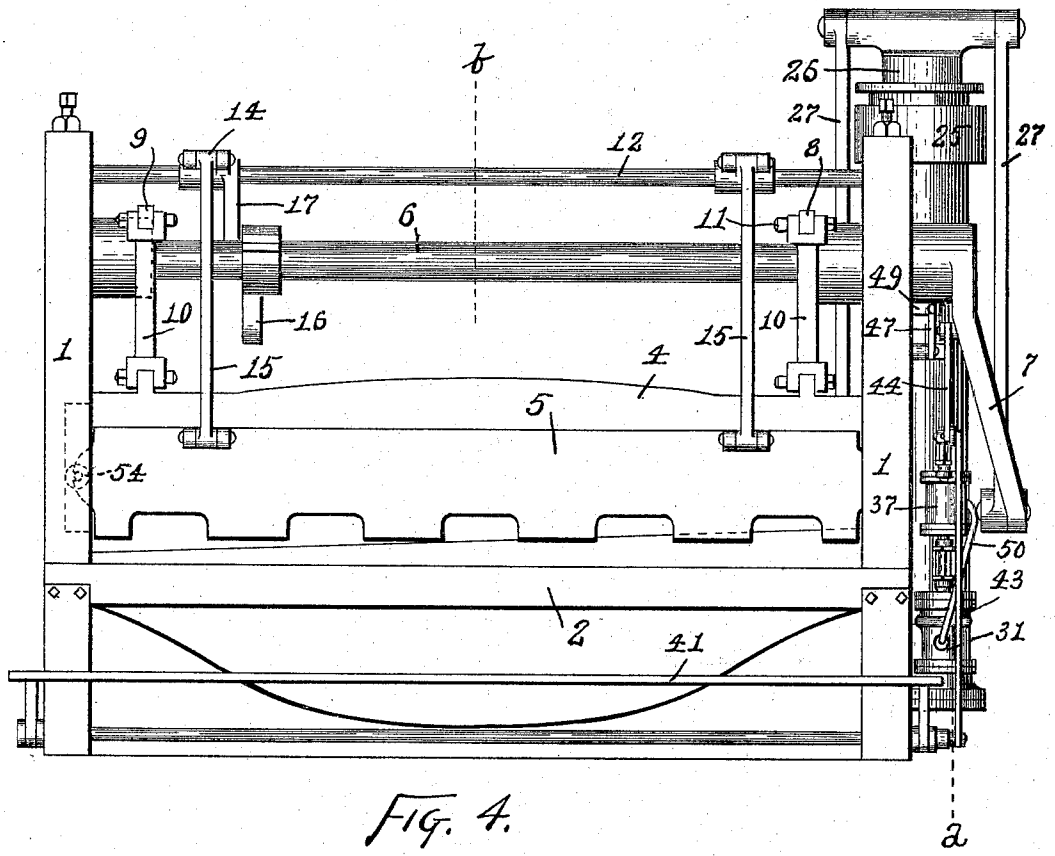


FIG. 4.

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(No Model.) 3 Sheets—Sheet 3.

G. GUILD & C. A. BERTSCH.

SHEARING MACHINE.

No. 590,041. Patented Sept. 14, 1897.

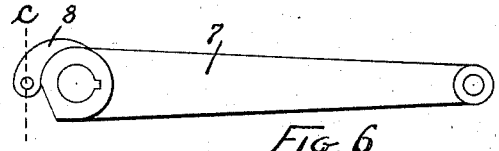


FIG. 6.

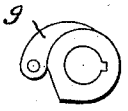


FIG. 7.

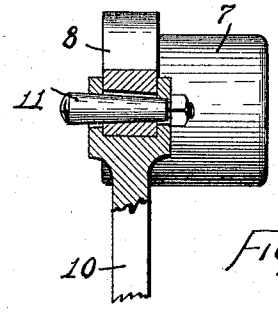


FIG. 8.

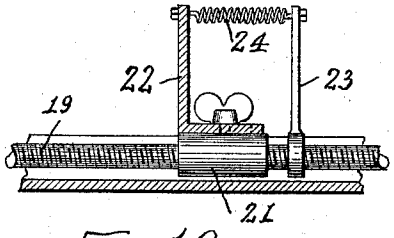


FIG. 10.

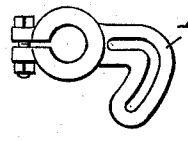


FIG. 9.

FIG. 5.

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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.

SHEARING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 590,041, dated September 14, 1897.

Application filed November 14, 1896. Serial No. 612,163. (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 Shearing-Machines, of which the following is a specification.

Our invention pertains to that class of machines in which a vertically-reciprocating gate carries a shear-blade to coöperate with a stationary shear-blade upon a table below. Such machines frequently have punching-tools substituted for the shearing-blades.

Our invention will be readily understood from the following description, taken in connection with the accompanying drawings, in which—

Figure 1 is an end elevation of a machine exemplifying our improvements; Fig. 2, a plan of one of the housings with its attached parts; Fig. 3, a vertical section of the valve in the plane of line *a* of Figs. 2 and 4; Fig. 4, a front elevation of the machine; Fig. 5, a vertical section of the machine in the plane of line *b* of Fig. 4; Fig. 6, a side elevation of one of the power-arms on the main shaft; Fig. 7, a side elevation of the link-arm on the main shaft; Fig. 8, a front elevation of one of the power-arms, the link-arm and a portion of its link appearing in section in the plane of line *c* of Fig. 6; Fig. 9, a side elevation of the holddown-cam, and Fig. 10 a vertical longitudinal section of one of brackets which supports the rear gage.

In the drawings, 1 indicates the housings of the machine; 2, the table; 3, the lower shear-blade supported thereby; 4, the gate; 5, the holddown; 6, the main shaft journaled in the housings above the gate; 7, a pair of power-arms secured to the main shaft, one at each side of one of the housings and extending rearwardly, so as to straddle the housing; 8, a link-arm projecting forward from that one of the power-arms which is at the inner side of the housing straddled by the pair of power-arms; 9, a link-arm fast on the main shaft near the opposite housing; 10, links pivoted at their upper ends to the link-arms 8 and 9 and at their lower ends to the gate; 11, Fig. 8, taper pins forming the pivots for links 10, such pins being provided at each end of the links; 12, a holddown-shaft journaled in vertically-sliding boxes in the housings above the main shaft; 13, springs disposed over the boxes of this shaft and provided with screws for adjusting their tension; 14, a pair of arms projecting forwardly from the holddown-shaft; 15, links connecting arms 14 with the holddown 5; 16, a cam on the main shaft and having a concentric portion in its contour, this cam being frictionally secured to the main shaft by having its hub split and clamped thereon; 17, an arm fast on the holddown-shaft and engaging the holddown-cam; 18, the usual brackets at the rear of the table for supporting the rear gage; 19, the usual screws in these brackets for adjusting the gage to and from the shear-line; 20, the usual chain-and-sprocket mechanism connecting the screws and serving as a means for turning the screws in unison; 21, Fig. 10, the usual nuts on gage-screws 19; 22, the usual rear gage supported on the nuts 21 and secured to the nuts by screws through the slots, as usual, so as to permit one end of the gage being adjusted farther toward the shear-line than the other when non-parallel pieces are to be sheared off; 23, nuts on the gage-screws 19 to the rear of nuts 21 and separated from them a distance and provided with upwardly-projecting arms; 24, springs extending between the arms of nuts 23 and the gage 22; 25, the power-cylinder disposed vertically at the rear of one of the housings and preferably cast therewith and straddled by the power-arms 7; 26, the piston or plunger of this cylinder; 27, links connecting the upper end of the plunger with the free ends of power-arms 7, so that as the plunger rises the main shaft will be turned and the gate forced down; 28, a cataract-cylinder disposed vertically at the rear of the power-cylinder 25 and having its piston-rod projecting upwardly; 29, the by-pass pipe of the cataract-cylinder provided with the usual regulating-cock; 30, links connecting the cataract-piston rod with the free ends of power-arms 7, so that the cataract-piston and power-plunger move vertically together; 31, power-cylinder valve-chamber suited for a piston-valve; 32, inlet to the valve-cylinder for steam or compressed air or wa-

ter, as the case may be; 33, port leading from upper part of valve-cylinder to lower end of power-cylinder; 34, exhaust from valve-cylinder; 35, hollow spool-valve working in the valve-cylinder and adapted, when down, to leave port 33 open to the exhaust 34 and when up to put port 33 in communication with inlet 32; 36, valve-stem; 37, auxiliary cylinder above and in line with the valve-cylinder; 38, auxiliary piston fast on the valve-stem 36; 39, auxiliary valve; 40, a lever having its rear end connected with the stem of the auxiliary valve; 41, a treadle; 42, a spring holding the treadle in normal upward position; 43, a link extending from the treadle upwardly to an intermediate point on lever 40 and adjustably connected therewith, so that the point of attachment may be shifted to or from the stem of the auxiliary valve; 44, a link connecting the forward end of lever 40 with one of power-arms 7; 45, a pair of springs connected with valve-stem 36 to cushion its motion in either direction; 46, an upward prolongation of valve-stem 36; 47, a hand-lever pivoted to the housing and having its rear end linked to this upward prolongation of the valve-stem, the forward or handle end of the lever being in convenient position to be reached by a workman in front of the machine; 48, the pivot on which hand-lever 47 rocks; 49, a cam-lug projecting from the hub of one of the power-arms and engaged by a toe on hand-lever 47; 50, supply-pipe for auxiliary cylinder; 51, throttle-valve in main inlet 32, this valve being normally closed; 52, an arm connected with the treadle; 53, a link detachably connecting valve 51 with arm 52, so that as the treadle is depressed the throttle-valve will be opened; and 54, Fig. 4, the rounded ends of the holddown, forming the portions working in the holddown-guides in the housings, such rounded portion being preferably formed as or provided with a roller with its axis horizontal, so that in case of breakage of holddown-gear at one end of the holddown the oblique action of the holddown will not produce breaking-strains on the holddown-guides.

Referring to Fig. 8, let it be noticed that taper pin 11 is not in contact with the upper portion of the eye in link-arm 8, the clearance being produced by enlarging the taper eye upwardly or giving it a somewhat elliptical form. By drawing in the taper pin the lower portion of the hub of the eye is brought firmly to its seat in the link and lost motion thus taken up.

Springs 13 over the holddown-shaft form a yielding load upon that shaft and consequently permit of variations in the thickness of material gripped by the holddown without the necessity for special adjustment or danger of breakage. These springs, or equivalent weights, if substituted, may be adjusted to produce a satisfactory gripping pressure by the holddown upon the thinnest material to be sheared, and the rising of the holddown-shaft will permit of satisfactory action on thicker material.

Referring to Fig. 10, it is found in practice that accurate rear gaging is interfered with by lost motion in the nuts which carry the gage, and it is also found that the gage may become shifted on the nuts to which it is secured by screws through slots in the gage to permit of taper shearing. The secondary nuts 23, in connection with springs 24, hold the gage-box to its rearmost position on the main nuts and hold the main nuts back on the screw-threads, thus avoiding the evils of lost motion in the threads of the screws.

Referring to Fig. 9, the clamping of the holddown-cam to the main shaft permits of slippage in case of extraordinary strains being brought upon the holddown, strains which would otherwise result in breakage of some of the holddown connections.

The power-cylinder acting at one end only of the main shaft requires that motion be transmitted to the distant end of the gate through the shaft. For extraordinary lengths of gate, where the torsion of the main shaft would become objectionable, the power mechanism may be duplicated at the other housing, and in that case, of course, the main shaft becomes subjected to no torsion and need not be present as a shaft extending clear across the machine.

In the exemplification the power-cylinder is single-acting, the weight of the plunger and the power-arms being sufficient to elevate the gate. The cataract checks the motion of the power parts on the working stroke under the influence of the power medium and checks the motion of the parts on the downstroke under the influence of gravity.

The parts being in the position shown in Figs. 1 and 3, the gate being up, the attendant depresses the treadle. The forward end of lever 40 acts as a stationary fulcrum, and hence the auxiliary valve is raised. The auxiliary piston now rises, raising the main valve and permitting steam to go to the power-cylinder and produce the cutting-stroke. The depression of the treadle causes the opening of throttle-valve 51. The treadle being still depressed and the plunger making its upstroke the upper end of link 43 becomes for the time the fixed fulcrum of lever 40 and consequently the auxiliary valve is reversed as the power-arm rises, thus reversing the main valve at the top of the stroke. The plunger will thus reciprocate and work the gate continuously so long as the treadle be held down. If, however, so soon as the plunger shall have partially risen the treadle be released, the auxiliary valve will become reversed by the power-arm connection at the top of the stroke and the plunger will descend and lift the gate, but the second upstroke will not be made until the treadle be again depressed. The gate may thus make its single cutting-stroke and then return and come to rest.

Throttle-valve 51 may be adjusted for nor-

mal small opening, so that the depression of the treadle gives a freer admission at the beginning of the stroke, or link 53 may be detached and the throttle-valve left open to desired extent. By adjusting the upper end of link 43 closer to or farther from the auxiliary valve-stem the quickness of movement of the auxiliary valve as produced by the treadle may be adjusted so as to cause the machine to make its cutting-stroke more quickly.

It is desirable to employ the power mechanism in operating the gate delicately and gently when adjusting new shear-blades or cutting-tools. For this purpose hand-lever 47 is provided, by means of which the valve can be worked by hand, as desired, to control the motion of the gate at all portions of its stroke.

When the valve is down, as in Fig. 3, representing the downstroke of the plunger, then hand-lever 47 is in its uppermost position. As the plunger nears the lower end of its stroke cam-lug 49 depresses hand-lever 47 sufficient to elevate valve 35 enough to close, or partially close, port 33, and thus check the freedom of exhaust and serve in cushioning the plunger at the foot of the stroke.

We claim as our invention—

1. The combination, substantially as set forth, of a link-arm having a tapering eye and having a bearing-surface at the exterior of the hub of the eye, a link straddling said arm at said hub and having a bearing-seat engaging said bearing-surface on the hub of the eye and having tapering eyes eccentric with the tapering eye in said link-arm, and a tapering pin engaging the eyes in the link and link-arm and holding said bearing-surface in close engagement with said bearing-seat.

2. The combination, substantially as set forth, of a vertically-moving gate, a vertically-moving holddown, an arm connected with said holddown, a shaft forming the fulcrum of said arm, vertically-sliding boxes for said shaft, a yielding load disposed over said boxes and tending to depress said fulcrum-shaft, and mechanism for actuating the gate and rocking said fulcrum-shaft.

3. The combination, substantially as set forth, of a vertically-sliding gate, a vertically-sliding holddown in front of said gate and having rounded extremities, and guides for said holddown engaging said rounded extremities, whereby one end of the holddown may move while the other end acts as a rocker in its guide.

4. In a shearing-machine, the combination, substantially as set forth, of a pair of gage-screws disposed at the rear of the shear-line, a nut on each of said screws, a gage secured at its ends to said nuts, an additional nut on each of said screws free from the first-mentioned nuts, and springs between the pair of nuts on each screw, whereby said gage is held rearwardly as far as permitted by the lost motion in the first-mentioned nuts.

5. In a shearing-machine, the combination, substantially as set forth, of a vertically-sliding gate, a main shaft connected therewith for actuating the gate, a vertically-sliding holddown, a shaft connected with the holddown, a holddown-cam clamped frictionally to the main shaft, and an arm on the holddown-shaft and engaging said cam, whereby said cam may slip on the main shaft in case of excessive resistance by the holddown.

6. The combination, substantially as set forth, of a housing, a gate sliding vertically therein, a double power-arm pivoted to and straddling said housing and connected with said gate at one extremity of said pivoted arm, a vertically-disposed cylinder at the rear of said housing and straddled by said double power-arm, and links extending upwardly from the opposite free ends of said power-arms and connected above said power-cylinder with the piston thereof.

7. The combination, substantially as set forth, of a housing, a gate sliding vertically therein, a rearwardly-extending power-arm connected with said gate, a power-cylinder and dash-pot cylinder disposed vertically at the rear of said housing, and links extending upwardly from the rear end of said power-arm and connected above said cylinders with the pistons thereof.

8. In a shearing-machine, the combination, substantially as set forth, of a pivoted power-arm, a power-cylinder having its piston connected therewith, a valve controlling the flow of pressure medium to and from said cylinder, an auxiliary cylinder having its piston connected with said valve, an auxiliary valve, a treadle, a lever connected with the auxiliary valve, a link connecting said treadle with said lever, and a link connecting said power-arm with said lever, whereby the first-mentioned link may shift the auxiliary valve and then serve as a fulcrum-support while the second-mentioned link shifts the auxiliary valve in the opposite direction.

9. In a shearing-machine, the combination, substantially as set forth, of a pivoted power-arm, a power-cylinder having its piston connected therewith, a valve controlling the flow of pressure medium to and from said cylinder, an auxiliary cylinder having its piston connected with said valve, an auxiliary valve, a treadle, a lever connected with the auxiliary valve, a link extending from said treadle to an adjustable pivot-point on said lever, and a link connecting said power-arm with said lever.

10. In a shearing-machine, the combination, substantially as set forth, of a pivoted power-arm, a power-cylinder having its piston connected therewith, a valve for controlling the flow of pressure medium to and from said cylinder, a treadle, a link connected with the treadle, a valve-operating lever pivoted to said link, and a link connecting said lever with said power-arm.

11. In a shearing-machine, the combination,

substantially as set forth, of a pivoted power-arm, a power-cylinder having its piston connected therewith, a valve to control the flow of pressure medium to and from said cylinder, an auxiliary cylinder having its piston connected with said valve, an auxiliary valve, a treadle, valve-gear connecting said treadle with said auxiliary valve, and a hand-lever connected with said controlling-valve.

12. In a shearing-machine, the combination, substantially as set forth, of a pivoted power-arm, a power-cylinder having its piston connected thereto, a valve for controlling the flow of pressure medium to and from said cylinder, an auxiliary cylinder, an auxiliary valve, a treadle, valve-gear connecting said treadle with said auxiliary valve, a cam connected with said power-arm, and connections from said cam to said controlling-valve whereby the exhaust from said power-cylinder is closed by the movement of the power-arm.

13. In a shearing-machine, the combination, substantially as set forth, of a pivoted power-arm, a power-cylinder having its piston connected therewith, a valve for controlling the flow of pressure medium to and from said power-cylinder, an auxiliary cylinder having its piston connected with said valve, springs to resist the terminal movement of said valve in either direction, an auxiliary valve, a treadle, and valve-gear connecting said treadle with said auxiliary valve.

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