E. S. BRADFORD, Jr. & M. OLSON.

POWER HACKSAW.

APPLICATION FILED SEPT. 24, 1909.

**988,624.** **Patented Apr. 4, 1911.**

3 SHEETS—SHEET 1.

Fig. 1.

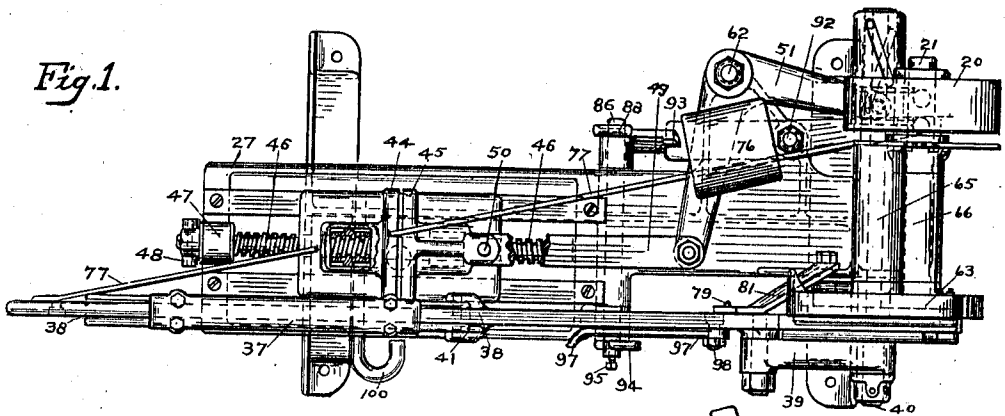



Fig. 2.

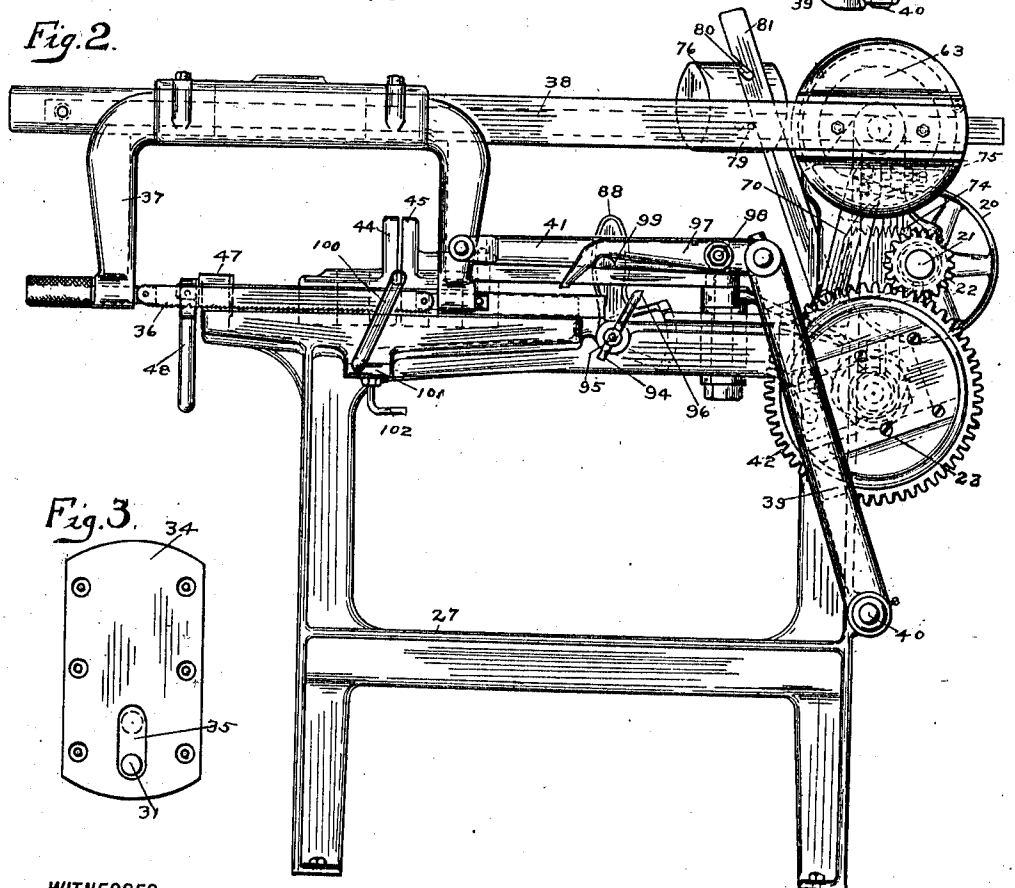



Fig. 3.




WITNESSES

S. W. Atherton.

Ernst P. Wold.

INVENTORS

Edward S. Bradford Jr. and

Maurits Olson

BY

A. M. Wooster

ATTORNEY

E. S. BRADFORD, JR. & M. OLSON.

POWER HACKSAW.

APPLICATION FILED SEPT. 24, 1909.

**988,624.** **Patented Apr. 4, 1911.**

3 SHEETS—SHEET 2.

Fig. 4.

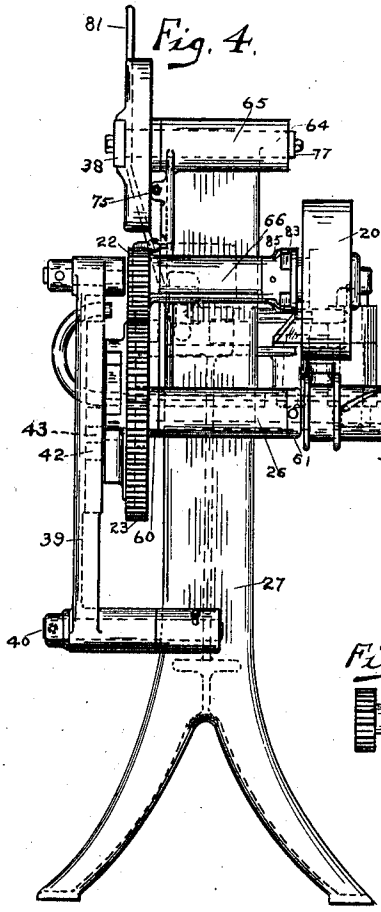



Fig. 5.

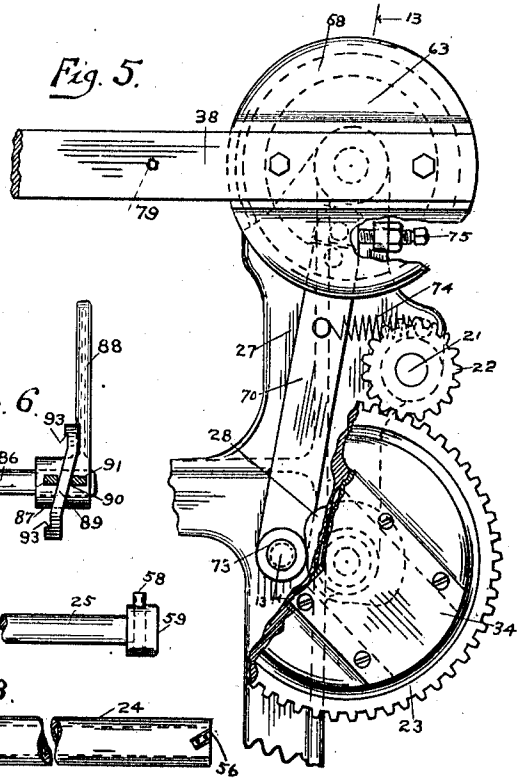



Fig. 6.




Fig. 7.




Fig. 8.




Fig. 10.

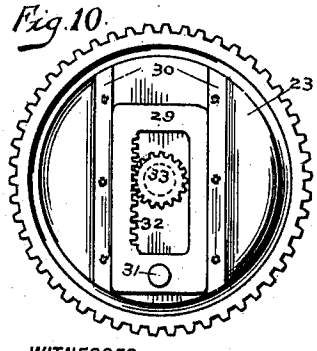



Fig. 9.

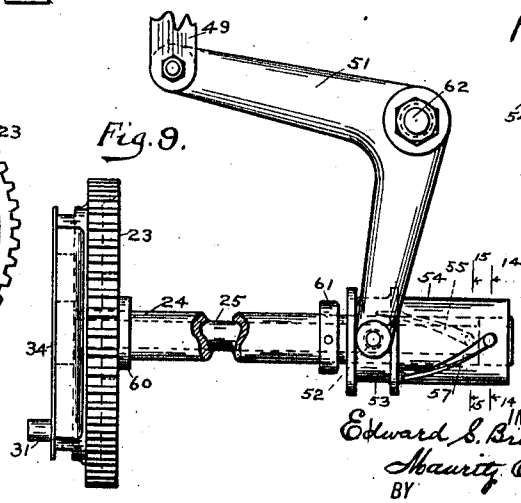
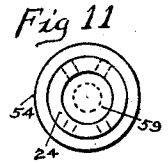



Fig 11




WITNESSES

S. W. Atherton.

Ernest P. Wold.

INVENTORS

Edward S. Bradford Jr. and

Maurice Olson

BY

A. M. Wooster

ATTORNEY

E. S. BRADFORD, Jr. & M. OLSON.

POWER HACKSAW.

APPLICATION FILED SEPT. 24, 1909.

**988,624.**

Patented Apr. 4, 1911.

3 SHEETS—SHEET 3.

Fig. 12.

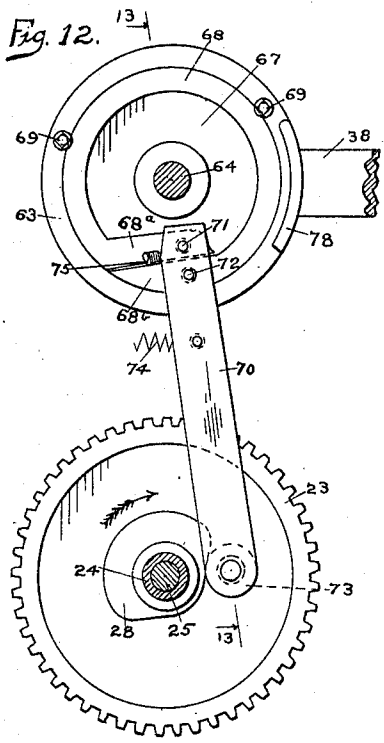



Fig. 13

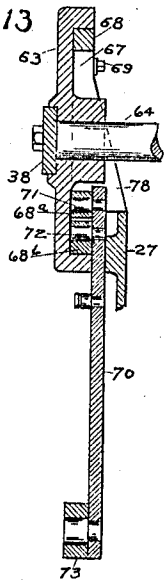



Fig. 14.

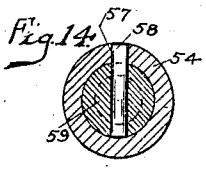



Fig. 15.

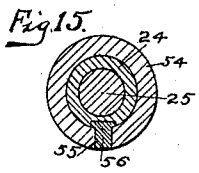



Fig. 16.

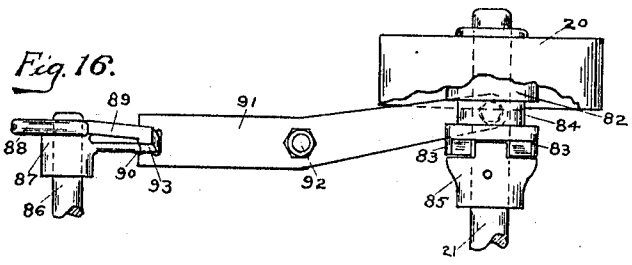
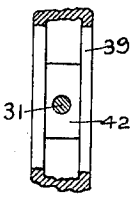



Fig. 17.




WITNESSES

S. W. Atherton.

Ernest P. Wold.

INVENTORS

Edward S. Bradford Jr. and
Maurits Olson

BY

A. M. Wooster

ATTORNEY

# UNITED STATES PATENT OFFICE.

EDWARD S. BRADFORD, JR., OF CHICOPEE, MASSACHUSETTS, AND MAURITZ OLSON, OF BRIDGEPORT, CONNECTICUT; SAID OLSON ASSIGNOR TO SAID BRADFORD.

## POWER-HACKSAW.

988,624. Specification of Letters Patent. Patented Apr. 4, 1911.

Application filed September 24, 1909. Serial No. 519,371.

*To all whom it may concern:*

Be it known that we, (1) EDWARD S. BRADFORD, Jr., and (2) MAURITZ OLSON, citizens of the United States, residing at (1) Chicopee, county of Hampden, State of Massachusetts, and (2) Bridgeport, county of Fairfield, State of Connecticut, have invented an Improvement in Power-Hacksaws, of which the following is a specification.

This invention relates to certain improvements in power hacksaws.

The invention has for its object the production of improved means for automatically adjusting the stroke of the saw to conform to the size and character of the object being operated upon.

A further object of the invention is to provide a power hack-saw having means for automatically stopping the saw when the work is cut through or at any predetermined time.

With these and other objects in view the invention consists in certain constructions and in certain parts, improvements and combinations which will be hereinafter described and then specifically pointed out in the claims hereunto appended.

In the accompanying drawings forming a part of this specification, in which like characters of reference indicate the same parts, Figure 1 is a plan view of the machine complete; Fig. 2 a side elevation thereof; Fig. 3 a detail view of a cover plate for the slide; Fig. 4 an end view as seen from the right in Fig. 2; Fig. 5 a detail elevation on an enlarged scale partly broken away, corresponding with Fig. 2 and showing a changed position of the blade lifting mechanism; Fig. 6 a detail view of the clutch operating mechanism; Fig. 7 a detail view of the pinion shaft; Fig. 8 a detail view of the sleeve which carries the gear wheel and eccentric; Fig. 9 a detail plan view of the stroke adjusting mechanism; Fig. 10 an elevation as seen from the left in Fig. 9 with the cover plate removed; Fig. 11 a detail elevation as seen from the right in Fig. 9; Fig. 12 a detail rear elevation corresponding with Fig. 5; Fig. 13 a section on the line 13—13 in Fig. 12; Fig. 14 a section on the line 14—14 in Fig. 9; Fig. 15 a section on the line 15—15 in Fig. 9; Fig. 16 a detail plan view of the clutch mechanism; and Fig. 17 is a detail rear elevation of the saw operating lever.

As shown in the drawings, power is applied to drive the machine by means of a belt (not shown) passing over a pulley 20 on a shaft 21 journaled in a bearing 66 upon the framework, which is indicated as a whole by 27. Shaft 21 carries a pinion 22 which meshes with a gear wheel 23 carried by a sleeve 24 which is mounted on a shaft 25 and journaled in a bearing 26 upon the framework. The special form of driving mechanism is of course immaterial as any rotating member may be used in lieu of a gear wheel. Sleeve 24 also carries a cam 28 which lies in the inner face of the gear wheel and may be formed integral therewith, (see Fig. 12 in connection with Fig. 5). Upon the outer face of gear wheel 23 is a slide 29 which is adapted to reciprocate in ways 30 and is provided with a pin 31. The slide is provided with an internal rack 32 which meshes with a pinion 33 carried by shaft 25 and is retained in place by a cover plate 34 having a slot 35 through which pin 31 projects. The saw comprises a blade 36 carried by a frame 37 which slides upon a bar 38. Reciprocatory movement is imparted to the saw from gear wheel 23 by means of an operating lever 39 pivoted on the framework as at 40 and connected to the saw frame by means of a link 41. Connection with the gear wheel is made by means of a sliding block 42 lying in a groove 43 in lever 39 and provided with a hole which receives pin 31 (see Fig. 17 in connection with Fig. 2).

The work to be operated upon is held by jaws 44 and 45 which are moved toward and from each other to grip or release the work by means of a right and left threaded screw 46 which is mounted to rotate on the framework, one of the bearings being indicated by 47, and is provided with a pivoted operating handle 48.

The length of the stroke of the saw is controlled from jaw 45 by means of a link 49 which is pivoted to the jaw as at 50 and to one arm of a bell crank lever 51 pivoted to the framework as at 62 (see Fig. 9 in connection with Fig. 1). The other arm of the bell crank lever carries a roller 52 which travels in a circumferential groove 53 in an outer sleeve 54 mounted to both oscillate and slide on sleeve 24. Outer sleeve 54 is provided with a spiral slot 55 which is engaged by a pin or block 56 (in the present instance a block) which projects from sleeve 24, and

opposite thereto with a spiral slot 57 which is engaged by a pin or block 58 (in the present instance a pin) which projects from an enlargement 59 at the outer end of shaft 25. This enlargement is of uniform diameter with sleeve 24 and lies within sleeve 54. As already stated, sleeve 24 is journaled in a bearing 26 on the framework and the sleeve is retained against longitudinal movement by the hub 60 of gear wheel 23 and by a collar 61 on the sleeve which bears against the opposite end of the bearing.

The automatic adjustment of the length of the stroke to correspond with the spacing of the jaws, that is, with the size of the piece of work to be operated upon, is effected by the mechanism just described. Movement of the jaws in either direction by means of link 49 will swing the bell crank lever, which in turn will move outer sleeve 54 longitudinally upon sleeve 24. Sleeve 24 being fixed to the gear wheel rotates only with the gear wheel and for the purposes of this description may be considered stationary. Owing to the engagement of pin or block 56 which projects from sleeve 24 with spiral slot 55 in outer sleeve 54, it follows that sleeve 54 must also oscillate on sleeve 24 when moved longitudinally thereon. This oscillation or partial rotation of sleeve 54 is transmitted to shaft 25 and the rotary movement of said shaft is doubled through the engagement of pin or block 58 which extends from the enlargement of shaft 25 and engages spiral slot 57 in outer sleeve 54. Shaft 25 carries pinion 33 and the rotary movement of this pinion through its engagement with rack 32 on slide 29 reciprocates said slide in the ways in the outer face of gear wheel 23, moving pin 31 toward or from the center of rotation of said gear wheel. As the slide is moved in or out pin 31 which engages sliding block 42 in operating lever 39 will be moved toward or from the center of rotation of the gear wheel and will consequently lengthen or shorten the arc of movement of the operating lever which in turn through link 41 will correspondingly lengthen or shorten the stroke of the saw. It will of course be understood that the parts are so proportioned and positioned as to accurately accomplish this result. In practice the full length of the saw is operative upon any piece of work. If the jaws are opened widely to receive a relatively large piece of work the stroke of the saw is correspondingly shortened. If the jaws are moved closer together to grip and hold a relatively small piece of work, the stroke of the saw is correspondingly lengthened and the cutting of the metal will proceed much more rapidly. The lifting of the saw on the return stroke is effected by the mechanism which we will now describe.

Bar 38 upon which the saw frame reciprocates is rigidly secured to a disk 63 which is itself secured to a shaft 64 journaled in a bearing 65 upon the framework. The inner face of this disk is provided with a recess 67 which receives an outwardly acting spring clamping ring 68 which bears against the wall of the recess and is shown as retained in place therein by the heads of bolts 69. The ends of the spring clamping ring overlap, the inner end being specifically indicated by $68^a$ and the outer end by $68^b$.

70 denotes an arm which is pivoted to each of the overlapping ends of the spring clamping ring as at 71 and 72. At the lower end of this arm is a roller 73 which bears upon the face of cam 28 carried by sleeve 24 and lying within the inner face of gear wheel 23 (see Fig. 12 in connection with Fig. 5). A spring 74 connected to arm 70 and to the framework acts to retain the roller closely in engagement with the face of the cam.

The operation of raising the saw for the return stroke is as follows: The parts are so timed that at the end of the forward stroke of the saw, roller 73 will ride up on the high portion of cam 28, the effect of which is to swing arm 70 and owing to the distance between the pivotal points of said arm to the spring clamping ring to expand said ring outward and cause it to grip the wall of the recess in which it lies locking the ring to the disk and oscillating the disk which swings arm 38 and with it the saw upward and retains it in the raised position during the return stroke, at the end of which the roller will ride down onto the low portion of the cam releasing the grip of the spring clamping ring on the disk and permitting said disk, arm 38 and the saw to drop to their normal position an instant before the commencement of the next forward or operative stroke. The distance to which the saw is raised during the return stroke is determined by adjustment of the tension of the clamping ring which is effected by means of a screw 75 mounted in the framework and bearing against the upper end of arm 70 (see Fig. 12 in connection with Fig. 5). It will be obvious that by tightening up screw 75 the grip of ring 68 upon the wall of the retaining recess will be reduced and consequently less oscillation will be imparted to the disk by the movement of arm 70 and bar 38 upon which the saw frame reciprocates will not be swung as high. Slight loosening of screw 75 will increase the grip of the spring clamping ring upon the wall of the recess and will consequently increase the oscillation of the disk and the lift of the saw carrying bar.

The amount of pressure of the saw upon the work is determined by the adjustment of a weight 76 on a carrying rod 77, one end of which is secured to the forward end of

bar 38 and the other to the rear end of shaft 64. The rod in practice is made flat and the weight is shown as provided with a slot through which the rod passes, said slot being located at one side of the center of the weight so as to permit the latter to be moved clear to the forward end of the rod if required to increase the pressure upon the saw. The downward movement of the saw after a piece of work has been cut through is limited by the engagement of a stop lug 78 on disk 63 with a fixed portion of the framework, as clearly shown in Fig. 13. Should it be required to hold the saw raised out of operative position when not in use bar 38 is swung upward and a pin 79 upon the inner side of said bar is engaged with a notch 80 in a holding bar 81 which is pivoted to the framework, and, when the saw is not held in the raised position, rests against the pin as indicated in Figs. 1 and 2.

The operation of the saw is automatically stopped when the work is cut through or at any predetermined time by mechanism which we will now describe.

Belt pulley 20 is loose on shaft 21 and the hub 82 of said pulley is elongated and is provided with a clutch member 83 and with a circumferential groove 84. Shaft 21 carries a fixed clutch member 85 which is adapted to be engaged by clutch member 83 to communicate the motion of the belt pulley to shaft 21 and through the mechanism already described to impart reciprocatory motion to the saw.

86 denotes a controlling shaft which is journaled in the framework and is provided with a hub 87 having a hand piece 88 and carrying a cam 89, shown in the present instance as a skeleton cam. This cam engages a notch 90 in a clutch lever 91 which is pivoted to the framework as at 92 and is provided with a pin or roller (see dotted lines Fig. 16) which engages groove 84 in hub 82 of the belt pulley. At the ends of the cam are stops 93 which limit the oscillation of the cam and the shaft and prevent the cam from becoming disengaged from the clutch lever. At the opposite end of shaft 86 from the cam and handle is a stop pin 94 which is adapted to slide freely in a hole in the shaft and is locked at any desired adjustment by means of a set screw 95. When the controlling shaft is at its normal position the hand piece extends upward approximately vertically and the stop pin lies at an angle to the hand piece, the upper end of the pin being inclined away from the saw and toward the driving mechanism. The back of the upper end of the stop pin is rounded and the face of the upper end is provided with a slight recess, as at 96.

97 denotes a pawl which is pivoted to link 41 as at 98 and which rests upon a boss or projection 99 on the link. The forward end of the pawl extends downward and outward into position to engage pin 94. The time at which the machine will be stopped is determined by the adjustment of the stop pin. In use, the saw will drop downward as it cuts into the work. If the engaging end of the pawl drops below the stop pin after passing it, the pawl will be lifted by the rounded upper end of the pin and will pass over it freely, but at the next forward stroke of the saw the pawl will engage with the pin, the recess being provided to insure engagement therewith, and the pin will be swung forward oscillating shaft 86 and the clutch lever through the engagement of the cam therewith, moving the belt pulley outward on shaft 21 and disengaging the clutch members thereby stopping the rotation of shaft 21 and the driving mechanism. Should it be required to stop the saw at any time during its operation, this may be effected by oscillating shaft 86, the cam and the clutch lever by means of the hand piece. After the machine is stopped, bar 38 carrying the saw may be swung upward and locked in the raised position by means of bar 81, as already explained.

100 denotes a sliding gage the free end of which is curved to adapt it to be swung to a position in alinement with the center of a piece of work gripped by the jaws. The shank of the gage slides in half sockets in the under side of the framework and in a block 101 and it is locked at any required adjustment by a clamping screw 102. This gage is used when a number of pieces are to be cut to the same length. When not in use the clamping screw is turned slightly backward which permits the gage to drop downward out of the way.

Having thus described our invention, we claim:—

1. An improvement in hack saws comprising work holding jaws, a rotatable member, a radially adjustable slide carried thereby, a saw, means for reciprocating said saw, said means being operatively connected with said slide, and means connected with one of said jaws for adjusting said slide.

2. An improvement in hack saws comprising a crank wheel, a radially adjustable crank pin carried thereby, a saw, means operated by said crank pin for reciprocating said saw, work holding jaws, and means connected with one of said jaws and said crank pin for adjusting the position of the crank pin.

3. An improvement in hack saws comprising a crank wheel provided with a radially adjustable crank pin, a sleeve on which said crank wheel is mounted, a saw, means operated by said crank wheel for reciprocating said saw, work holding jaws, a shaft mounted in said sleeve and connected with one of

said jaws, and means operated by said shaft for varying the position of said crank pin.

4. An improvement in hack saws comprising a crank wheel, a radially adjustable slide carried thereby and provided with a crank pin, a sleeve on which said crank wheel is mounted, a saw, means operated by said crank wheel for reciprocating said saw, work holding jaws, a shaft mounted in said sleeve and connected with one of said jaws, and means operated by said shaft for varying the position of said slide.

5. An improvement in hack saws comprising a crank wheel provided with a radially adjustable crank pin, a sleeve on which said crank wheel is mounted, means for preventing longitudinal movement of said sleeve, a shaft mounted within said sleeve and provided with means for varying the position of said crank pin, a second sleeve mounted on the first mentioned sleeve and connected with said shaft to oscillate the latter, a saw, means operated by said crank pin for reciprocating said saw, work holding jaws, and means connected with one of said jaws for oscillating the second sleeve.

6. The combination with a reciprocating saw, jaws, a lever and a connection between the lever and the saw, of a rotating member, a slide carried thereby which engages the lever and is provided with a rack, a sleeve by which the rotating member is carried, a shaft journaled in the sleeve, a pinion on said shaft engaging the rack and connections intermediate the shaft and one of the jaws whereby the shaft and pinion are rotated by movement of the jaws to regulate the stroke of the saw.

7. The combination with a reciprocating saw, jaws, a rotating member, a slide carried thereby and provided with a rack and connections between the slide and the saw, of a sleeve by which the rotating member is carried, a shaft journaled in said sleeve, a pinion on said shaft engaging the rack and connections intermediate the shaft and one of the jaws, for rotating the shaft and pinion.

8. The combination with a reciprocating saw, jaws, a rotating member, a slide carried thereby and provided with a rack and connections between the slide and the saw, of a sleeve by which the rotating member is carried, a shaft journaled in said sleeve, a pinion on said shaft engaging the rack, an outer sleeve mounted to oscillate and slide on the rotating member-carrying sleeve and having spiral slots, connections between said slots and the rotating member-carrying sleeve and the shaft respectively, a bell-crank lever engaging the outer sleeve and a link intermediate the bell-crank lever and one of the jaws.

9. The combination with a reciprocating saw, jaws, a rotating member, a slide carried thereby and provided with a rack and connections between the slide and the saw, of a sleeve by which the rotating member is carried, a shaft journaled in said sleeve, a pinion on said shaft engaging the rack, an outer sleeve mounted to oscillate and slide on the rotating member-carrying sleeve and having a circumferential groove, spiral slot and pin connections between said sleeves and between the shaft and the outer sleeve, for the purpose set forth, a bell-crank lever engaging the groove in the outer sleeve and a link intermediate said lever and one of the jaws.

In testimony whereof we affix our signatures in presence of witnesses.

EDWARD S. BRADFORD, JR.
MAURITZ OLSON.

Witnesses for Bradford:
CARRIE M. STEBBINS,
EFFIE M. GOODWIN.
Witnesses for Olson:
A. M. WOOSTER,
S. W. ATHERTON.