March 18, 1952 H. E. ROSE 2,589,576

SAWING MACHINE

Filed Dec. 5, 1946 4 Sheets-Sheet 1

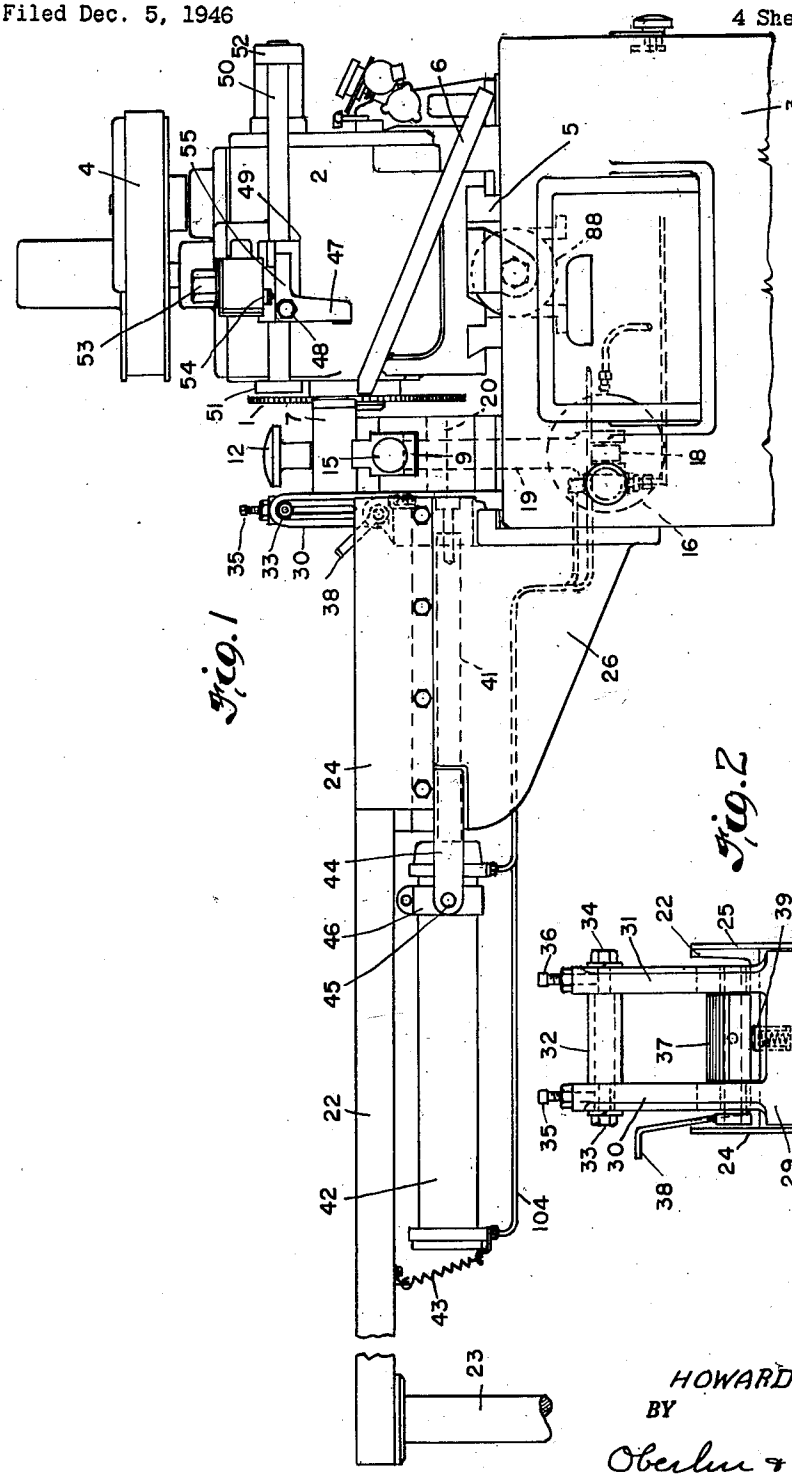


Fig. 1

Fig. 2

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SAWING MACHINE

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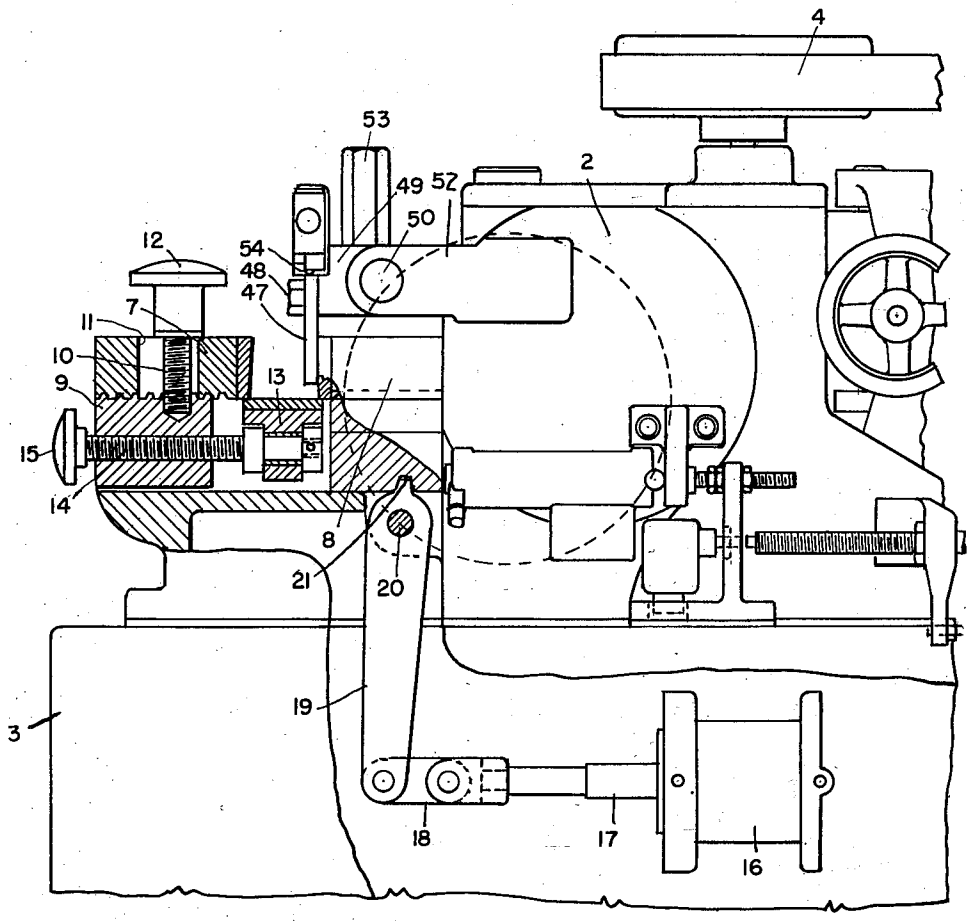


Fig. 3

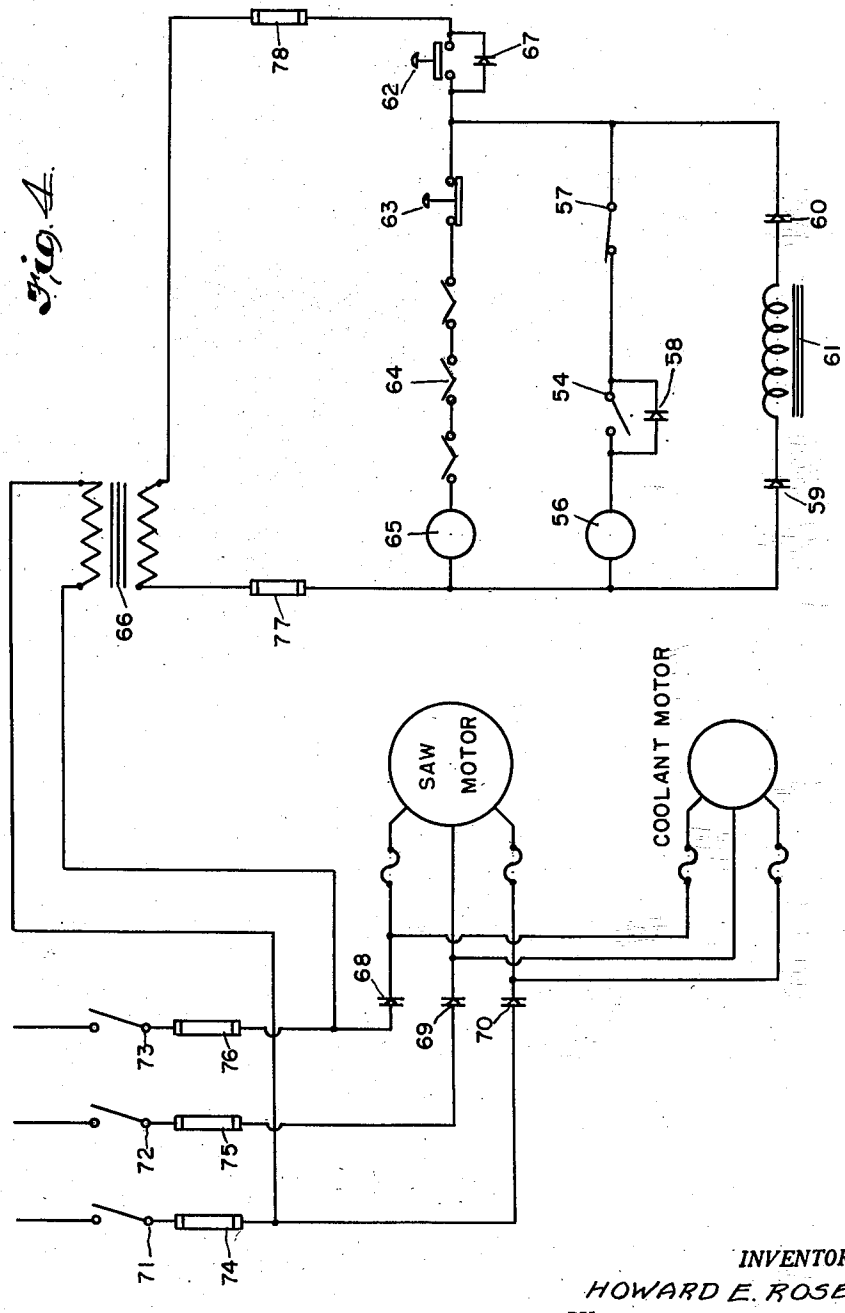
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Fig. 4.



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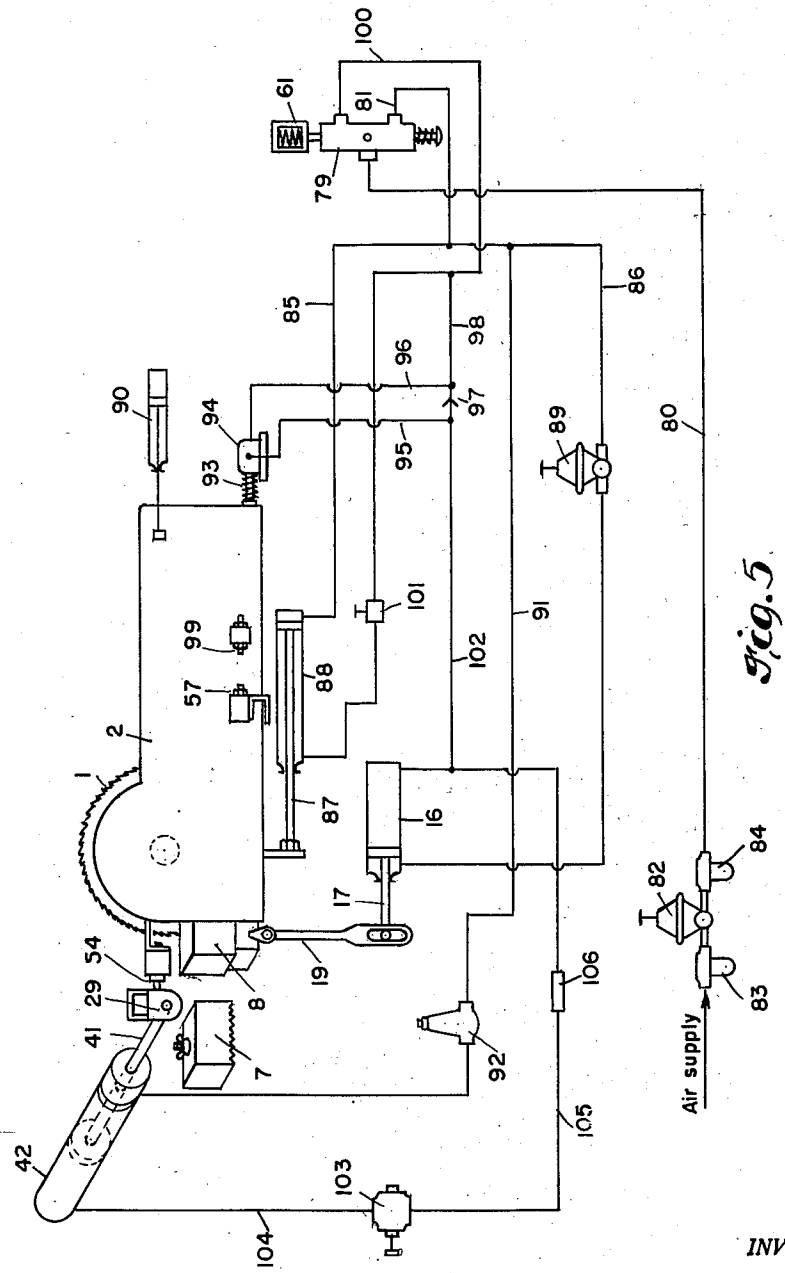


Fig. 5

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UNITED STATES PATENT OFFICE

2,589,576

SAWING MACHINE

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Application December 5, 1946, Serial No. 714,208

8 Claims. (Cl. 29—69)

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This invention relates, as indicated, to sawing machines and more particularly to metal sawing machines of the type described in Patent No. 2,327,920 to J. G. Moohl, for example. Novel air actuated means are provided whereby stock may be fed to the machine and the machine automatically operated.

There are many advantages in the use of air pressure to operate automatic machines including flexibility of control and availability of the medium. When applied to metal sawing machines, however, problems arise in regulating the advance of the saw carriage and the feeding of the stock, due in part to the compressibility of such medium. To obtain accurate gauging of the stock it is essential that such stock shall not rebound from the gauge stop when fed thereagainst. It is of course also essential that the stop shall remain firm when thus engaged by the end of the stock. The type of gauging means now commonly employed on metal sawing machines is in the form of an arm adapted to be swung into gauging position and then moved out of the way. Since the stop is at the end of the arm and there may be some play in the pivotal mounting, the work to be cut often may not be gauged as accurately as desired.

It is, therefore, a primary object of this invention to provide air operated means for actuating a metal sawing machine and the stock feeding mechanism therefor which will be automatic and trouble-free.

Another object is to provide stock feeding mechanism adapted to cooperate with the gauging means to ensure accurate gauging of the work to be cut off.

A further object is to provide novel stock gauging means which will be rigidly mounted to ensure accurate gauging but which will automatically be moved clear of the end of the workpiece before such work-piece is cut off.

Still another object is to provide control means connected with such gauging means operative to initiate the cycle of operation of the sawing machine.

Other objects will appear as the description proceeds.

To the accomplishment of the foregoing and related ends, said invention then comprises the features hereinafter fully described and particularly pointed out in the claims, the following description and the annexed drawing setting forth in detail certain illustrative embodiments of the invention, these being indicative, however, of but a few of the various ways in which the principle of the invention may be employed.

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In said annexed drawing:

Fig. 1 is a side elevational view of a metal sawing machine and stock feeding means therefor;

Fig. 2 is an end elevational view of such stock feeding means on an enlarged scale;

Fig. 3 is an end elevational view of the machine, broken away to show the construction of the work-holding vise;

Fig. 4 is a wiring diagram of the means controlling such fluid pressure system; and

Fig. 5 is a diagrammatic layout of the fluid pressure system through which such sawing machine and stock feeding means may be synchronously operated.

Referring now more particularly to such drawing and especially Figs. 1, 2 and 3 thereof, the rotary disc saw 1 is mounted on a carriage 2 adapted to be reciprocated relative to supporting base frame 3. The saw is driven by an electric motor housed in such carriage through a belt drive 4 and gearing within such carriage. The carriage travels on ways 5 on base frame 3 whereby the saw may be traversed to engage the work, the cut-off work-piece being discharged down chute 6. Also mounted on base frame 3 to the other side of saw 1 is a work-holding vise comprising jaws 7 and 8 respectively. The serrated under surface of jaw 7 is adjustably seated on the serrated upper surface of sliding block 9, a screw 10 passing through slot 11 in jaw 7 being provided with a hand knob 12 to lock such jaw in adjusted position. Sliding block 9 is secured to vise seat 13 by means of an adjusting screw 14 with hand knob 15, permitting precise final positioning of the jaw 7. The work is intermittently clamped and released by lateral reciprocation of jaw 8. Such reciprocation is obtained through action of fluid pressure cylinder 16 and piston 17 which is operative through link 18 to rock lever 19 about its fulcrum 20. The upper end of such lever engages a notch 21 in the under surface of jaw 8 whereby such jaw may be reciprocated.

Means is provided intermittently to advance an extended work-piece such as bar stock, for example, into position to be cut off by the saw. Such work feeding means comprises a trough 22 supported at its outer end on column 23 and welded at its inner end to side plates 24 and 25. These side plates are bolted to bracket 26 which is attached to base frame 3 of the sawing machine. Upstanding flanges 27 and 28 of bracket 26 form a trackway along which the work gripping means is adapted to be reciprocated. The work gripping means comprises a carriage mem-

ber 29 resting on flanges 27 and 28 and provided with two vertically slotted columns 30 and 31. A roller 32 is carried on a pin which is vertically adjustable in such slotted columns, being clamped in selected position by means of nuts 33 and 34 and positively held against upward movement by set screws 35 and 36. Pivotally mounted between the lower portions of such columns is a serrated eccentric cam gripper 37 provided with a hand lever 38 to permit manual release when required. A spring-backed plunger 39 bears against the under surface of such cam forwardly of its pivotal mounting.

A lug 40 depending from carriage 29 is secured to the end of piston 41 extending from fluid pressure cylinder 42. Such cylinder is supported by a spring 43 from member 22 at its outer end and by arms 44 pivotally attached at 45 to a collar 46 near its other end.

The work is gauged by means of a stop 47. This stop is pivotally mounted at 48 on block 49 which is slidably supported on bar 50 carried by brackets 51 and 52. Turning of hex nut 53 serves to clamp such block in desired position along such bar. A normally open limit switch 54 is mounted on block 49 in position to be engaged by arm 55 integral with stop 47. It is thus apparent that when the end of a work-piece engages stop 47 such stop will be pivoted very slightly, thereby closely switch 54. The operation of the machine may best be understood by reference to Figs. 4 and 5 of the drawing. To set up the machine the stock is first slid past the serrated cam gripper 37, lever handle 38 being raised to turn such gripper against the force of spring-backed plunger 39. The stock feed carriage is in fully advanced position as shown in Fig. 1. When the end of the stock engages stop 47 limit switch 54 is closed, completing the circuit through relay 56 and the normally closed switch 57. Relay 56, thus activated, closes maintaining contact 58 and also contacts 59 and 60, thereby completing the circuit through solenoid 61.

The saw motor and coolant motor (see Fig. 4) have previously been started by pressing the button of starting switch 62 which completes the circuit through stop switch 63, overloads 64, relay 65, and transformer 66. Relay 65, thus activated, closes maintaining contact 67 and also contacts 68, 69, and 70, thereby starting such motors, it being understood that line switches 71, 72, and 73 are closed. Fuses 74, 75, 76, 77, and 78 are included in the circuits as indicated.

Solenoid 61 is thus activated to shift four-way valve 79 (see Fig. 5) to admit air pressure from air supply line 80 to line 81. Air is admitted to line 80 from an air pressure source through pressure regulating valve 82 and combination strainers and oilers 83 and 84. Air pressure from line 81 passes to lines 85 and 86, that in line 85 causing piston 87 in cylinder 88 to be advanced, starting the saw carriage 2 toward the work, and the pressure in line 86 (pressure regulating valve 89 having been opened) reciprocating piston 17 in cylinder 16 to firmly clamp the work. The work is thus clamped before carriage 2 has advanced sufficiently to bring saw 1 into engagement with the work. A hydro-check 90, comprising a piston-cylinder assembly with adjustable rate of leakage, is employed to supply continued resistance to the advance of the saw carriage, thereby snubbing any tendency to jump forward and controlling the rate of such advance.

When piston 17 ceases to move in cylinder 16 (i. e. when the work is firmly clamped) pressure is built up in line 91 sufficient to overbalance pressure valve 92 and to move piston 41 back into cylinder 42. The cam gripper 37 moves freely in this direction, the amount of movement being greater than the length of the section which is to be cut off.

Initial movement of the saw carriage permits extension of spring 93 on two-way valve 94, thereby shifting such valve to block lines 95 and 96. Since there is no pressure in line 98 at this time nothing is effected immediately by such action. When the saw carriage has advanced sufficiently to sever the work, adjustable stop 99 on the saw carriage engages switch 57 which it opens, breaking the circuit through solenoid 61 of valve 79 and shifting such valve to connect line 100 with pressure supply line 80. Line 81 is connected with exhaust. As a result of this shift, air from line 100 passes through needle regulating valve 101 to reciprocate piston 87 rapidly to return the saw carriage, the hydro-check 90 being ineffective in this direction of movement. After the saw carriage has returned, air pressure from line 100 passes through line 96, valve 94, line 95, and line 102 to cylinder 16 to reciprocate piston 17 and release the hold of the vise on the work. It will be noted that while switch 57 closes again as the saw carriage returns, the circuit nevertheless now remains broken since limit switch 54 is not engaged by the end of the work-piece and relay 56 permitted contacts 58, 59, and 60 to open when switch 57 was opened.

Pressure from line 102 passes through speed control valve 106, line 105, valve 103, and line 104 into cylinder 42 to reciprocate piston 41 to feed the work against stop 47. The air pressure in cylinder 42 exerts a continuing thrust, holding the work firmly against the stop. Limit switch 54, closed by engagement of the work with the stop, causes valve 79 to be shifted and the cycle is repeated until the stock is exhausted. The cycle may be stopped, when desired, by manually shifting 3-way valve 103.

By pressing stop switch 63 relay 65 is de-activated, stopping both motors and opening contact 67, thereby breaking the circuit. The spring of solenoid 61 thereupon causes lines 80 and 100 to be put in communication and all elements are returned to starting position. Main shut off valve 82 may then be closed, turning off the air.

It will be seen from the foregoing that I have provided an improved sawing machine capable of automatic operation through the employment of fluid pressure, and, more particularly, pneumatic means. The stock gauge is mounted firmly on the saw carriage, ensuring accurate gauging, and is carried clear of the end of the work during the sawing operation. The stock is fed in such manner that it is forcibly held against the gauge stop at the time the vise grips the same so that danger of rebound and inaccurate gauging is obviated.

Other modes of applying the principle of the invention may be employed, change being made as regards the details described, provided the features stated in any of the following claims or the equivalent of such be employed.

I therefore particularly point out and distinctly claim as my invention:

1. In a sawing machine, a reciprocable saw carriage, work holding means through which an elongated length of stock may be intermittently advanced transversely of the path of reciprocation of such saw, and means adapted to gauge such stock mounted on said carriage for such

reciprocatory movement therewith and for engagement by the end of such stock when said carriage is in retracted position.

2. In a sawing machine, a reciprocable saw carriage, work holding means through which an elongated length of stock may be intermittently advanced transversely of the path of reciprocation of such saw, means adapted to gauge such stock mounted on said carriage for such reciprocatory movement therewith, and a switch associated with said gauging means adapted to be closed by engagement of such stock with said gauging means and thereby to initiate movement of said saw carriage.

3. In an automatic sawing machine, a reciprocable saw carriage, work holding means through which an elongated length of stock may be intermittently advanced transversely of the path of reciprocation of such saw, means adapted to gauge such stock mounted on said carriage for such reciprocatory movement therewith, and a switch associated with said gauging means adapted to be closed by engagement of such stock with said gauging means and thereby to initiate clamping of said work holding means and movement of said saw carriage.

4. In a sawing machine, a reciprocable saw carriage, work holding means through which an elongated length of stock may be intermittently advanced transversely of the path of reciprocation of such saw, a bracket on said carriage, a bar carried by said bracket, and stock gauging means adjustably mounted on said bar for such reciprocatory movement with said carriage in position to engage the end of such stock when the latter is thus advanced through said work holding means.

5. In a sawing machine, a reciprocable saw carriage, work holding means through which an elongated length of stock may be intermittently advanced transversely of the path of reciprocation of such saw, a stock gauge mounted on said carriage for such reciprocatory movement therewith adapted to engage the end of such stock, and air-operated stock feeding means operative to advance such stock into engagement with said gauge and hold it firmly thereagainst until clamped by said work holding means.

6. In a sawing machine, a reciprocable saw carriage, work holding means through which an elongated length of stock may be intermittently advanced transversely of the path of reciprocation of such saw, a stock gauge mounted on said carriage for such reciprocatory movement therewith adapted to engage the end of such stock, air-operated stock feeding means operative to advance such stock into engagement with said gauge and hold it firmly thereagainst until clamped by said work holding means, and a switch associated with said gauging means adapted to be operated by engagement of such stock with said gauging means and thereby to initiate clamping of said work holding means.

7. In a sawing machine, a reciprocable saw carriage, work holding means adapted to hold a length of stock transversely of the path of reciprocation of such saw, whereby portions thereof may be cut off by the saw on said carriage, and a stock gauge carried by an outrigger support on said carriage and adapted to engage the end of such stock when the latter is advanced through said work holding means and to clear such end when said carriage is thus reciprocated to sever such stock.

8. In a sawing machine, stock gauging means mounted for slight movement when engaged by an end of a length of stock, stop means rigidly supporting said gauging means against further movement, fixed stock clamping means operative in response to such slight movement of said gauging means to firmly clamp such stock, and pneumatic stock feeding means operative intermittently to advance such stock and actively yet resiliently urge the same against said gauging means until clamped by said clamping means.

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