

April 29, 1930.

S. MADSEN

1,756,296

WINDOW FRAME MACHINE

Filed Sept. 27, 1927

8 Sheets-Sheet 1

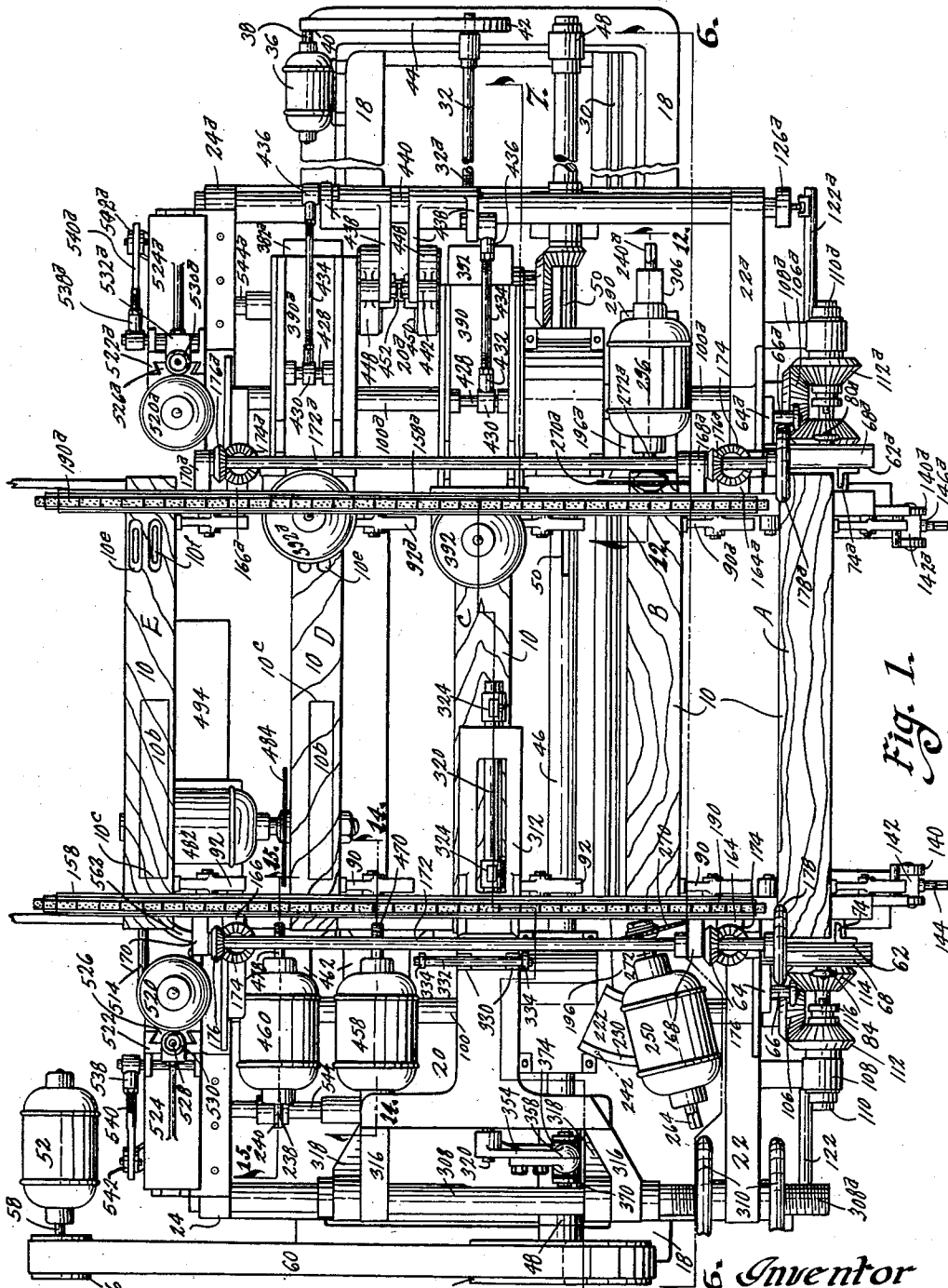


Fig. 1.

Witness
DE Bovey

54 48 18 6 Inventor
N. Sern Madsen
by Bair & Freeman Attorneys

April 29, 1930.

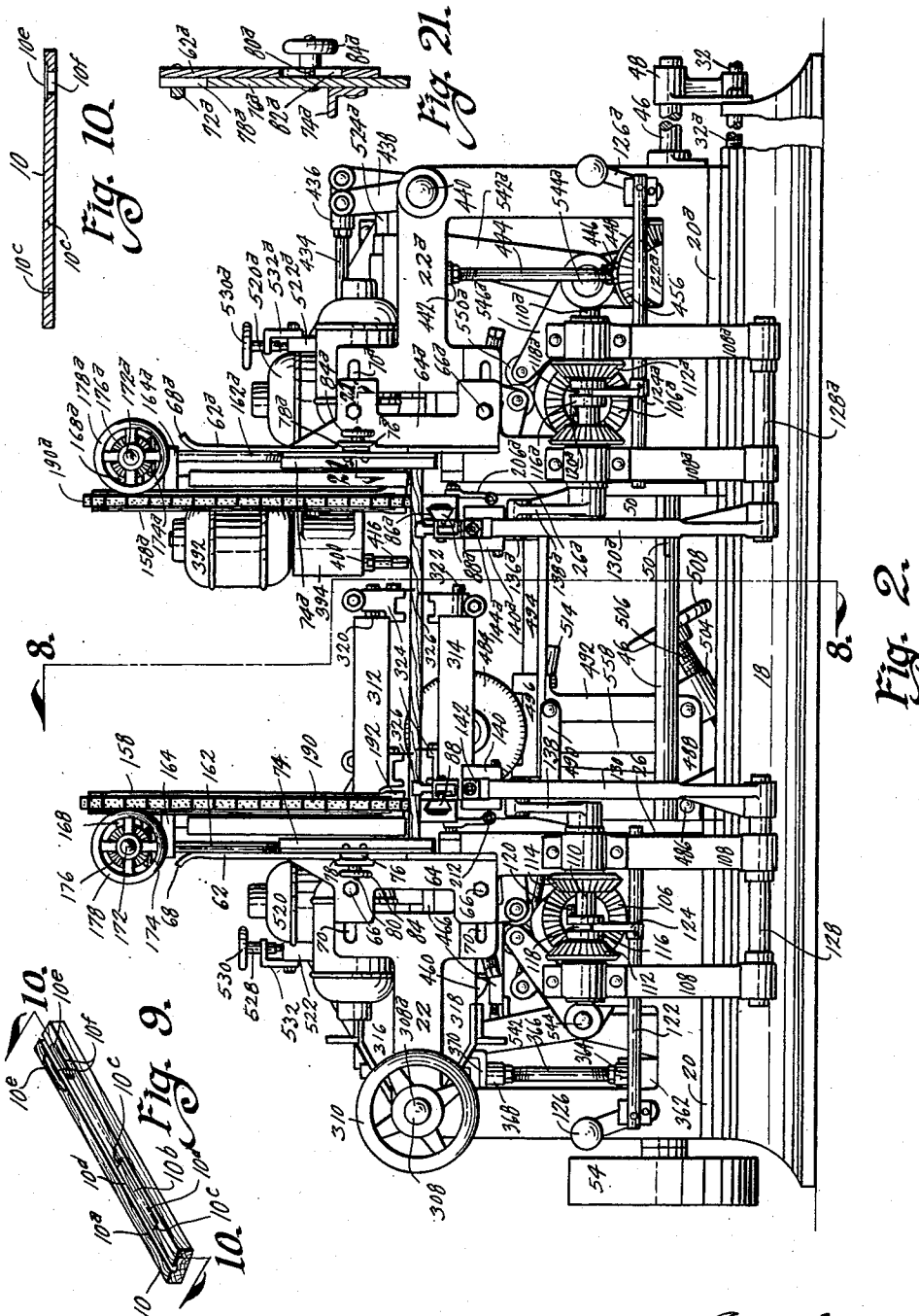
S. MADSEN

1,756,296

WINDOW FRAME MACHINE

Filed Sept. 27, 1927

8 Sheets-Sheet 2



Witness
DE Bovey

Inventor
Sern Madsen
by Bair & Freeman Attorneys

April 29, 1930.

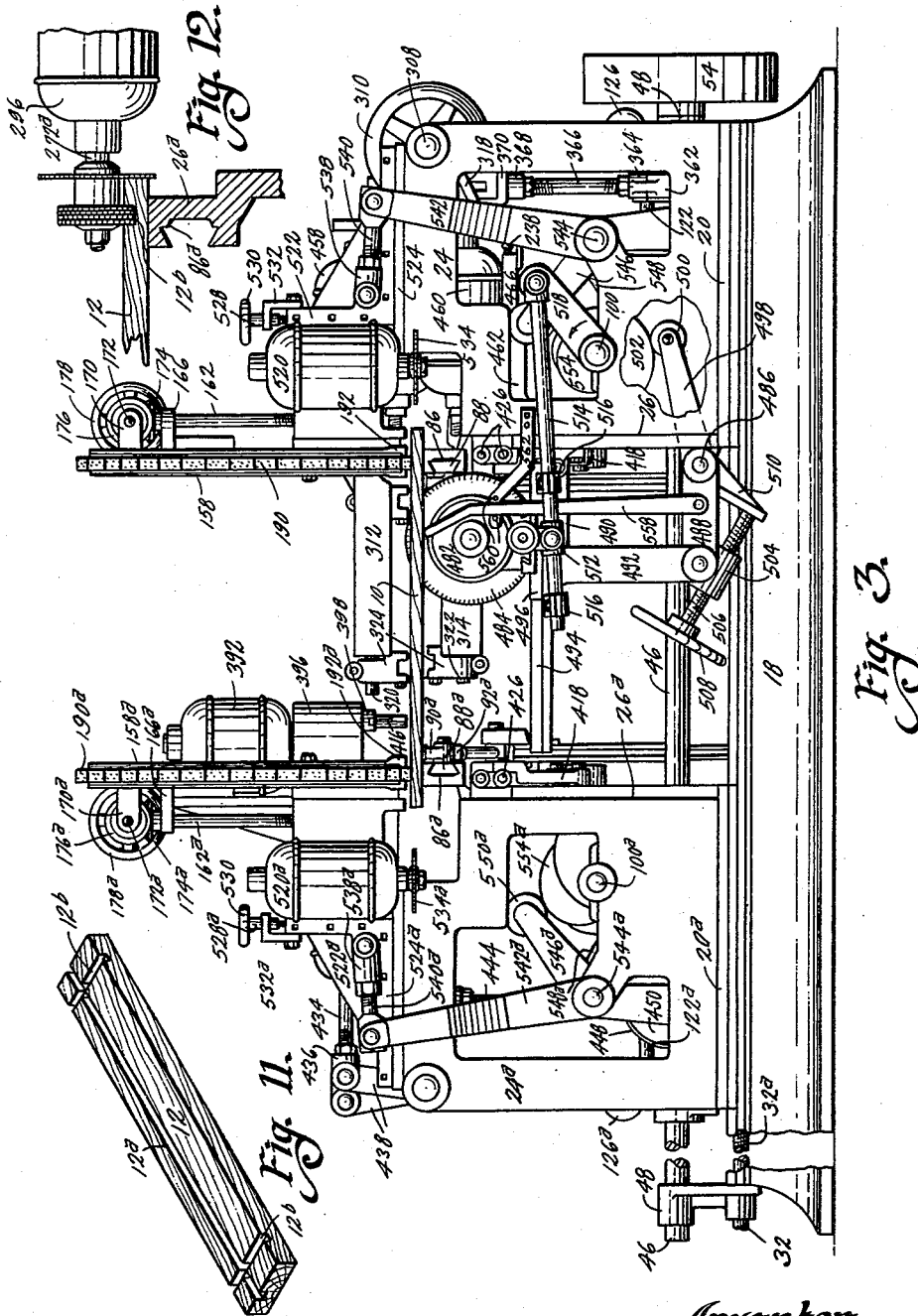
S. MADSEN

1,756,296

WINDOW FRAME MACHINE

Filed Sept. 27, 1927

8 Sheets-Sheet 3



Witness
DE Bovey

Inventor
Sern Madsen

by Bair & Freeman Attorneys

April 29, 1930.

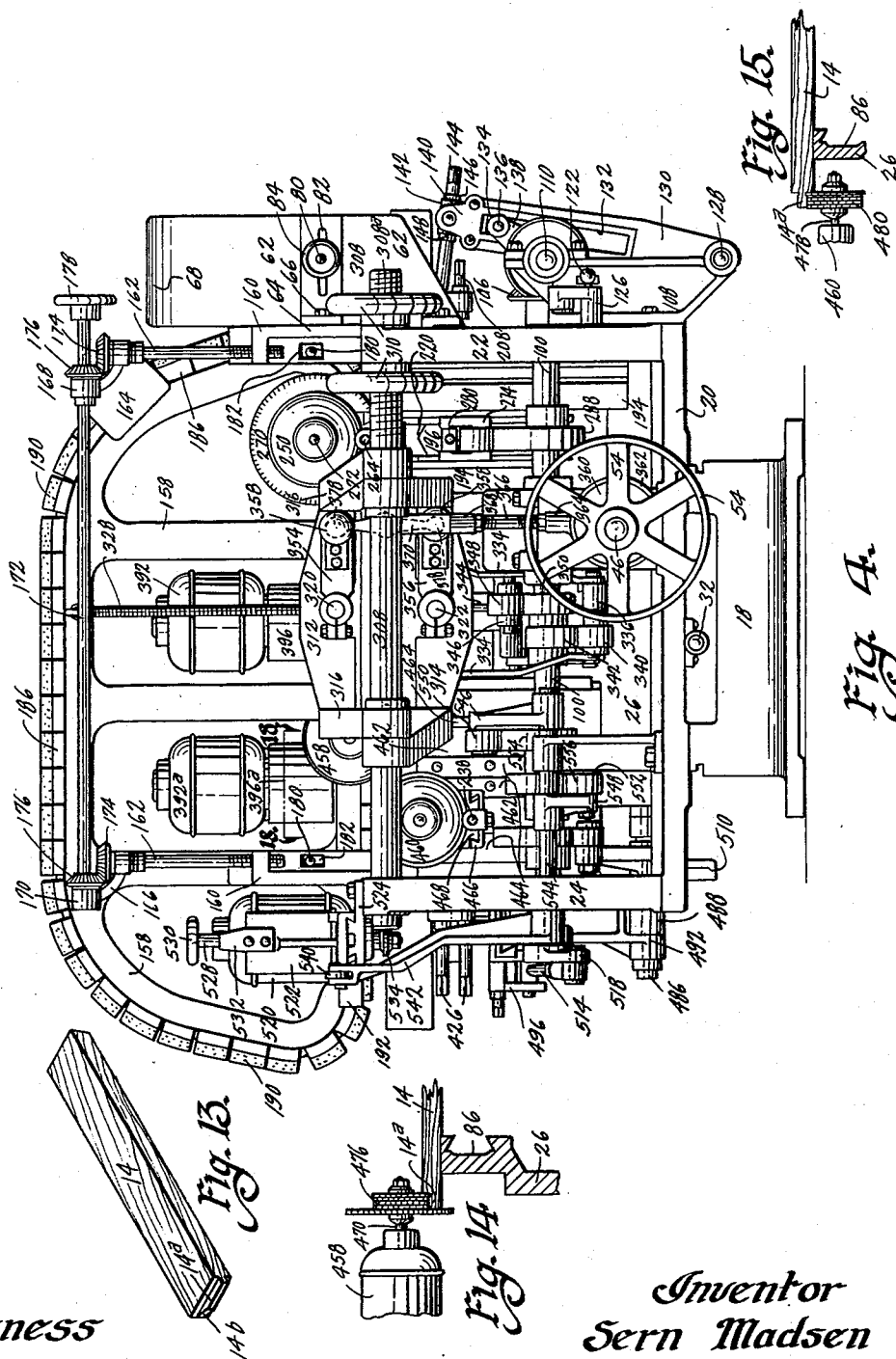
S. MADSEN

1,756,296

WINDOW FRAME MACHINE

Filed Sept. 27, 1927

8 Sheets-Sheet 4



Witness
DeBovey

Inventor
Sern Madsen
by Bair & Freeman Attorneys

April 29, 1930.

S. MADSEN

1,756,296

WINDOW FRAME MACHINE

Filed Sept. 27, 1927

8 Sheets-Sheet 5

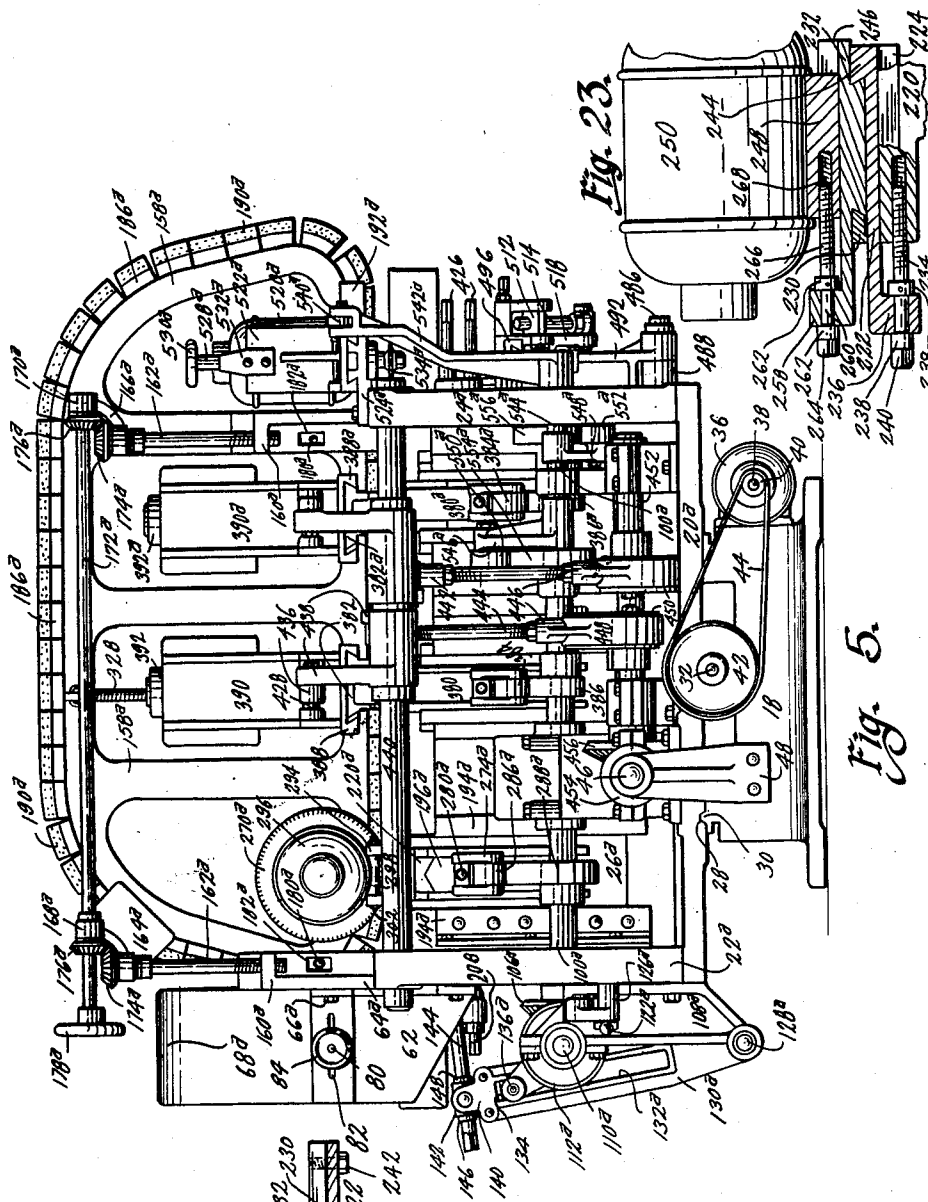


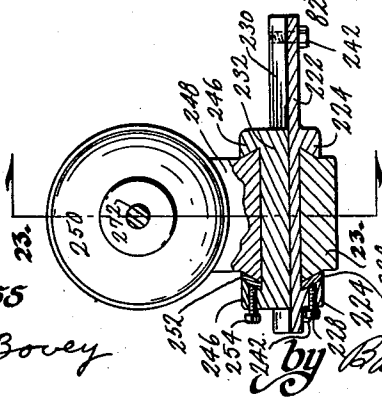
Fig. 23.

Fig. 5.

Witness

DEBovey

Fig. 22.



Inventor

Sern Madsen

by Bair & Freeman Attorneys

April 29, 1930.

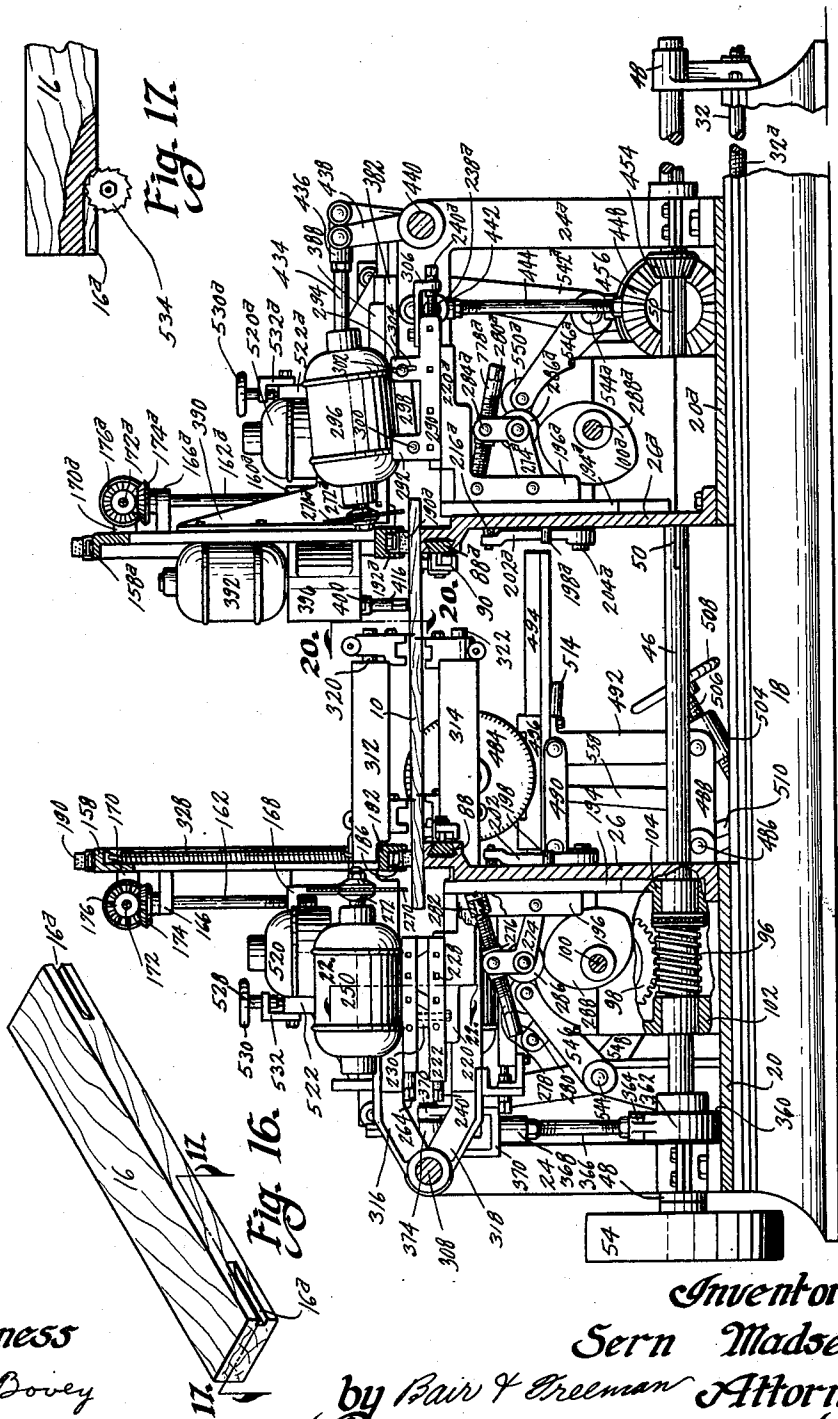
S. MADSEN

1,756,296

WINDOW FRAME MACHINE

Filed Sept. 27, 1927

8 Sheets-Sheet 6



Witness
DEBovey

Inventor
Sern Madsen
by Bair & Freeman Attorneys

April 29, 1930.

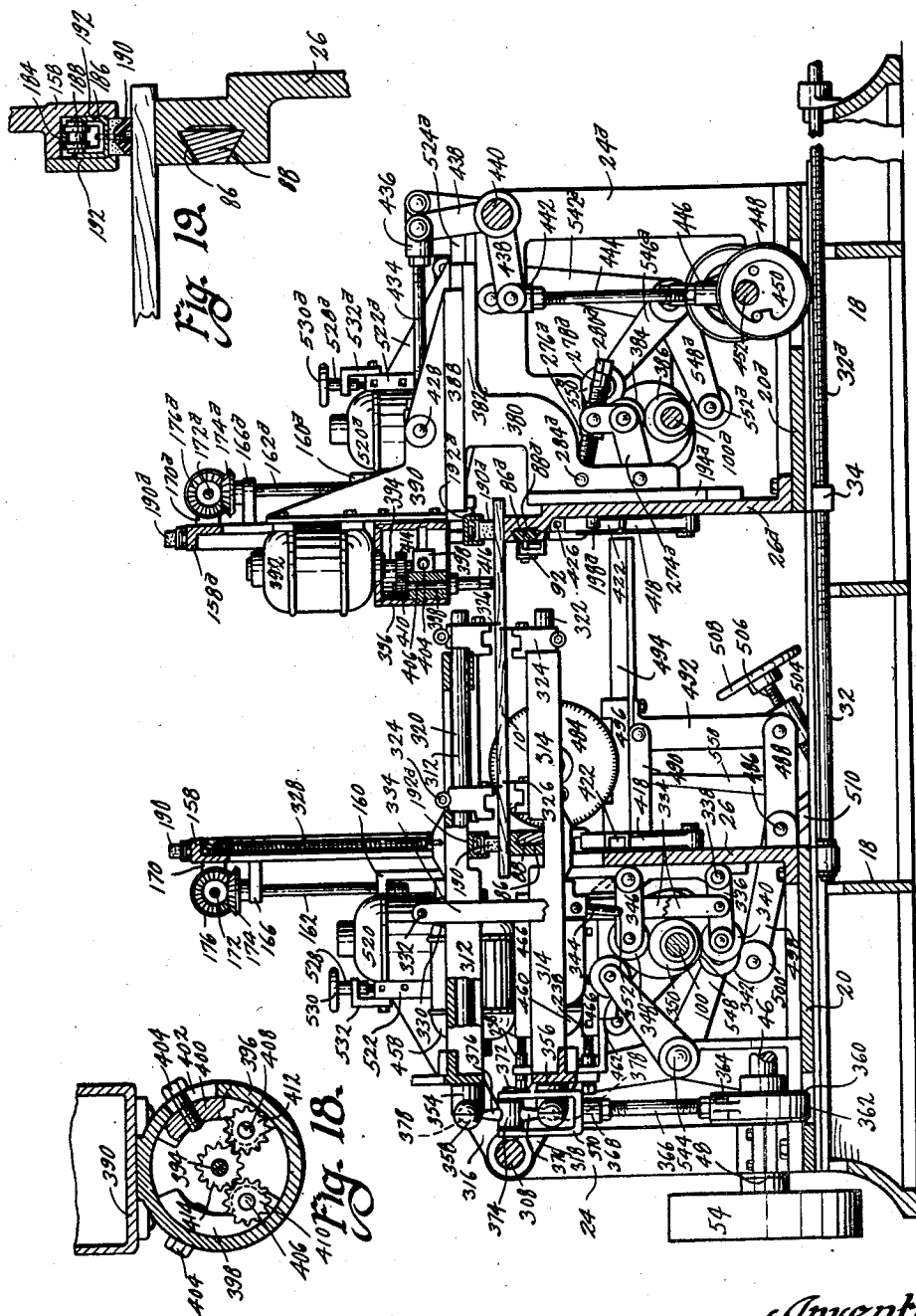
S. MADSEN

1,756,296

WINDOW FRAME MACHINE

Filed Sept. 27, 1927

8 Sheets-Sheet 7



Witness
DEBovey

Inventor
Sern Madsen
by Bair & Gruen Attorneys

April 29, 1930.

S. MADSEN

1,756,296

WINDOW FRAME MACHINE

Filed Sept. 27, 1927

8 Sheets-Sheet 8

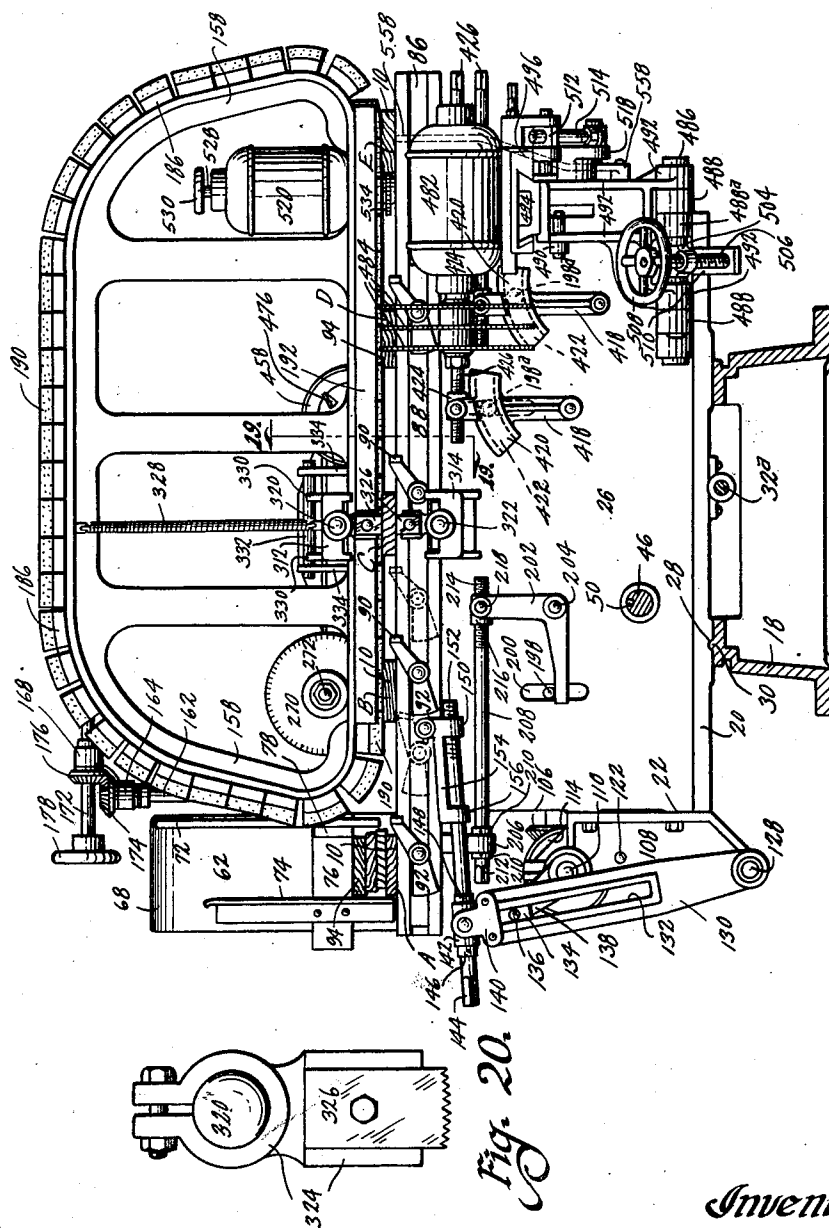


Fig. 20.

Witness

DEBovey

Inventor

Sern Madsen

by Bair & Freeman Attorneys

Fig. 8.

UNITED STATES PATENT OFFICE

SERN MADSEN, OF CLINTON, IOWA, ASSIGNOR TO CURTIS COMPANIES, INCORPORATED,
OF CLINTON, IOWA

WINDOW-FRAME MACHINE

Application filed September 27, 1927. Serial No. 222,294.

The object of my invention is to provide a machine for cutting window frame members.

More particularly, it is my purpose to provide a machine whereby window frame side jambs, head jambs, sills, side casing members and head casing members, after having been cut to width and approximate length, may have further operations performed on them for completing them.

It is my purpose in this connection to provide a machine having a series of units to which the stock is fed automatically and by successive movements for performing the various operations necessary.

Another purpose is to provide such a machine in which the units are readily adjustable for performing a variety of operations.

With these and other objects in view, my invention consists in the construction, arrangement and combination of the various parts of my window frame machine, whereby the objects contemplated are attained, as herein-after more fully set forth, pointed out in my claims, and illustrated in the accompanying drawings, in which:

Figure 1 is a top or plan view of a window frame machine embodying my invention.

Figure 2 is a front elevation of the same, parts being broken away.

Figure 3 is a rear elevation of the machine, parts being broken away.

Figure 4 shows an end elevation of the machine as viewed from the left-hand as seen in Figure 1.

Figure 5 shows an end elevation of the opposite end of the machine from that shown in Figure 4.

Figure 6 is a detail, sectional view taken on the line 6—6 of Figure 1.

Figure 7 is a similar view taken on the line 7—7 of Figure 1.

Figure 8 is a sectional view taken on the line 8—8 of Figure 2.

Figure 9 is a perspective view of a side jamb member of the kind made with my machine.

Figure 10 is a detail, sectional view taken on the line 10—10 of Figure 9.

Figure 11 is a perspective view of a head jamb.

Figure 12 is a detail, sectional view taken on the line 12—12 of Figure 1.

Figure 13 is a perspective view of a side casing member, forming part of a window casing.

Figure 14 is a detail, sectional view taken on the line 14—14 of Figure 1.

Figure 15 is a similar view taken on the line 15—15 of Figure 1.

Figure 16 is a perspective view of a head casing member.

Figure 17 is a detail, sectional view taken on the line 17—17 of Figure 16, illustrating the position of the cutting tool in performing one of the operations on the head casing member.

Figure 18 is a detail, sectional view taken on the line 18—18 of Figure 4.

Figure 19 is a detail, sectional view taken on the line 19—19 of Figure 8.

Figure 20 shows an end elevation of one of the pocket end cutting units viewed as indicated by the line 20—20 of Figure 6.

Figure 21 is a detail, sectional view taken on the line 21—21 of Figure 2.

Figure 22 is a detail, sectional view taken on the line 22—22 of Figure 6; and

Figure 23 is a detail, sectional view taken on the line 23—23 of Figure 22.

The machine under consideration is one of the multiple unit type. The various units perform various operations upon different members of window casings and jambs.

The side jamb stock, for example, is placed in a hopper and is then automatically advanced through the machine and operated on by the various units for completing the side jamb.

By a slight adjustment of some of the units a top jamb member, a sill, side casing member, or top casing member may be delivered from the hopper through the machine and may have the necessary operations performed on it.

Since the most typical unit manufactured on this machine is the window side jamb, I shall during the description of the machine describe it as used for the making of side jambs, but when necessary will refer to the mechanisms as used for operations on other members and their functions.

In a preliminary may and for greater clear-

ness in the subsequent explanation, I will refer to the side jamb illustrated in perspective in Figure 9 and indicated by the reference numeral 10. The stock for the side jamb is supplied to the hopper, cut to width and approximately cut to length, and with the parting stop groove 10^a formed therein. Usually in this machine, the side jamb is completed by performing the end operations of cutting the top ends straight across and of cutting the bottom end on a bevel or incline to fit the sill.

These jams are also provided with sash weight pockets. The pockets are formed by cutting out rectangular pieces. This piece for convenience I shall call the pocket member. This pocket member is indicated in Figure 9 at 10^b. In cutting out the pocket member, it is necessary to make the four end cuts 10^c and two longitudinal side cuts 10^d.

The completion of the side jamb member requires the countersinking of two recesses 10^e for weight pulley plates and the cutting or routing out of elongated slots 10^f for the pulley weight ropes and pulleys.

For the purpose therefore of completing a side jamb member, the present machine is provided with units for cutting both ends of the stock, for making end cuts and lengthwise cuts for the sash weight pocket, for routing out a countersunk portion for the pulley plates, and routing out the slots for the pulleys. Likewise the machine performs a series of operations for other window frame or jamb members.

Where head jamb members 12, such for instance as shown in Figure 11, are to be completed, stock is furnished to the hopper, cut to width and approximately to length and with the longitudinal groove 12^a formed therein.

The machine cuts off the ends accurately and cuts the grooves 12^b near the ends of the stock.

Where a side casing member 14, as is shown in Figure 13 is to be completed, the stock is supplied, cut to width and approximately to length, and this machine cuts it to length, cuts the tenoning grooves or rabbets 14^a, and makes the relish cut 14^b.

If a head casing member, such as is shown in Figure 16 at 16, is to be completed, stock is cut to exact length on the machine and the grooves 16^a are cut in the side edge thereof at the opposite ends of the said casing member.

For performing the series of operations on any of these members, stock is automatically advanced and stopped at various stations in the machine, and the units are automatically operated for performing all of the operations of the machine.

The machine is a double-end machine in the sense that it has units for performing operations at both ends of the stock advancing through it.

I shall now proceed to the description of the structure of my improved machine.

Frame

The machine is provided with the hollow base 18 shown in Figures 2, 4 and 8. Mounted on the base 18 are right and left-hand unit supporting frames. Each of these right and left-hand unit supporting frames supports a plurality of operating units.

The right-hand one of these frames is adjustable on the base 18 toward and from the left-hand one.

The right and left-hand unit supporting frames are alike except that the right-hand one is adjustable in the manner mentioned.

The left-hand unit supporting frame has the bed plate 20, the front and rear end plate members 22 and 24, as illustrated for example in Figure 4, and the inside upright plate or frame member 26.

The right-hand unit supporting frame has similar parts, the bed plate being designated as 20^a, the front and rear end plate members as 22^a and 24^a, and the inside plate as 26^a. (See Figures 5 and 6.) The bed plate 20^a is mounted to slide on the base 18 and for that purpose is provided with a groove 28, which receives a rib 30 on the base.

For accomplishing the sliding movement of the right-hand supporting frame on the base 18, a shaft 32 is suitably non-slidably journaled on the base 18 just below the bed plate 20^a. (See Figures 1, 5 and 8.)

The bed plate 20^a is provided with a threaded nut 34 which receives a threaded portion 32^a of the shaft 32. (See Figure 8.)

Mounted on the base 18 is an ordinary reversible motor 36 having the shaft 38 on which is the small sprocket 40. (See Figures 1 and 5.)

On the shaft 32 is a sprocket 42 aligned with the sprocket 40. A chain 44 travels on the sprockets 40 and 42 providing for the transmission of power from the motor 36 to the shaft 32 for thereby adjusting the right-hand unit supporting frame toward or from the left-hand unit supporting frame.

By reversing the motor 36, the right-hand frame may be adjusted either toward or from the left-hand frame on the base 18 as may be desired.

Main driving shaft

For transmitting power to the various units carried by the unit frames, a shaft 46 is suitably journaled in bearings 48 on the base 18. (Figure 5.) On account of the adjustment of the right-hand unit frame on the base 18, it is necessary that the shaft 46 be provided with suitable splineways 50 to accommodate sliding worm and beveled gears mounted on the movable frame. (See Figure 8.)

As shown in Figure 1, power is supplied to the shaft 46 from the motor 52 by means

of pulleys 54 and 56 mounted on the shaft 46 and the motor shaft 58 respectively and by means of the belt 60 traveling on those pulleys.

Of course, it will be understood that any ordinary method might be employed for imparting rotation to the shaft 46.

Hopper

At the front of the machine, there is provided a hopper for receiving the stock to be fed to and operated on by the machine. The hopper is adjustable to accommodate stock of different lengths and widths.

Mounted on the left-hand frame member is the hopper end member 62, having the flange 64 bolted as at 66 to the frame. (See Figures 1, 2, 4 and 8.)

The upper end of the hopper end member 62 is bent laterally at 68 to facilitate the inserting of the stock.

On the right-hand frame member is a similar hopper end member, the parts of which are indicated by the reference numerals just used in describing the left-hand hopper end member with the addition of the letter "a".

The bolts 66 and 66^a extend through elongated slots 70 and 70^a so that when their nuts are loosened, the bolts may be adjusted laterally of the machine for varying the length of the hopper.

On the inner face of each hopper end member 62 and 62^a adjacent the edge nearest the back of the machine is an upright member 72 forming a rear hopper wall element, which is carried by its end member, but is not otherwise adjustable. (See Figure 8.)

The members 72 terminate enough short of the bottom of the hopper to permit stock to be advanced from the hopper to the first operating unit of the machine.

The hopper members 62 and 62^a have mounted on them the adjustable upright front hopper wall members 74 and 74^a. (Figures 1, 2 and 21.) The members 74 and 74^a are fixed to transverse bars 76 and 76^a slidably received in grooves 78 and 78^a formed in the members 62 and 62^a. Bolts 80 and 80^a are secured to the bars 78 and 78^a and are extended through elongated slots 82 and 82^a formed in the members 62 and 62^a at the bottoms of the grooves 78 and 78^a. Hand wheel nuts 84 and 84^a are used on the bolts 80 and 80^a.

The upper edges of the frame members 26 and 26^a form the bottom of the hopper for supporting stock therein and also serve for supporting the stock during its sliding advance through the machine.

It will be noted that the front wall members 74 and 74^a may be adjusted by loosening the wheel nuts 84 and 84^a and then adjusting the bars 76 and 76^a fore-and-aft in the machine.

The length of the hopper may be regulated

by loosening the nuts on the bolts 66 and 66^a and adjusting the members 64.

It will also be noted, of course, that the right-hand hopper is carried by the right-hand unit frame, so that it is automatically adjusted with the adjustment of that frame on the base 18.

Stock advancing units

The upper parts of the frame members 26 and 26^a are provided on their inner faces with dove-tailed grooves 86 and 86^a in which are received the sliding bars 88 and 88^a. Pivoted to the inner faces of the bars 88 and 88^a at suitably spaced intervals are the pawls 90 and 90^a (see Figures 2 and 8), which have the weighted ends 92, which serve to keep the stock engaging ends of the pawls normally raised. Yet during the return movement of the bars 88 and 88^a, the pawls will slide under the stock.

Referring to Figure 8, I have used the reference numeral 10 to represent a piece of stock.

For reciprocating the bars 88 and 88^a by strokes of proper length, I provide the following means:

Fixed on the main drive shaft 46 for the left-hand set of units is a worm 96, which meshes with a worm wheel 98 fixed on a shaft 100 suitably journaled in the left-hand unit frame and extending fore-and-aft in the machine. (See Figure 6.)

For the right-hand unit, there is a similar worm 96^a splined on the shaft 46 to permit it to slide with the adjustment of the right-hand unit frame.

It will be noted that the worm 96 is arranged between suitable bearings 102 and 104 supported on the left-hand frame member.

Similar bearings are provided on the right-hand frame member for the shaft 46 and the right-hand worm 96^a is held between similar bearings.

Journaled on the right-hand unit frame is a shaft 100^a similar to the shaft 100, which has its worm wheel 98^a corresponding to the worm wheel 98.

On the shafts 100 and 100^a at the front of the machine are beveled gears 106 and 106^a shown in Figure 2.

At the front of the machine, the right and left-hand unit frame members carry pairs of brackets 108 and 108^a (see Figures 2, 4 and 5.) Journaled on the brackets 108 and 108^a respectively are shafts 110 and 110^a. On the shafts 110 and 110^a are rotatably but non-slidably mounted opposed beveled gears 112, 114, 112^a and 114^a. (See Figure 2.)

Splined on the shafts 110 and 110^a for sliding but non-rotatable movement relative to said shafts are clutch sleeves 116 and 116^a provided with the annular grooves 118 and 118^a. The clutch sleeves have clutch teeth

120 and 120^a for coacting with the respective beveled gears 112 and 114 and 112^a and 114^a.

Clutch operating shafts 122 and 122^a are slidably mounted on the brackets 108 and 108^a and carry clutch operating arms 124 and 124^a, which project into the grooves 118 and 118^a.

For sliding the shafts 122 and 122^a for operating the clutches, I provide the levers 126 and 126^a pivoted on the left and right-hand unit frames, and having loose pivotal connections with the shafts 122 and 122^a.

By manipulating the levers 126 and 126^a, the clutches may be operated for causing the shafts 110 and 110^a to be operated in either direction.

The desirability of such variation in the direction of rotation of these shafts will be hereinafter fully referred to.

Journalled in the lower ends of the brackets 108 and 108^a are shafts 128 and 128^a to which are fixed the arms 130 and 130^a. Slidably mounted in guides 132 and 132^a are blocks 134 and 134^a, which are provided with pins 136 and 136^a.

On the shafts 110 and 110^a are fixed arms 138 and 138^a to which the pins 136 and 136^a are pivotally connected.

Thus when the shafts 110 and 110^a are rotated, the arms 138 and 138^a will be rotated for sliding the blocks 134 and 134^a and imparting reciprocating movement to the arms 130 and 130^a.

The arms 130 and 130^a are operatively connected with the slide bars 88 and 88^a in the following manner:

At the upper end of each arm 130 and 130^a, I provide a pair of ears 140 and 140^a. Between the ears 140, there is pivoted a sleeve 142 and between the ears 140^a is pivoted the sleeve 142^a. Rotatably received in the sleeve 142 is a shaft or rod 144, which is held against sliding movement in the sleeve 142 by means of the collars 146 and 148.

Similarly, rotatably, but non-slidably mounted in the sleeve 142^a is the shaft or rod 144^a held against sliding movement by the collars 146^a and 148^a.

Pivoted to the slide bar 88 is a threaded nut 150 in which the threaded end 152 of the rod 144 is received. Projecting from the nut 150 is an arm 154 carrying a sleeve 156 receiving the rod 144.

It will thus be seen that the reciprocation of the arm 130 acts on the rod 144 for reciprocating the slide bar 88. The slide bar 88^a and arm 130^a are connected by similar parts designated by similar numerals with the addition of the letter "a".

It is sometimes desirable to give to the bars 88 and 88^a a speeded-up movement toward the rear of the machine and a slower return movement toward the front of the machine. This might be true where it was desired to have some of the units operate on stock dur-

ing the movement of the bars forwardly in the machine and while the stock remained stationary.

When it is desirable to thus advance the stock rapidly toward the rear on the bars 88 and 88^a, the clutches above described are regulated so that the shafts 110 and 110^a will be actuated in such manner that the pins 136 and 136^a will carry the arms 130 and 130^a rearwardly in the machine during the lower part of the revolution of said pins, and will serve to carry the arms 130 and 130^a forwardly in the machine when the pins are at the upper part of their revolution.

This will speed up the rearward movement of the bars 88 and 88^a and slow down their forward movement.

By reversing the clutches, the forward movement of the bars may be speeded up and their rearward movement slowed down. This is desirable for some operations.

It will be seen that the bars 88 and 88^a and the pawls 90 and 90^a will serve to advance the stock slidingly on the frame members 26 and 26^a.

Owing to the manner of operation of some of the saws, it is desirable that the stock be held down firmly on said frame members during its progress through the machine, and while it is stationary and being operated upon.

I have provided means for this purpose.

Traveling tracks

The traveling tracks now to be described form a part of the stock advancing means.

On each of the unit frames is mounted a continuous guide track 158 and 158^a.

Referring now to Figures 4 and 5, it will be noted that on the unit frames are upwardly projecting brackets 160 and 160^a. Threaded into the upper parts of these brackets are upright shafts 162 and 162^a.

On the upper parts of the tracks 158 and 158^a are brackets 164 and 164^a and 166 and 166^a in which the upper ends of the shafts 162 and 162^a are journaled. The brackets 164, 164^a, 166 and 166^a are also provided with journals 168, 168^a, 170 and 170^a, in which are journaled the shafts 172 and 172^a.

On the shafts 162 and 162^a are beveled gears 174 and 174^a meshing with beveled gears 176 and 176^a on the shafts 172 and 172^a.

On the shafts 172 and 172^a are hand wheels 178 and 178^a by which the shafts may be manipulated for imparting rotation to the shafts 162 and 162^a and raising or lowering them, for thus raising and lowering the tracks 158 and 158^a.

The tracks are provided with projecting pins 180 and 180^a traveling in elongated slots 182 and 182^a for thus guiding the tracks in their up and down movement.

On the outer surface of the tracks 158 and

158^a extending entirely around them is a hardened steel strip or bar 184 and 184^a.

Traveling on each track is an endless conveyor device, comprising a series of channel-shaped links 186 and 186^a. (See Figures 4, 5 and 19.)

Journalled in the links 186 and 186^a are flanged wheels 188 and 188^a, which travel on the strips 184 and 184^a. Secured to each link 186 and 186^a is a foot 190 and 190^a preferably of rubber.

Referring now to Figure 19, it will be observed that the lower part of each track 158, 158^a is channel-shaped as at 192, 192^a to snugly receive and guide the endless traveling devices.

While I have called the endless traveling devices a part of the stock advancing means, it may be noted that the advancement of the stock is what advances the endless traveling members, and that the endless traveling members and particularly their rubber feet simply snugly hold the stock down against the frame members 26 and 26^a, as illustrated for instance in Figures 7 and 19.

Cut off units

The first units, which operate on the stock, as the stock is advanced by the bars 88, 88^a and the pawls 90, 90^a are the cut off units. The left and right-hand units are not quite the same.

I shall therefore describe the left-hand unit and then the right-hand unit.

Referring now to Figures 1, 2, 6, 22 and 23, it will be noted that the left-hand unit frame member 26 is provided with an upright gibway 194, having the usual form of a dove-tailed channel. Vertically, slidably mounted in the gibway 194 is a bracket 196.

Similar gibways and substantially similar brackets are used for several of the units for adjustably supporting various motors and operating devices.

The bracket 196 is provided with a pin 198 projecting through an elongated slot 200 of the frame member 26 as shown in Figure 8.

A bell crank lever 202 is pivoted on the frame member 26 at 204 and has one arm standing just below the pin 198. Suitably journaled in a bearing 206 supported on the frame member 26 is a shaft 208 held against sliding movement in the bearing 206 by the collars 210.

The outer end of the shaft is squared as at 212 to receive a wrench.

The inner end is threaded as at 214 and is received in a nut 216 to which the other end of the bell crank lever 202 is pivoted as at 218.

By rotating the shaft 208, the bell crank lever 202 is rocked for raising or lowering the bracket 196. The bracket, of course, drops by gravity and therefore no positive connection

between the bell crank 202 and the pin 198 is necessary.

By raising or lowering the bracket 196, the motor supported thereon is raised or lowered.

Referring now to Figures 6 and 22, it will be noted that the bracket 196 has a laterally projecting portion 220, the upper edges of which are flared outwardly slightly.

Mounted on the portion 220 of the bracket 196 is a saddle 222, having the receiving flanges 224, which receive and slide along the bracket portion 220. Between one of the flanges 224 of the saddle 222 and the bracket portion 220 is a removable gib 226. One of the flanges 224 is provided with a series of set screws 228 by which the saddle 222 may be rigidly locked to the bracket member 220.

The saddle 222 is provided on its upper surface with curved guides 230 and 244 at its side edges to receive a block 232, which slides between the guides 230 and 244.

The saddle 222 is given its sliding adjustment on the bracket member 220 in the following manner:

Screwed into the block 232 is a threaded rod 234. The saddle 222 is provided at one side with a downwardly projecting lug 236 through which the rod 234 is rotatably extended. The rod 234 has on each side of the lug 236 the collars 238. The outer end of the rod 234 is squared at 240 to receive a wrench.

By imparting rotation to the rod 234, the saddle 222 may be adjusted laterally in the machine.

The guide members 230 and 244 on the saddle 222 have their inner faces beveled as shown in Figure 23, so that there is a dove-tailed connection between the block 232 and the saddle 222. The block 232 is adjusted by hand on the saddle 222 and is rigidly locked thereto by means of bolts 242. (See Figure 22.) The bolts 242 are mounted in the bracket member 220 and are screwed into the guide member 230, which is detachable, so that its beveled edge may be drawn tightly against the coacting beveled edge of the block 232.

Two or more of the screw bolts 242 may be provided.

The block 232 is provided with guide flanges 246 similar in construction to the flanges 224 for receiving the base 248 of the cut off motor 250. Between one of the flanges 246 and the base 248 is a gib 252 similar to the gib 226. Set screws 254 extend through one of the flanges 246 for tightening the gib 256 against the base 248.

On loosening the set screws 254, the motor 250 on its base 248 may be adjusted between the guide flanges 246 in the following manner:

The block 232 is provided with an upwardly extending lug 258 similar to the lug 224 already described in which is journaled

for rotation a shaft 260, which is held against sliding movement by means of the collars 262.

The outer end of the shaft 260 is squared as at 264. Its inner end is threaded as at 266 to coact with a threaded hole 268 in the base 248. By rotating the shaft 260, the base may be adjusted on the block 232.

Saws of various kinds, such as the saw 270, may be fastened on the motor shaft 272.

It will thus be seen that by means of the bell crank lever 202, shown in Figure 8, and the connected parts, the bracket 196 (Figure 6) and the parts carried thereby may be raised or lowered and held in position which will limit its downward movement.

The saddle 222 may be adjusted laterally on the bracket member 220 by means of the bolt 234.

The block 232 may be adjusted on a curved line manually, when the bolts 242 are loosened.

The motor and its base 248 may be adjusted by means of the shaft 260.

In the use of the motor 250, the usual practice is to raise it before the stock is advanced to it, and then to lower it.

During the lowering operation, the saw 270 operates on the stock, such for instance as the side jamb 10.

By arranging the motor 250 at an angle, the end of the stock will be cut on a bevel to fit the sill.

For imparting the rising and lowering motion to the bracket 196, and the motor 250, I provide the following means:

One arm of a bell crank lever 274, shown in Figure 6, is pivoted to the bracket 196. A threaded sleeve 276 is pivoted to the other arm of the bell crank lever 274. A threaded shaft 278 is received in the sleeve 276 and has one end squared as at 280 to receive a wrench. Its other end is rotatably but non-slidably journaled in a collar 282 pivoted as at 284 on the bracket 196.

Between its sides, there is journaled on the bell crank lever 274, a roller 286, which coacts with a cam 288 on the shaft 100.

During the operation of the cam 288, the bracket 196 carrying the motor 250 is raised away from the bell crank 202 and is then permitted to drop downwardly.

For adjusting the rod 278, the movement imparted by the cam 288 may be varied for thus varying the effective throw of the cam and the degree of up and down movement and position of the motor 250.

I will now describe the right-hand cut off unit.

This unit includes a bracket 196^a having at its upper end an extension 220^a. The bracket 196^a is mounted in a gibway 194^a in the manner already described in connection with the bracket 196. Pivoted to the bracket

196^a is a bell crank 274^a similar to the bell crank 274^a, having a similar roller 286^a coacting with a cam 288^a on the shaft 100^a.

The bracket 196^a has a threaded rod 278^a similar to the rod 278 and similarly connected with its bell crank 274^a and the bracket 196^a.

The upper part of the bracket portion 220^a is shaped the same as the bracket portion 220 and mounted thereon is a saddle 290, which is connected with the bracket member 220^a in the same manner that the saddle 222 is connected with the bracket member 220.

The saddle 290 has pairs of spaced upwardly projecting ears 292 and 294.

The right-hand cut-off motor 296 has a base 298 pivoted at 300 between the ears 292. The base 298 is slidably adjustable on the ears 294 and is secured thereto by means of set screws or the like 302 extended through elongated curved slots 304 and screwed into the base 298.

Thus the motor 296 may be tilted to the position for instance shown in Figure 6.

The motor 296 has the shaft 272^a to receive a saw 270^a.

The bracket 196^a is adjusted to a predetermined height on the frame 26^a by means of the mechanism shown in Figure 6. This adjusting mechanism is similar to that provided for the bracket 196 and illustrated at the left-hand part of Figure 8, and consisting of the bell crank 202 and connecting parts.

The bracket 196^a has the pin 198^a similar to the pin 198 projecting through a slot similar to the slot 200.

The bell crank 202^a is similar to the bell crank 202 and has similar operating mechanism, which need not be further described.

For adjusting the saddle 290 on the bracket member 220^a, the saddle 290 is provided with a downwardly extending lug 306, in which is non-slidably but rotatably journaled the rod 238^a similar to the rod 238 and connected with the bracket member 220^a in the same manner that the rod 234 is connected with the bracket member 220.

It will be noted that the motor 296 may be used for cutting stock on a straight edge or for beveling the edge of the stock, as for instance for the purpose of shaping window casing members to fit a slanting sill.

The motors 250 and 296 of the cut off units are used on nearly all the stock that is operated upon by this machine, either for trimming off the ends on a straight line or for cutting them on bevels, as indicated at the left-hand side of Figure 1 and the right-hand side of Figure 6.

The operating mechanisms for the cut off units are so synchronized that the motors are moved upwardly and held in raised position while the stock advancing pawls are moving the lowermost piece of stock 94 from the pile in the hoppers (see Figure 8) to the first oper-

ating position, which is the position for operation by the cut off units.

The cams 288, 288* then function to lower the motors 250 and 293 for cutting off the ends of the stock and thereafter immediately raise the motors.

Thereupon the stock advancing means advances the first piece of stock to position for performance of the second operation, and at the same time advances a second piece of stock from the hopper to the cut off position.

The second unit mounted on the left-hand unit frame is the pocket end cutting unit, which will now be described.

Pocket end cutting unit

The pocket end cutting unit is the one which makes the saw kerfs indicated at 10°, 10° in the side jamb of a window frame. (See Figure 9.)

Mounted in the end frame members 22 and 24 of the left-hand unit frame is a shaft 308 adapted to be slid lengthwise.

It is threaded as at 308^a (Figure 4) near one end to received threaded hand wheels 310 upon opposite sides of the frame member 22. By adjusting the hand wheels 310, the shaft 308 can be readily moved lengthwise with relation to the left-hand unit frame for carrying with it the pocket end sawing mechanisms now to be described.

Refer to Figures 1, 2, 4, 6, 7, 8 and 20.

Upper and lower frames 312 and 314 are provided with arms 316 and 318 journaled on the shaft 308 as shown in Figures 1 and 4. The frames 312 and 314 project laterally inwardly from the shaft 308. The frames 312 and 314 are substantially T-shaped as shown and carry the pocket end cutting tools. These frames are pivotally hung on the shaft 308.

Journaled on the under side of the frame 312 and extending transversely of the machine is a shaft 320. Journaled on the upper side of the frame 314 substantially parallel with the shaft 320 is the shaft 322.

On the inner end of each shaft 320 and 322 is mounted a detachable clamp 324, carrying the detachable saw-toothed cutter 326. (See Figure 20.)

The shafts 320 and 322 are rocked a limited distance for actuating the cutters 326 for cutting the pocket end kerfs 10° shown in Figure 9. The means for rocking the shafts will be hereinafter mentioned.

In operating the pocket end cutting units, the frames 312 and 314 are swung respectively upwardly and downwardly when the stock is being advanced to position for cutting the pocket end kerfs and are then swung toward each other to position where the cutters 326 can operate on the stock, and are forcibly pressed toward each other during the cutting operation.

It will be noted that each shaft 320 has two of the clamps 324 and cutters 326.

The cutters on the upper shaft 320 cut about half way through the stock, and the cutters on the lower shaft 322 cut about half way through the stock.

The end cutters 326 are slightly offset with relation to each other, and those spaced from them on the respective shafts 320 and 322 are also slightly offset or staggered with relation to each other to permit the end pocket piece to be readily broken out, as clearly shown in Figure 7.

The purpose of thus offsetting the cutters is to permit a slight split endwise between the two cuts so that when the pocket has been inserted in the jamb, it can be held in place by screws. The offset split part acts as a shoulder. This prevents the cutters from striking each other, and yet cuts the kerf sufficiently.

For raising and lowering the upper frame 312, I provide the following means: A powerful coil spring 328 is secured to the upper part of the left-hand track 158 and to the frame 312 (Figure 7) for normally, yieldingly holding the frame 312 in its raised position.

For lowering the frame 312 to cutting position, I provide the following mechanism:

On the top of the frame 312 is a raised lug 330 (Figures 1 and 7). Normally resting on the raised lug 330 and extending transversely across the frame 312 is a rod 332. Pivoted to the ends of the rod 332 are downwardly hanging links 334. The lower ends of the links 334 are pivoted to short links 336, which are pivotally mounted in turn on the frame member 26 at 338. The links 336 carry between their ends a cam roller 340. (See Figures 7 and 4.) The cam roller 340 coacts with the cam 342 on the shaft 100. (Figure 4.) Rotation of the shaft 100 with the cam 342 thereon draws the frame 312 downwardly against the tension of the spring 328 at the proper time in the operation of the machine.

The lower pocket end cutting unit frame 314 has pivotally secured to its under side the downwardly projecting link 344. (Figure 7). This link has its lower end seated in a pocket 352 in an arm or cam lever 346 pivotally mounted on the frame member 26. The arm 346 carries a cam roller 348, which cooperates with a cam 350 on the shaft 100.

The frame 314 drops by gravity and is raised at the proper time in the operation of the machine by the cam 350.

For rendering the pocket end cutting means inoperative the operator simply depresses the frame 312 against the tension of the spring 328 and lifts the rod 332 off the upwardly projecting lug 330 (see Figure 7), whereupon the downward movement of the links 334 and rod 332 will not be sufficient to lower the frame 312 far enough for the cutters 326 mounted thereon to reach the stock.

Similarly the frame 312 is raised and the lower end of the link 344, which sets in the

small pocket 352 in the lever 346 is swung out to the dotted line position shown in Figure 7, whereupon the raising of the link 346 will not raise the frame 314.

For oscillating the shafts 320 and 322 the following means are provided:

Clamped on the shafts 320 and 322 at their outer ends are forwardly projecting brackets 354 and 356. These carry at their forward ends two-part sockets 358.

Referring to Figures 4 and 7, it will be observed that on the shaft 46 is an eccentric disc 360 on which travels a band 362 having the socket 364. Screwed into the socket 364 is a rod 366. The rod 366 at its upper end is screwed into a socket 368 from which a yoke 370 projects upwardly. A pin 372 is mounted in the upper ends of the yoke 370. On the pin 372 is a sleeve 374, from which there project upwardly and downwardly respectively the arms 376, having at their ends balls, as shown at 378 in dotted lines in Figure 7, received in the ball sockets 358 shown in Figure 4 and Figure 7.

The rotation of the shaft 46 reciprocates the rod 366 and the yoke 370 up and down. (See Figure 7). This reciprocation rocks the arms 354 and 356 (Figure 4) and imparts oscillating motion to the shafts 320 and 322 for thus rocking the cutting tools 326, (Figures 1, 2, 8 and 20), for cutting the pocket end kerfs 10°. (Figures 2 and 9.)

The rod 366 is connected with the respective sockets 364 and 368 (Figure 7) by right and left-hand screw threads, so that by adjusting the rod 366 some slight variation in the oscillation of the shafts 320 and 322 may be secured.

Arranged transversely opposite the pocket end cutting unit in the machine and on the right-end unit frame is the countersink router unit.

Countersink router unit

This unit is used for making the two countersinks 10° in the side jamb shown in Figure 9. These countersinks receive the plates on which the rope pulleys are mounted.

Within the outline of the countersinks 10° are the holes 10° cut by the through router unit hereinafter referred to, which latter holes are to receive the pulleys and the ropes.

The countersink router unit is supported on a bracket 380 having at its upper end the horizontal laterally extending portion 382. The bracket 380 is mounted on the frame 26^a in gibways 194^a similar to those already described, and has a pin 198^a projecting through a slot in the frame member 26^a as above described in connection with the bracket 196^a.

The bracket 380 has a bell crank lever 274^a, similar to the one already described, carrying a cam roller 384 similar to the cam roller 286^a. The cam roller 384 coacts with a cam 386 on the shaft 100^a. (Figure 7.)

Likewise the bell crank 274^a is connected with the bracket 380 by means of a threaded rod 278^a similar to that already described.

A saddle 388 is mounted on the bracket portion 382 in the same manner as the saddle 222 is mounted on the bracket portion 220 shown in Figure 2, omitting the set screws 228 for sliding movement transversely in the machine.

On the saddle 388 is a bracket 390. Supported on the bracket 390 is a motor 392 (Figure 7) having the usual shaft 394. Supported on the bracket 390 below the motor 392 is a gear casing 396. The gear casing 396 has cylindrical walls on which are mounted for slidable adjustment the bearings 398 and 400.

The gear casing 396 has horizontally elongated slots 402 receiving screw bolts 404 screwed into the respective bearings 398 and 400 for providing for this adjustment. (Figure 18.)

Journaled in the bearings 398 and 400 are short upright shafts 406 and 408 on which are pinions 410 and 412, meshing with the pinion 414 on the motor shaft 394.

The shafts 406 and 408 carry the router bits 416. (Figures 7 and 18.)

By adjusting the bearings 398 and 400 circumferentially of the casing 396, the distance between the shafts 406 and 408 can be varied for regulating the distance apart of the countersink routings 10° in the side jamb shown in Figure 9. The gears will remain in proper mesh.

For regulating the height at which the bracket 380 normally stands, I provide the following means:

This means is best illustrated in Figure 8 in connection with the showing of the adjustment of the brackets of the tenoning units. Since the parts are the same, except as hereinafter noted, one description will serve for both the router units and the tenoning units.

For cooperating with the pin 198^a, there is pivoted on the frame 26^a in the case of the routing unit a lever or arm 418, which carries a plate or bar 420, in which is a curved guide way 422, illustrated by dotted lines in Figure 8.

The pin 198^a projecting from the bracket 380 extends into the guide way 422. By rocking the arm 418 and the guide way 422, the pin 198^a on the bracket 380 may be raised or lowered by a movement, which is positive, for both upward and downward movements.

Pivoted to the upper end of the arm 418 is an internally threaded sleeve 424, into which is threaded a rod 426.

The various rods or shafts 426 are similar to the rod or shaft 208 and are similarly mounted on the frame members 26 or 26^a as the case may be.

The plate 420 with its guide device 422 is employed in the case of the tenoning units

because of the fact that these machines must be positively moved to the position desired. For the routers, it is sufficient to let them move by gravity in one direction, and the upper flange on the guide devices for the routers is therefore omitted.

For reciprocating the router unit now being considered laterally in the machine, a short shaft 428 is journaled on the bracket 390, as shown in Figure 1.

A sleeve 430 is mounted on the shaft and is provided with a socket 432 which receives the threaded end of a rod or link 434.

The other end of the rod 434 is screwed into a socket 436, shown in Figure 1 and also in Figure 7. The socket 436 is pivoted to one end of a bell crank lever 438. The bell crank lever is rockably mounted on a shaft 440 supported on the right-hand unit frame.

The arm 438 has pivoted to it a socket 442 into which is threaded a rod 444. The rod 444 is threaded at its other end into a socket 446 on a band 448 mounted on an eccentric disc which is fixed on a shaft 452 suitably journaled on the right-hand unit frame. This shaft 452 is operated from the shaft 46 in the following manner:

Referring to Figures 1 and 6, it will be noted that the shaft 46 carries a beveled gear 454 meshing with a larger beveled gear 456 on the shaft 452. By the mechanism just described, the router bits 416 travel back and forth continuously for cutting progressively into the stock, as the bits are lowered. The length of stroke given to this oscillation of the router bits determines the length of the routing cuts and an adjustment can be provided if desired to change the length of stroke for different styles of sash weight pulleys.

On the right-hand unit frame is another router unit, the motor being indicated at 392^a. This router unit is constructed and mounted in exactly the same way as the one already described, except only that the router bits are smaller in diameter for cutting a narrower slot, and the vertical throw of the second router is adjusted so as to cut a slot entirely through the stock.

This latter router is the through router and cuts the slots 10^c shown in the side jamb in Figure 9.

No further description of the through router will be made, because of its similarity to the countersink routing unit.

Tenoning units

On the left-hand unit frame are the tenoning units employing the motors 458 and 460 for cutting tenon grooves in the ends of the stock.

The motors 458 and 460 are mounted in spaced position fore-and-aft in the machine, and the motor 458 is mounted substantially higher than the motor 460. These motors

are supported on brackets 462 quite similar in structure to the bracket 196 already described (see Figure 3) and similarly mounted in gibways 464 similar to the gibway 194.

The means for vertically adjusting the brackets 462 have already been described and are illustrated in Figure 8. They consist of the rocking arm 418 carrying the plates 420 with the curved guides 422 receiving the pins 198^a similar to those already described. The rocking guide ways are actuated from the threaded shafts or rods 426.

The brackets 462 are provided with guide ways 466 similar to other guide ways already described to receive the bases 468 of the motors 460 and 458.

Lateral adjustment in the machine is provided by means of threaded members 238 similar to those already described.

The motors 458 and 460 are adjusted to the proper height by means of the rocking arms 418 and connected parts, and they are adjusted laterally in the machine by means of the threaded rods 238.

The upper motor 458 has a shaft 476 to receive a tenoning saw 472 for cutting the tenon groove in the upper side of the stock 14, as shown in Figure 14, and at 14^a in Figure 13.

The motor 460 has a similar shaft 478 to receive a tenoning saw 480 for cutting the tenoning groove in the lower face of the stock. (See Figure 15.) The tenoning units operate on the stock during the advancing movement thereof through the machine.

The stock stops between the two tenoning units having the motors 458 and 460 during the through routing operation by the second routing unit already described, and also for the pocket ripping operation.

Pocket side ripping unit

This unit is mounted on the left-hand unit frame. It is shown in Figures 1, 3, 6, 7 and 8.

The motor of this unit is indicated at 482 and its general location with relation to the other units may be seen in Figure 1.

The motor 482 is mounted for an up-and-down movement and for a horizontal, lateral movement in the machine.

The motor 482 carries on its shaft, three saws 484, which are spaced apart the proper distance for cutting the kerfs 10^d (Figure 9).

Suitably mounted on the frame member 26 is a shaft 486, which is arranged fore-and-aft of the machine and is mounted for rocking movement. Projecting laterally from the shaft 486 is a strong link 488. Arranged parallel with the link 488 and pivotally mounted on the frame 26 is an upper link 490. The links 488 and 490 are connected by a link 492 to which they are pivoted. Supported on the link 492 is a base or table 494 upon which is a saddle 496 mounted for

lateral, sliding movement in the manner set forth heretofore in the description of the saddle 222. That is to say, the sliding connection is similar to that already described.

The manner of effecting the sliding movement will be described later.

The base of the motor 482 is mounted on the saddle 496 for adjustment in identically the same manner that the base 248 is mounted on the block 232, as shown in Figure 22.

For raising and lowering the motor 482, there is provided an arm 498 fixed to the shaft 486 and carrying a cam roller 500, which cooperates with a cam 502 on the shaft 100.

For allowing a variation in the rise of the motor 482 for stock of different thicknesses, variable saw size, or for disengagement, a sleeve 504 is pivoted to the link 492. Screwed into the sleeve 504 is a shaft 506 on which is a hand wheel 508.

An arm 510 projects from the same bell crank as the cam arm 498 and is engaged by the shaft or rod 506.

For imparting lateral, sliding movement to the saddle 496 on the base 494, there is pivoted to the saddle 496 a sleeve 512 in which slides a rod 514 on which are the adjustable clamp collars 516 spaced apart as shown in Figure 3.

The rod 514 is pivoted to an arm 518 fixed on the shaft 100, so that the rotation of the shaft 100 reciprocates the rod 514 for causing the collars 516 to engage the sleeve 512 for sliding the motor 482.

In the practical operation of this unit, the stock is moved to position above the saws 484. The cam 502 then actuates the arm 498 for raising the motor and causing the saws to engage the stock.

Two of the saws engage the stock for cutting the kerfs 10^a. These may be the two rear saws or the two forward saws, depending on whether the side jamb operated on is a right or a left.

I use three saws, because the pocket is not in the middle of the side jamb from side to side.

Coping units

In Figures 1, 3, 4, 5 and 17 are illustrated the coping units, which include the motors 520 and 520^a mounted respectively on the left and right-hand unit frames.

I will describe only the left-hand coping unit since their construction is the same.

The bracket 522 is mounted on the left-hand unit frame for lateral, sliding movement in the machine. The bracket 522 slides on a base 524 supported on the frame member 24, as shown in Figure 4. The motor 520 is in upright position and its base 526 is slidably mounted on the bracket 522 and is given some adjustment by means of a rod 528, shown in Figures 1, 4 and 7. The rod 528 has a hand wheel 530 on its upper end. The rod is non-slidably but rotatably mounted in

a bracket 532, and has a screw-threaded connection with the base 526 of the motor 520. (See Figures 1 and 7.)

There is thus provided sufficient vertical adjustment of the motor 520 to take care of different thicknesses of stock. The motor 520 carries the cutter 534, shown for instance in Figures 3 and 17, for cutting the groove 16^a in the edge of the stock as shown in Figure 17.

For reciprocating the motor laterally in the machine, there is pivoted to the bracket 522 a socket 538 shown in Figure 3. Screwed into the socket 538 is a threaded rod 540, the outer end of which is pivoted to a lever 542, which is extended downwardly, and is pivoted at its lower end on a shaft 544. Fixed to the shaft 544 are arms 546 and 548 carrying cam rollers 550 and 552. The rollers 550 and 552 coast with cams 554 and 556 on the shaft 100.

The right-hand coping unit is the same and the parts are described by the corresponding numerals with the addition of the letter "a."

In the operation of the coping units, the cam 554 actuates the parts to move the motor 520 to the left out of the path of the advancing stock. The stock is advanced to operating position by the stock advancing mechanism, whereupon the cam 556 actuates the proper parts for moving the motor 520 to the right for sawing the groove in the stock as shown in Figure 17. See also Figure 16, which illustrates the grooves cut by the coping units.

Pocket kick-out unit

There is also provided a pocket kick-out unit on the machine.

It will be remembered that the upper and lower saws 236 of the pocket end cutting units are slightly staggered as illustrated for instance in Figures 6 and 7. This leaves some of the material in the ends of the pockets, which is not cut through.

In order to kick out the pocket and finish the separation thereof from the stock, the kick-out unit is provided.

After the pocket ripping units have operated (see Figure 1), the stock is advanced to the last position shown in Figure 1, where it is operated on by the pocket kick-out unit.

Referring to Figure 3, it will be seen that the link 488 has pivoted to it an upwardly extending kick-out arm 558, which extends between guide pins 560 on an arm 562.

When the link 488 is swung upwardly, the arm 558 is carried with it and strikes the under side of the pocket piece of the member 10^b (see Figures 1, 3 and 9) for breaking it out. From the last position of the stock mentioned, it is discharged from the machine.

I shall now outline somewhat in detail the operation of the machine.

Operation

I shall describe the operation of the machine first in making a side jamb. The right-hand unit frame is adjusted laterally in the machine to accommodate the stock to be operated upon. This is done by operating the motor 36 shown in Figure 1, which rotates the shaft 32. The shaft 32 (Figures 1 and 7) being threaded in the nut 34 on the movable right-hand unit frame carries that frame with it for a proper adjustment.

The hopper is then adjusted for the width of the stock by loosening the hand wheel nuts 84, 84^a (Figures 2, 4 and 21) and adjusting the bars 76, 76^a for thus adjusting the upright hopper wall members 74, 74^a.

The hand wheel nuts 84, 84^a are then tightened and the stock is placed in the hopper.

For convenience, I have referred to the various positions taken by the stock in its movement through the machine as "A", "B", "C", "D" and "E". (Figure 1.)

Position A is like the position of the stock in the hopper. From position A, the stock is moved to position B for the end cutting operation. In each instance, the lowermost piece of stock is moved from the hopper. This operation is accomplished as follows:

The driving shaft 46 is actuated from a pulley 54, belt 60, pulley 56 and motor 52. (Figure 1.) The worms 96, 96^a actuate the worm wheels 98, 98^a and the shafts 100, 100^a. (Figure 6.)

Referring now to Figure 2, the beveled gears 106, 106^a actuate the beveled gears 112, 112^a or 114, 114^a depending upon the positions of the clutches, thereby rotating the shafts 110, 110^a. (Figures 1 and 2.)

Rotation of the shafts 110 and 110^a carries with them the arms 138, 138^a for reciprocating the arms 130 and 130^a.

The reciprocation of the arms 130, 130^a operates the rods 144, 144^a and connected parts for reciprocating the slide bars 88, 88^a, which carry the pawls 90, 90^a.

The forward pawls 90, 90^a engage the lowermost piece of stock in the hopper and advance it from position A to position B. (See Figures 1 and 8.)

Assuming that the cut-off unit motors 250 and 296 have been properly adjusted and have had the proper saws mounted thereon for cutting square ends from the side jamb stock, the next operation is the lowering of the motors 250 and 296. These motors are carried by the brackets 196, 196^a, which have the bell cranks 274, 274^a supporting the roller 286, 286^a, which coact with the cams 288, 288^a. The parts being properly synchronized, the rotation of the shaft 100 and the cams 288^a, 288^a will lower the motors 250 and 296 for cutting square or beveled ends on the side jamb stock.

The stock is then ready for movement to po-

sition C where it is operated on by the pocket-end cutting unit and the countersink routing unit.

The motors 250 and 296 are raised, and the first piece of stock is advanced to position C, while the second piece of stock is being advanced to position B.

When the stock reaches position C (Figure 1), the frame members 312 and 314, shown in Figure 7, are respectively lowered and raised. The frame 312 is lowered against the tension of the spring 328 by means of the links 334, the roller 340 and the cam 342. (Figures 4 and 7.)

The frame 314 is raised by means of the link 344, link 346 and cam 350 (Figure 7).

The saws 326 are reciprocated by the reciprocation of the shafts 320 and 322.

Referring to Figures 4 and 7, it will be observed that the eccentric 360 on the shaft 46 reciprocates the shaft 366 and the arms 354 and 356 for rocking the shafts 320 and 322.

At the same time, the first or countersinking routing operation is performed.

The motor 392 and its bracket 390 and the bracket 380 are lowered by the movement of the cam 386. (Figure 7.)

The motor 392 carrying the router bits 416 is then reciprocated laterally in the machine through the operation of the eccentric 450, the shaft or rod 444, the bell crank 438 and the rod 434.

As soon as the pocket end cutting operation is completed, the cam 342 raises the roller 340 and the links 334, thus permitting the spring 328 to raise the frame 312.

At the same time, the cam 350 rotates to a position permitting the frame 314 to drop. At the same time, the cam 386 rotates to position to raise the bracket 380 and the motor 392.

Stock is then ready to be advanced towards position D.

Ordinarily the saws of the tenoning unit motors 458 and 460 do not operate on the side jamb shown in Figure 9 and now being considered.

When the stock moves to position D shown in Figure 1, the motor 482 of the pocket ripping unit is raised.

Referring to Figure 3, this raising movement is accomplished by the operation of the cam 502 through the roller 500 on the arm 498, the shaft 486, the arm 488 and the link 492. When the motor 482 has been raised, it is moved laterally in the machine for completing the pocket side ripping operation by means of the rod 514 and the arm 518 on the shaft 100. (See Figure 3.)

At the completion of this operation, the motor 482 is lowered by the further movement of the cam 502.

While the pocket ripping operation is being performed, the second or through router unit operates in the same manner as would the first or countersink router unit, except-

ing that the bits on the motor 392^a are of smaller diameter, and the lateral movement of the unit is shorter than that of the first router unit for cutting the through slots 10^f.

5 The through router unit is raised, and the stock is then moved to position E.

The coping units do not operate on the side jamb shown in Figure 9 and now being considered.

10 In position E, the pocket kick-out unit, illustrated in Figure 3, breaks out the pocket.

When the pocket side ripping unit is raised for cutting the sides of the pocket of one piece of stock in position D, the kick-out arm 558 is raised for breaking out the pocket of the stock in position E.

15 Assume that a head jamb member, such as is shown in Figure 11 is to be operated upon by the machine. Stock is first moved to the end cutting units, and the ends are cut for giving the head jamb members 12 the exact length and for cutting the grooves 12^b. (See Figures 11 and 12.) The ends are trimmed and the grooves are cut by the same operation, simply by providing the motors 250 and 296 with the proper cutting instruments 564 and 566. (Figure 12.)

20 Where a side casing, such as that shown in Figure 13 is to be operated upon, the stock is put in the hopper and advanced through the machine in the manner already described. One end is cut square off by the saw-carried by the motor 296. The motor 250 is adjusted to make the relish cut 14^b.

25 No further operations are performed on the machine until the stock is advanced past the tenoning units having the motors 458 and 460.

30 The upper tenoning unit is provided with a cutter of the kind shown in Figure 14, which trims off the end of the stock and also cuts the upper tenon groove.

The saw 460 carries the cutting tool 480 by which the lower tenon groove is formed.

35 Where a head casing, such as that shown in Figure 16 is to be operated upon, the ends are trimmed as they pass the motors 250 and 296, and the grooves 16^a are cut by the saws carried by the motors 520 and 520^a.

40 It will, of course, be understood that operations, other than those here specifically explained, may be performed by this machine.

45 When the motor 296 is tilted as shown for instance in Figure 6, the right-hand end of the stock may be beveled from top to bottom.

50 The motor 250 may be swung to the angle shown in Figure 1 for beveling the stock and from side to side.

55 It will be observed from the foregoing that I have provided a machine by which the operations on any particular piece of stock are automatically performed, as the stock is advanced automatically through the machine.

60 The machine is built for rapid and economical operations in general.

It is economical of space, because it is a double-end machine and stations B, C, D and E perform operations on both ends of the stock.

In the case of a side jamb, stock is operated on at both ends at stations B, C and D.

The end cut-off units having the motors 250 and 296 may be readily rendered inoperative by moving the motors 250 and 296 laterally, so that their saws will be out of the path of the advancing stock, or by raising the brackets 196 by means of the rods 208 until the cams 288 and 288^a are inoperative.

The pocket end cutting units can be rendered inoperative in the manner already described.

The router units can be rendered inoperative by raising the brackets 380 and 380^a by means of the appropriate rods 208 until the cams 386 and 386^a are inoperative.

35 The tenoning units having the motors 458 and 460 may be rendered inoperative by moving the saws. This, of course, is true of all the sawing units.

Similarly, they may be made inoperative by moving the motors 458 and 460 far enough to the right, so that their saws may be out of the path of the advancing stock or by raising and lowering the motors.

40 The pocket side ripping unit may be rendered inoperative by adjustment of the hand wheel 508 (Figure 3) and this will automatically render the pocket kick-out device inoperative.

45 The coping units may be rendered inoperative by simply raising the motors 520 and 520^a or by taking out the upper pivot pins of the levers 542 and 542^a.

50 The machine is capable of a large variety of adjustments and uses in addition to those hereinabove more particularly explained, many of which will be obvious from the foregoing description of the construction and operation of the parts.

55 Changes may be made in the construction and arrangement, shape and sizes of the parts, without departing from the real spirit and purpose of my invention, and it is my intention to cover by my claims, any modified forms of structure or use of mechanical equivalents, which may be reasonably included within their scope.

I claim as my invention:

1. In a machine of the class described, means for advancing stock through the machine in successive steps, routing units for operating on the stock at different steps in its advancement, means for automatically, vertically, oscillating said units and for automatically moving the units lengthwise of the stock for forming countersink and through mortises in successive steps.

2. In a machine of the class described, means for advancing stock through the machine by successive steps, pocket end cutter

devices, comprising rock shafts having cutter blades secured thereto, means for adjusting said cutter blades lengthwise of said rock shafts for different lengths of pockets, means for automatically bringing said cutter blades to operating position when the stock is stopped between two steps of its advancement, and means for automatically actuating the cutter blades when brought to such position comprising mechanism for oscillating the rock shafts.

3. In a machine of the class described, means for moving stock through the machine by successive steps, automatic means for cutting pocket end kerfs in the stock while the stock is stopped at one position of its advancement, and means for automatically cutting side pocket kerfs on the stock while it is stopped at another position of its advancement, said last means comprising a saw and means for moving the saw to engage the stock, moving it at right angles to the axis of its shaft and then moving it away from the stock.

4. In a machine of the class described, means for moving stock through the machine by successive steps, automatic means for cutting pocket end kerfs in the stock while the stock is stopped between two advancing movements, means for automatically cutting side pocket kerfs on the stock while it is stopped at another position of its advancement, and means for automatically kicking out the pocket piece in another stage of the advancement of the stock.

5. In a machine of the class described, means for advancing stock through the machine, means for automatically cutting pocket-end kerfs, means for automatically cutting pocket side kerfs, and means for knocking out pocket end pieces.

6. In a machine of the class described, means for automatically advancing stock by successive steps through the machine, and means for automatically cutting pocket side kerfs in the stock while it is stopped between two steps of its advancement, said means comprising a saw raisable to cut into the stock and lowerable therefrom, and means for moving the saw parallel to the plane thereof when in raised position.

7. In a machine of the class described, means for advancing stock by successive steps through the machine, a saw support, spaced saws thereon, means for operating said saws, means for adjusting said saws toward the stock and for causing them to travel longitudinally of the stock for cutting side pockets in the stock while it is stopped between two advancing movements, the means for causing them to travel longitudinally comprising a reciprocating member, a lug associated with said saw support and slidably receiving said reciprocating member, and stop collars on said reciprocating member

spaced on opposite sides of said lug, said stop collars being clamped to the reciprocating member and capable of adjustment longitudinally relative thereto.

8. In a machine of the class described, means for advancing stock by successive steps through the machine to different stations, means for automatically cutting the ends of the stock while it is stopped at one station, means for automatically cutting pocket end kerfs in the stock while it is stopped at another station, means for automatically cutting pocket side kerfs in the stock while it is stopped at a third station, means for automatically kicking out the pocket piece after the pocket kerfs have been cut.

9. In the machine of the class described, means for advancing stock through the machine by successive steps, means for cutting pocket end kerfs in the stock when it is stopped between two of its successive advancements, a plurality of spaced saws for cutting pocket side kerfs, means for automatically raising said saws and moving them longitudinally of the stock while the stock is stopped at another stage in its advance and for then moving said saws away from the stock.

10. In a machine of the class described, a base, unit frames on the base capable of adjustment toward and from each other, operating mechanism, units supported on the respective frames, means for advancing stock through the machine by successive steps and for stopping the stock at different stations adjacent to the respective operating mechanisms, said mechanisms being adapted at different stations to cut pockets from stock and to kick out the pockets.

11. In a machine of the class described, a frame, a pocket end sawing device mounted thereon, and comprising a supporting shaft arranged parallel to the line of travel of the stock, an arm thereon and extending at right angles with respect thereto, a rock shaft on said arm and cutter blades on said rock shaft, means for moving stock to position adjacent to the end sawing device, means for adjusting said end sawing device in the machine in the direction of the path of travel of the stock with relation to the station of the stock when it is stopped for the pocket end sawing operation, said last means comprising mechanism for moving said supporting shaft longitudinally.

12. In a machine of the class described, means for advancing stock therethrough in successive steps, routing units for operating on said stock, one of said routing units making a countersunk cut and the other one making a cut completely through the stock, said second cut being smaller than the first one, and means for automatically causing said units to move to and from cutting position.

13. In a machine of the class described, a

base, a supporting frame thereon, pocket end cutting mechanism supported on said frame and comprising a pair of rock shafts having cutter blades secured thereto and extending radially therefrom, and means for oscillating said rock shafts, comprising an arm secured to each shaft, a link connecting the outer ends of said arms together, and a reciprocating mechanism operatively connected with said link.

14. In a machine of the character disclosed, a pocket end cutting device comprising a support shaft, a pair of supporting arms pivoted thereto and adapted to extend one above and one below a piece of stock in which a pocket is to be cut, rock shafts journaled on said supporting arms, cutter blades on said rock shafts extending toward each other, and means for oscillating said rock shafts comprising an arm on each rock shaft, a link connecting the free ends of said arms together, and reciprocating mechanism operatively connected with said link, the connections between said arms and said link being universal to allow pivotal movement of said supporting arms on said supporting shaft.

15. In a machine of the character disclosed, a track, means for advancing stock therealong, units for operating on said stock at various positions along said track, and means for maintaining said stock on said track, comprising a guide member parallel with and spaced from said track, friction blocks guided by said guide member and interposed between the guide member and the stock on said track, said friction blocks being propelled from one end of the guide member to the other due to engagement thereof with said stock as it advances along said track, and means for returning the friction blocks to the first end of the guide after having traveled the length of the guide.

16. In a machine of the character disclosed, a pocket side cutter for cutting the sides of pockets in stock carried by the machine, said cutter being mounted for raising, moving longitudinally in one direction, lowering and then moving longitudinally in the other direction, and a member adapted to loosen the pocket so cut, said member being operatively connected with the mounting for the cutter whereby it rises therewith for loosening the pocket.

17. In a machine of the character disclosed, a pocket side cutter for cutting the sides of pockets in stock carried by the machine, a mounting for said cutter comprising a base, means for supporting said base relative to the machine for up and down movement, a cutter supported on said base for sliding horizontal movement, means for raising the base, sliding the cutter in one direction relative thereto, lowering the base and sliding the cutter in the other direction relative thereto for cutting a pocket in said stock, and a push-

out arm for loosening the pocket so cut, said arm being connected for raising movement simultaneously with said base.

18. In a machine of the class described, means for holding stock therein, routing units for operating on said stock, one of said routing units making a countersunk cut and the other one making a cut completely through the stock.

19. In a machine of the class described, means for holding stock therein, routing units for operating on said stock, one of said routing units making a countersunk cut and the other one making a cut completely through the stock, said second cut being smaller than the first one.

20. In a machine of the class described, means for holding stock therein, routing units for operating on said stock, one of said routing units making a countersunk cut and the other one making a cut completely through the stock, and means for moving said routing units for lengthening the cuts made thereby, the units being moved in opposite directions, thereby balancing each other as they oscillate.

21. In a machine of the class described, means for holding stock therein, routing units for operating on said stock, one of said routing units making a countersunk cut and the other one making a cut completely through the stock, said routing units including routing bits arranged in pairs, the bits of each pair being simultaneously driven from a common source of power.

22. In a machine of the class described, means for holding stock therein, routing units for operating on said stock, one of said routing units making a countersunk cut and the other one making a cut completely through the stock, means for moving said routing units at right angles to their axes of rotation for lengthening their cuts, said means being arranged to move the units different distances to fit various pulleys and for different countersinks.

23. In a machine of the character disclosed, a frame, a hopper thereon for receiving stock, tracks on said frame, means for intermittently advancing stock along said tracks to different stations, means for performing various operations on said stock at its various stations, said last means comprising vertically reciprocating saws for trimming the ends of the stock, one of said saws being arranged to trim the end at an angle other than an angle parallel to the movement of the stock at the first station, saws for cutting pocket ends and routers for countersink routing said stock at the second station, saws for cutting pocket sides and routers for through routing said stock at the third station, and means for breaking the pocket out of the stock at the fourth station.

24. In an automatic machine of the char-

acter disclosed, feeding means for feeding
stock, said means operating to move the stock
to successive station points and leave it at
each station point a predetermined length of
5 time, two types of mechanisms for working
on said stock, one type while the stock is sta-
tionary at the station points and the other
type while the stock is moving from one sta-
tion point to the next one, means for selec-
10 tively causing either type of mechanism to
work upon the stock, actuating means for
causing said feeding means to operate quick-
ly in a forward direction and slowly in a re-
verse direction when the first type of mech-
15 anism is operative to work upon the stock
and means for reversing said actuating means
for causing said feeding means to operate
slowly in a forward direction and quickly in
20 a reverse direction when the second type of
mechanism is operative to work upon the
stock.

SERN MADSEN.

25

30

35

40

45

50

55

60

65