

Feb. 25, 1947.

R. H. STEVENS ET AL

2,416,652

AUTOMATIC CUTTING APPARATUS

Filed Feb. 5, 1941

12 Sheets-Sheet 2

Fig. 2.

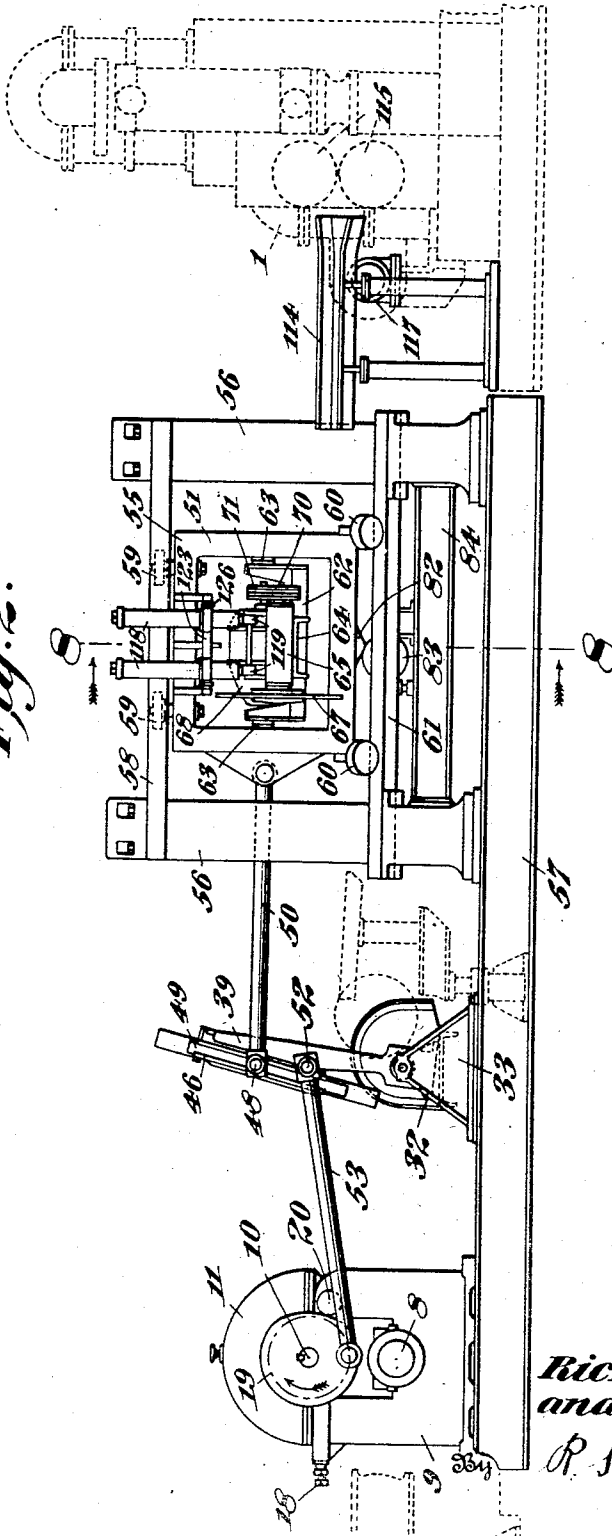


Fig. 4.

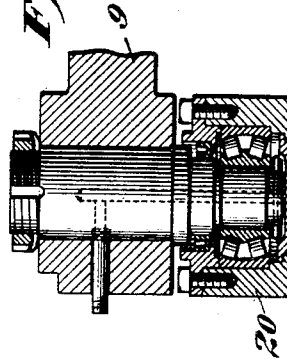
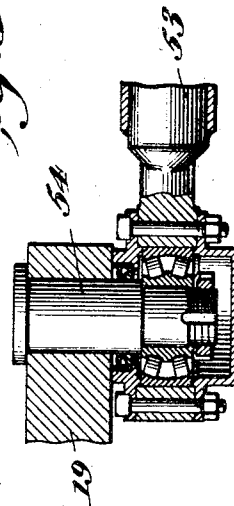


Fig. 3.



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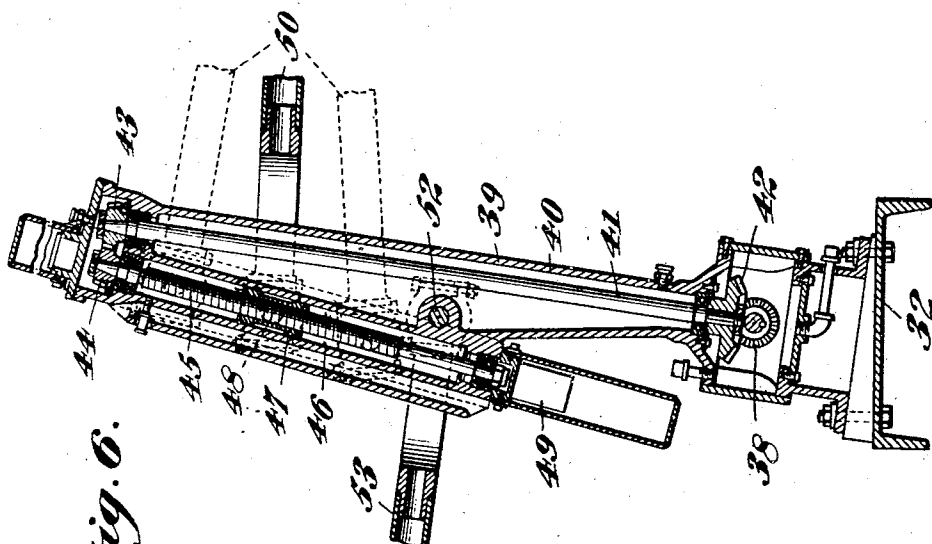


Fig. 6.

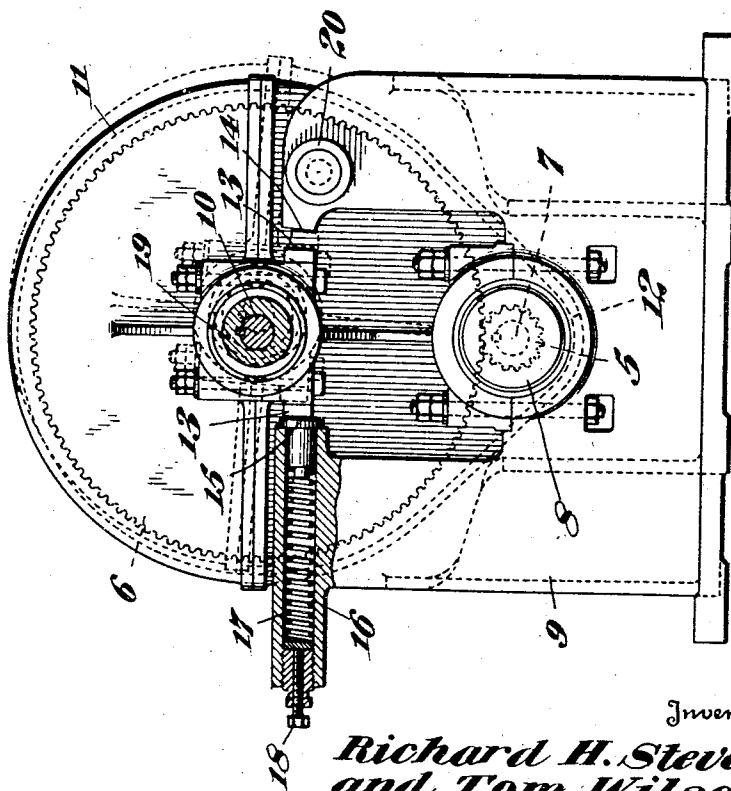


Fig. 5.

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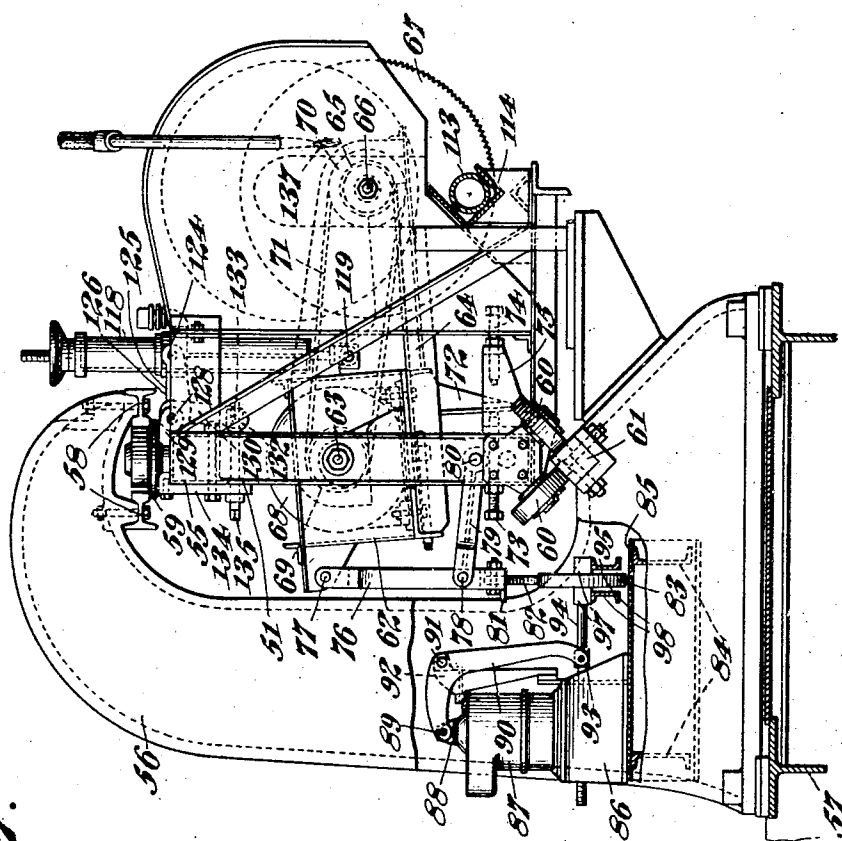
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Fig. 7.



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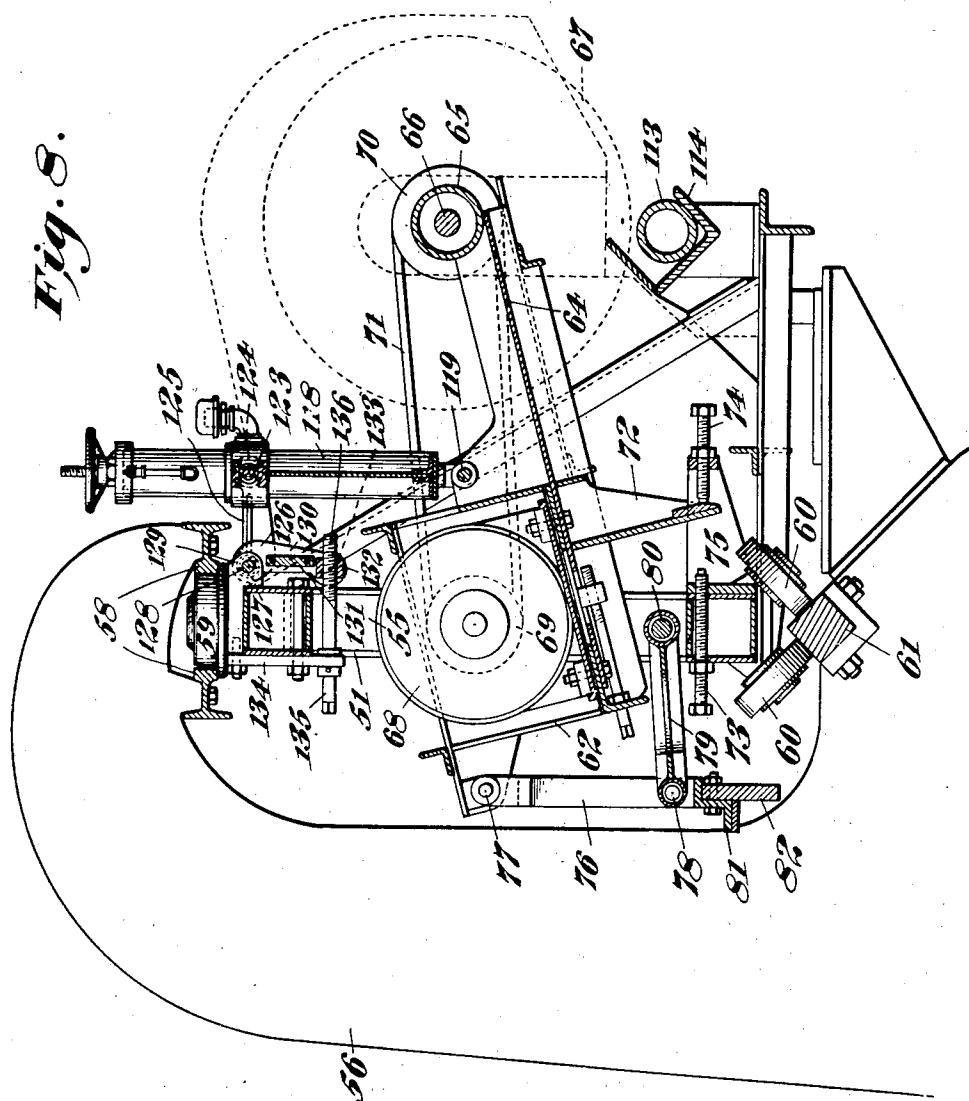
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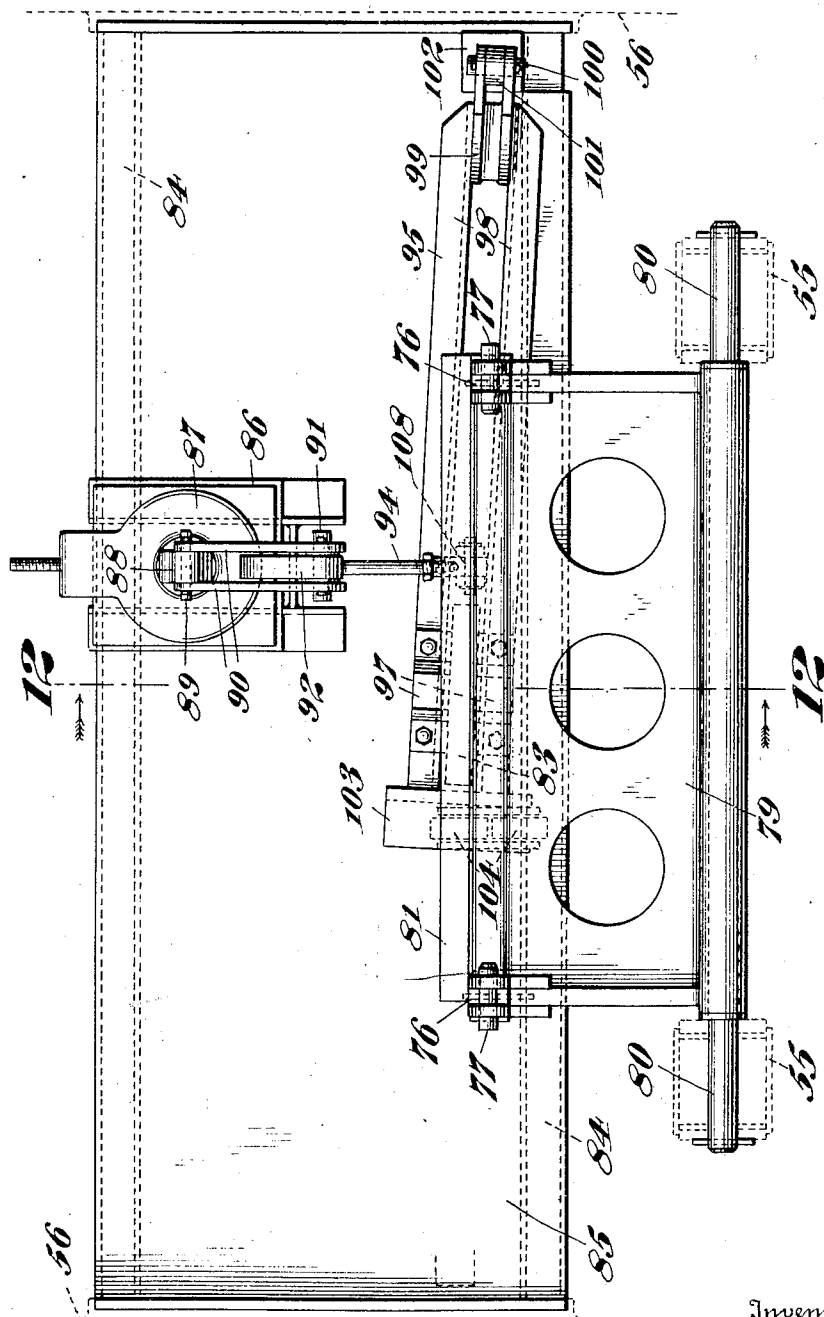
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Fig. 9.



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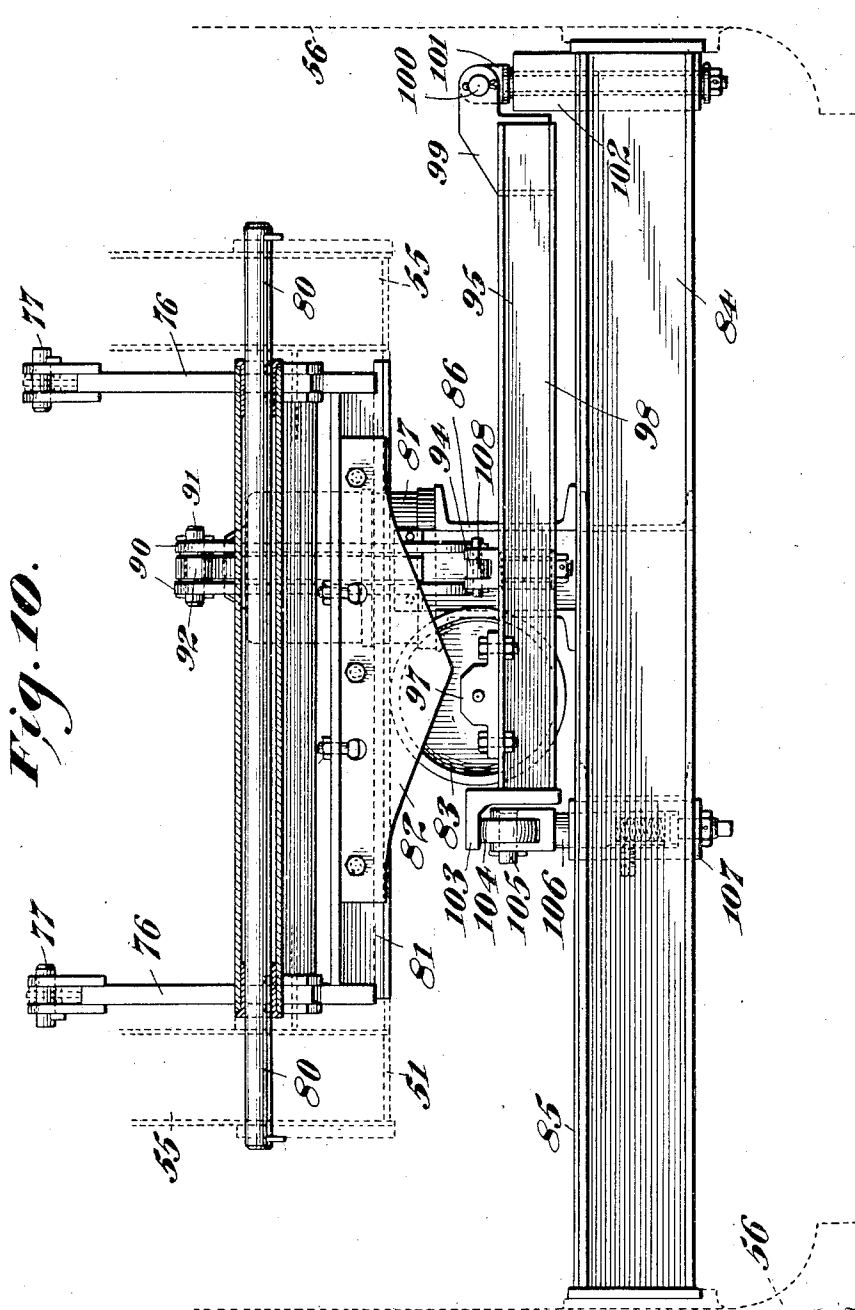


Fig. 10.

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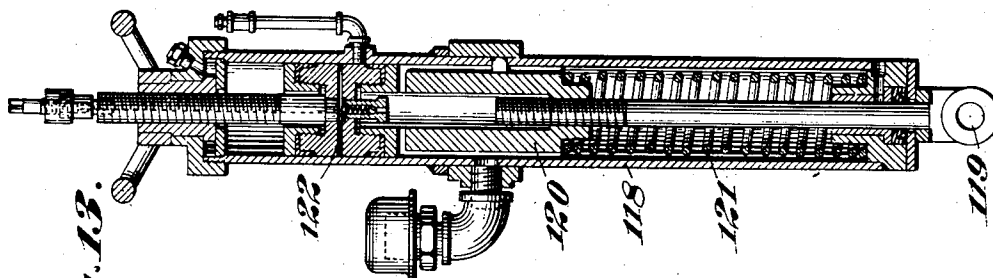


Fig. 13.

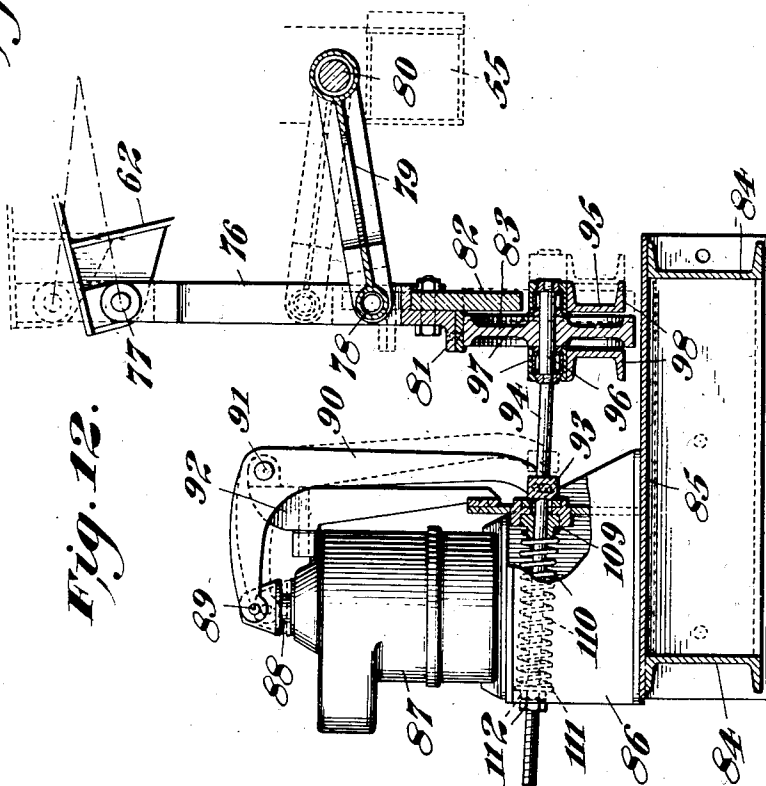


Fig. 12.

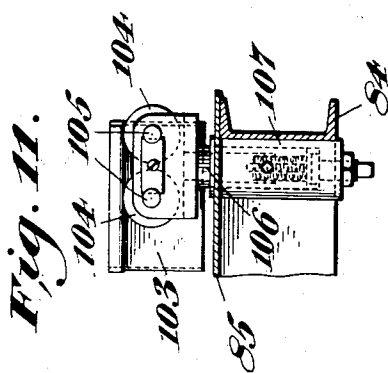


Fig. 11.

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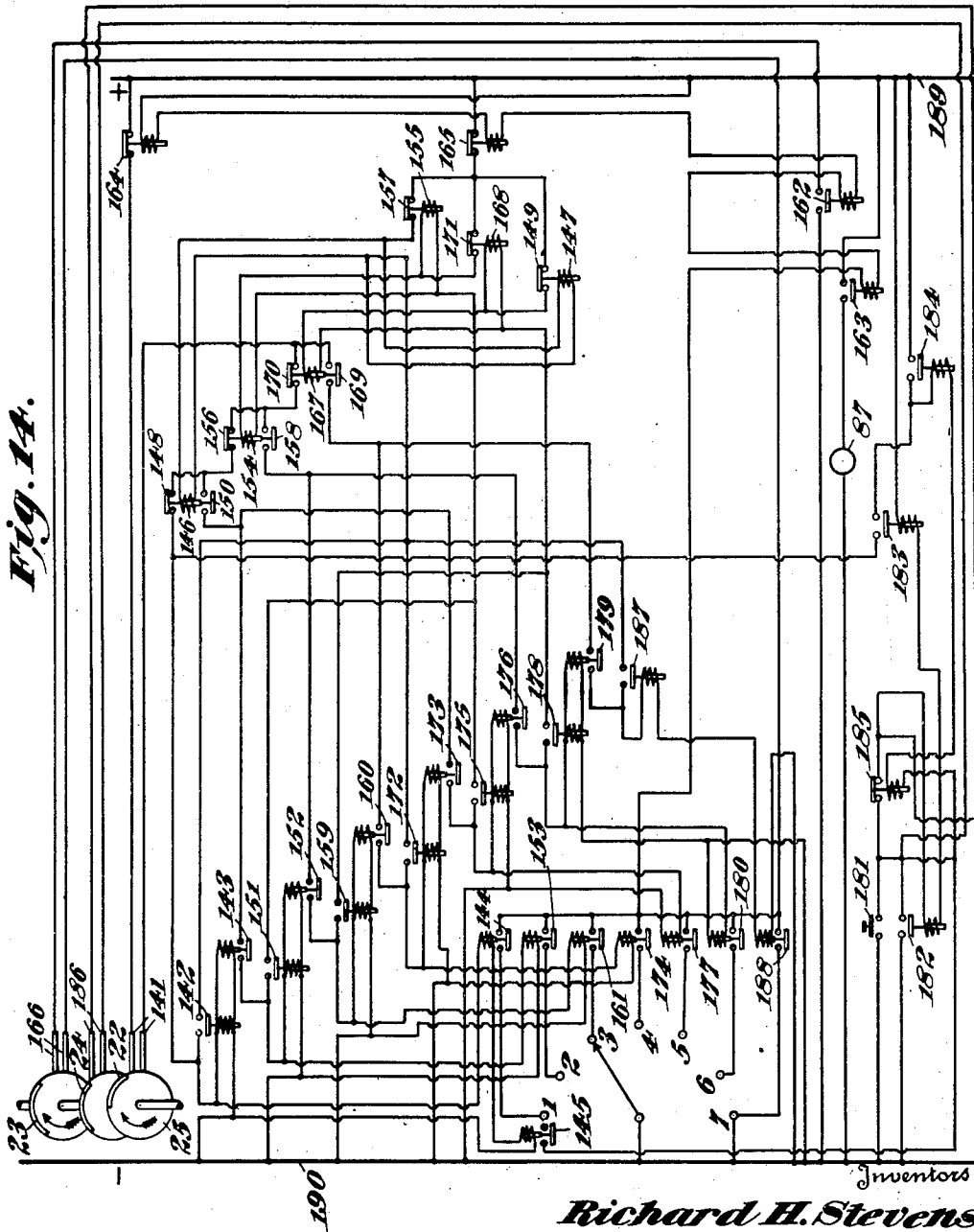
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AUTOMATIC CUTTING APPARATUS

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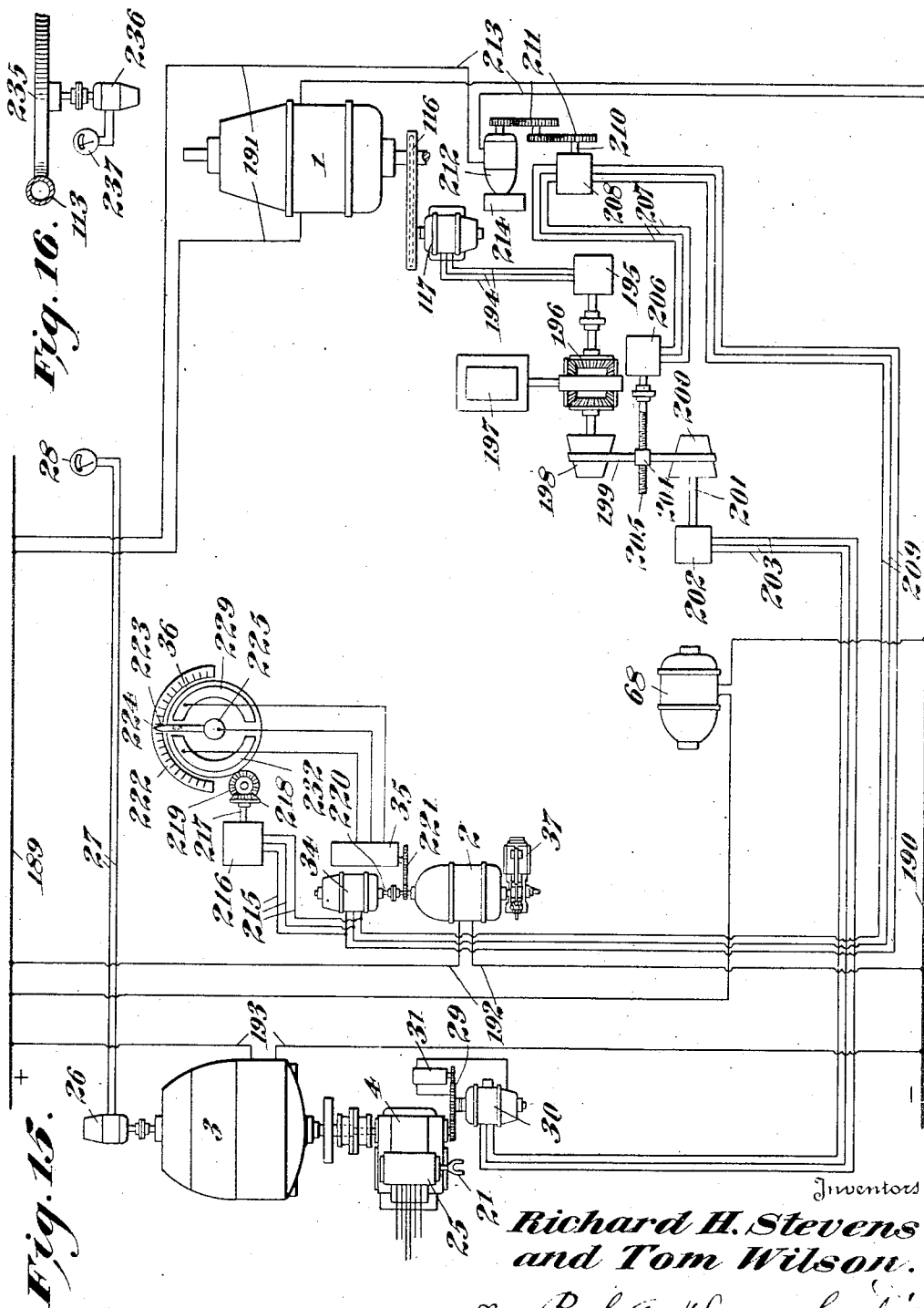
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AUTOMATIC CUTTING APPARATUS

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AUTOMATIC CUTTING APPARATUS

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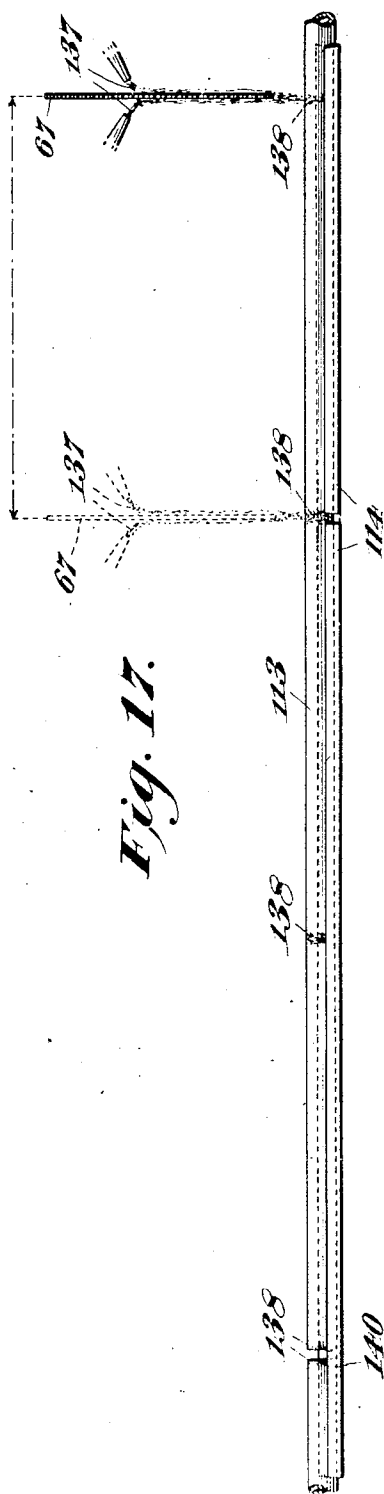


Fig. 17.

Fig. 18.

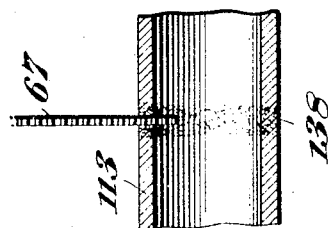


Fig. 19.

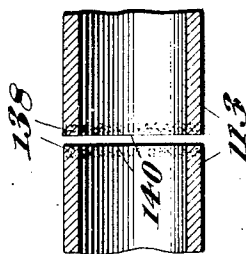


Fig. 20.

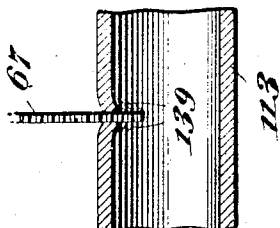
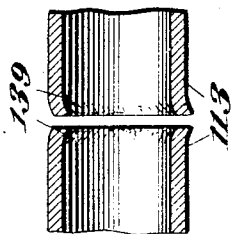


Fig. 21.



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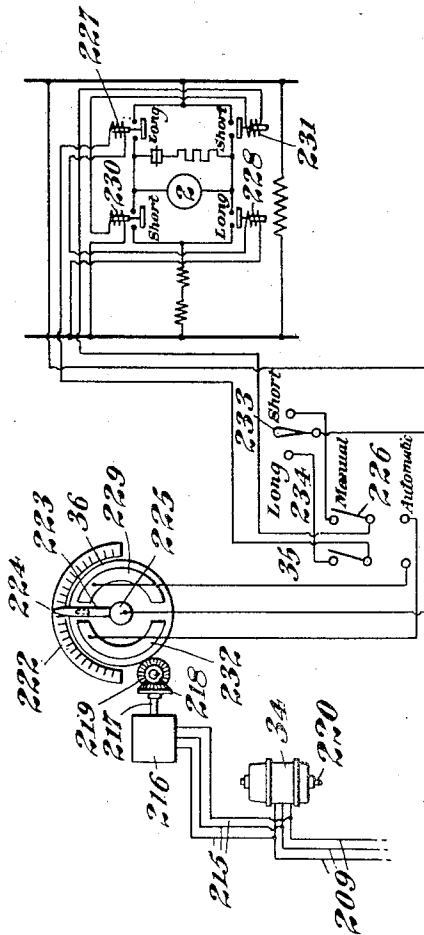
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Fig. 22.



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UNITED STATES PATENT OFFICE

2,416,652

AUTOMATIC CUTTING APPARATUS

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Application February 5, 1941, Serial No. 377,504

36 Claims. (Cl. 29—69)

1

This invention relates to a method and apparatus for automatically severing moving objects such as pipes, rods and the like into predetermined lengths and is more especially designed for use with a continuous butt weld pipe mill.

In pipe mills of this type the skelp used when it comes from the rolling mill is in the form of coils. These coils are fed rapidly in succession to a machine which uncoils the skelp and straightens it and then it is advanced in a ribbon like form on a run out table or floor of the mill to form a long loop. After a coil has been fed in this manner the next coil is placed in the machine for uncoiling. As this coil is fed to the run out table the crop ends of the rear end for the fed coil and the forward end of the coil to be fed are cut off and the two ends welded together. From the run out table and skelp is passed through a heating furnace where the skelp is heated to a welding temperature. The skelp after issuing from the heating furnace is drawn through a bell or forming rolls, then between sets of welding and sizing rolls, thence is cut into commercial lengths and passed between scale removing rolls and finally conveyed to a cooling bed to cool.

In forming butt welded pipe in this manner the skelp and pipe formed therefrom are advanced continuously at high speed. As an example in making 3-inch pipe the skelp and pipe formed therefrom will travel forward at the rate of about 125 feet a minute, while in making 1½-inch pipe the travel will be over 300 feet per minute.

The pipe is cut into commercial length just after passing between the welding and sizing rolls and it is necessary to have the saw travel at the same speed as that of the pipe during the cutting operation.

One of the objects of our invention relates generally to apparatus for cutting into predetermined lengths continuously moving pipe and particularly to means for synchronizing the movement of a pipe severing device with the moving pipe.

Another object of our invention relates to means which can be preset to indicate the travel of the pipe in feet per minute.

Another object of our invention relates to the method of cooling the pipe at the point to be cut and then severing the pipe through the cooled area.

Another object of our invention relates to mechanism which can be preset to automatically cut a plurality of pipe sections of uniform lengths.

Another object of our invention relates to mechanism by means of which pipe sections of different lengths can be automatically cut.

Another object of our invention relates to the means for adjusting the stroke of the saw carriage.

Another object of our invention relates to the

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mechanism for automatically tilting the saw carriage.

Other objects will appear hereinafter.

Having thus given a general description of our invention, we will now in order to make the same more clear refer to the annexed twelve sheets of drawings forming a part of this specification and in which like characters of reference indicate like parts:

Figure 1 is a top plan view illustrating the application of our invention;

Fig. 2 is a front elevation thereof;

Fig. 3 is a detail view showing the connection between the cut timing cam and the connecting rod;

Fig. 4 is a detail view illustrating the manner of attaching the cam roller to the stationary portion of the gear casing;

Fig. 5 is a side elevation of the gear casing for the carriage drive, with parts in section to show more clearly the construction;

Fig. 6 is a vertical section through the rocking lever;

Fig. 7 is an end elevation of the saw carriage with parts broken away and in section;

Fig. 8 is a vertical transverse section taken substantially on the line 8—8 of Fig. 2 but drawn on a larger scale;

Fig. 9 is a detail top plan view showing the general arrangement of the saw carriage tilting cam parts adjacent thereto;

Fig. 10 is a side elevation of the mechanism shown in Fig. 9;

Fig. 11 is a detail view showing the manner of supporting the movable end of the swinging frame on which the tilting cam roller is mounted;

Fig. 12 is a detail section illustrating the manner of operating the tilting cam roller for the saw carriage taken on the line 12—12 of Fig. 9.

Fig. 13 is a vertical section through one of the spring balances and dash pot for the saw carriage;

Fig. 14 is a diagram of the electrical control circuits for the sequence operation which will determine the number of reciprocations of the saw carriage per cut of pipe section;

Fig. 15 is a diagram of the electrical control circuits for producing a uniform action saw carriage drive;

Fig. 16 is a detail view of a device which indicates the travel of the pipe in feet per minute;

Fig. 17 illustrates the manner of cooling and forming dark ring marks on the pipe produced by the water or the like which is sprayed on the saw and then flowing over the pipe during each reciprocation of the saw carriage;

Figs. 18 and 19 illustrate the smooth cut made by the saw during the cutting operation through the cooled area;

Figs. 20 and 21 illustrate the rough and deformed ends of the pipes which have been cut by the saw without cooling the pipe at this point; and

Fig. 22 is a diagram illustrating an arrangement to preset the length of pipe to be cut.

Referring now to the various characters of reference on the drawings, the numeral 1 indicates the mill motor, 2 the motor for adjusting the block in the rocking lever, and 3 the motor for actuating the saw carriage through reduction gearing in casing 4 and pinion 5 and gear wheel 6 in a housing adjacent thereto. The shaft 7 for the pinion 5 is journaled in bearings 8 of a stationary lower portion 9 of the gear housing, while the gear wheel 6 has a shaft 10 journaled in a casing 11 and pivoted at its lower portion as at 12 and provided at each side of the journal bearing for shaft 10 with abutments 13 for engaging a stationary and movable stop 14 and 15 on the lower stationary portion 9 of the gear housing to limit the swinging movement of the casing 11. The movable stop 15 consists of a cylindrical plunger which is mounted in a cylindrical opening 16 with its outer end enlarged and held in contact with the abutment 13 at all times by means of a spring 17 adapted to be given greater compression by means of a set bolt 18 if desired.

The outer end of shaft 10 has a cam 19 keyed thereto for engaging a cam roller 20 which is held in engagement therewith at all times by means of the spring 17. The inner end of shaft 10 has a universal coupling 21 attached thereto for rotating the saw cut control segments 22, 23 and 24 of the limit switch 25 which is mounted on top of the casing 4 for the reduction gearing.

The motor 3 for reciprocating the saw carriage has its shaft provided at one end with a D. C. magneto generator 26 having a circuit connection 27 extending to a volt meter 28 properly calibrated for indicating the said motor speed. The opposite end of this motor shaft is connected to reduction gearing in the casing 4 adapted to drive the pinion 5 and this end of the shaft is also provided with a connection 29 for driving a synchro-tie generator 30 and a tachometer 31 which may be used in addition to the meter 28 for indicating the speed of the motor 3 at this point.

The motor 2 for adjusting the movable block in the rocking lever is mounted on a supporting frame 32 which is pivoted at opposite ends in standards 33. One end of the motor shaft is connected to a synchro-tie generator 34 and a limit switch 35 for controlling a dial indicator 36, while the opposite end of said motor shaft is provided with a friction brake 37 and a beveled gear 38 adapted to mesh with a beveled gear at the lower end of the rocking lever 39. This rocking lever has a hollow outer casing 40 in which is journaled a plain spindle 41 with a beveled gear 42 secured to its lower end meshing with beveled gear 38 and a beveled gear 43 keyed to its upper end meshing with a beveled gear 44 secured to the upper end of a threaded rod 45 disposed at a slight angle to the spindle 41 in a slideway 46 for an adjustable block 47 threaded on the rod 45 by means of which the stroke of the rocking lever and saw carriage may be varied. The block 47 has trunnions 48 extending from opposite sides which project through openings in sliding cover plates 49 and are pivoted to the bifurcated end of a pitman rod 50 having its other end pivoted to a reciprocating saw carriage 51.

At an intermediate point below the adjustable block 47 is a fixed bolt 52 to which is pivoted the bifurcated end of a connecting rod 53, the other end of which is pivoted by means of a crank pin 54 to the cam 19.

The saw carriage 51 has a rectangular frame 55 mounted to reciprocate on tracks in a supporting frame comprising stationary end frame members 56 which are secured to a sub-base 57 of the mill and connected together at the top by means of a pair of spaced rails 58 for guiding and forming a track for the flanged wheels 59 attached to the upper portion of the rectangular frame 55 of the saw carriage, while the lower portion of the rectangular frame is provided with rollers 60 having their axles disposed at an angle of 45° for engaging a square bar 61 which connects the end frame members 56 and forms a track for supporting the saw carriage. The saw carriage is also provided with a tilting frame 62 pivoted as at 63 to the vertical sides of the rectangular frame 55. An arm 64 extends outwardly from the tilting frame 62 and is provided with a sleeve 65 at its outer end for supporting a shaft 66 for a saw 67 which is driven by a motor 68 mounted on the tilting frame 62 through the sheaves 69 and 70 and connected by a belt 71.

In order to limit the movement of the tilting frame 62, a contact bracket 72 extends downwardly therefrom adapted to engage set bolts 73 and 74 threaded in the lower portion of the rectangular frame 55 and an outwardly extending bracket 75.

In order to tilt the saw for the pipe cutting operation a pair of hanger links 76 are pivoted as at 77 to the upper rear portion of the tilting frame 62 and extend downwardly therefrom and are pivoted near their lower ends as at 78 to a connecting frame 79 pivoted at its opposite end as at 80 to the vertical sides of the rectangular frame 55. The lower ends of the hanger link 76 are connected by welding or the like to the ends of a Z-bar 81 to which is attached the saw tilting cam 82 adapted to engage a cam roller 83 which is actuated in the following manner. The two stationary end frame members 56 near their lower inner surfaces are connected together by means of a pair of spaced channels 84 having a floor plate 85 thereon upon which is mounted a bracket 86 for supporting a solenoid 87 having its magnet 88 pivoted at 89 to the end of one arm of a bell crank lever 90 which is pivoted centrally by means of a pin 91 to ears 92 extending from the solenoid casing and bracket 86. The lower end of the bell crank lever 90 is pivoted to a block 93 which is secured on a shaft 94 adapted to operate a swinging frame 95 for supporting the cam roller 83 having a shaft 96 journaled in bearings 97 mounted thereon. This swinging frame 95 comprises a pair of channels 98 disposed in spaced relation with their webs vertically and their flanges extending outwardly and connected together at one end by means of a hinge lug 99 pivoted by means of a pin 100 to an eye bolt 101 pivotally secured to a bearing block 102 and attached to one of the channels 84 and the floor plate 85. The opposite end of the channels 98 of the swinging frame 95 are connected together by means of an angular member 103 having one leg extending outwardly to form a track for engaging a pair of rollers 104 journaled as at 105 in the head of a spring pressed plunger 106 mounted in a bearing block 107 secured at an intermediate point to the channel 84 and the floor plate 85. One end of the shaft

94 is pivotally connected as at 108 to the swinging frame 95 while the other end is threaded and extends through the wall of the bracket 86 which is provided with a spring seat 109 for engaging one end of a spring 110 mounted on the shaft 94, the other end of said spring engages a washer 111 held in position by means of nuts 112 threaded on the end of the said shaft. Normally the cam roller 83 does not engage the cam 82 but is held by the spring 110 in the position indicated in Figs. 9, 10 and 12.

In cutting the pipe the parts are so timed that the cam roller 83 will be adjacent to the low portion of the cam 82 when the solenoid 87 is energized. When this occurs the swinging frame 95 will swing the cam roller 83 into the position indicated in dotted lines in Fig. 12. As the saw carriage continues its stroke the cam roller 83 will ride up over the cam 82 thereby tilting the frame 62 and saw 67 into the position indicated in Fig. 7 and severing the pipe 113 in the pass or through 114 which has been advanced from the last set of rolls 115 driven by the mill motor 1, having a connection 116 with a synchro-tie generator 117.

A combined spring balance and dash pot 118 has the lower end of its piston rod pivoted as at 119 to opposite sides of the tilting frame 62. When the frame and saw 67 are tilted downwardly the pistons 120 compress the springs 121. After the cutting operation the springs 121 raise the frame 62 and saw 67, and in order to retard the return movement of each of the pistons 120 a dash pot is provided as at 122. The two combined spring balances and dash pots 118 are connected together at an intermediate point by means of a web 123 having eyes at each end for receiving the spring balances and dash pots 118 which are provided at each end with a pivoted projection 124 adapted to extend into holes in the outer ends of the horizontal arms 125 of a pair of bell crank levers 126. Each bell crank lever 126 is provided with a tubular hub portion 127 rotatably mounted on a shaft 128 which is pivoted in ears 129 secured to the top of the rectangular frame 55. The bell crank levers 126 have downwardly extending arms 130 connected together by a web plate 131 and a threaded nut 132 having trunnion projections 133 extending into holes in the lower ends of the arms 130. A bearing plate 134 is attached to the rear side of the upper portion of the rectangular frame 55, in the lower end of which is rotatably mounted a bolt 135 threaded as at 136 to engage the nut 132 by means of which the angle of the tilting frame 62 may be adjusted.

The saw 67 is driven continuously at high speed by the motor 68. As the pipe 113 is at substantially a welding temperature when cut, it is necessary to keep the saw cool, and to accomplish this a jet of cooling fluid such as water or the like is sprayed on one or both sides of the saw as indicated at 137 in Fig. 17. The cooling fluid sprayed on the saw is discharged onto the pipe 113 during the reciprocation of the saw carriage thereby cooling the pipe and producing dark rings 138 thereon, the number of which will correspond to the number of reciprocations of the saw carriage before the cut is made. As an example, assuming that the pipe is being cut into twenty foot lengths with the pipe advancing slightly less than seven feet for each reciprocation of the saw carriage, the length of pipe will have three dark rings and the cut will be made on the third forward stroke through the third

dark ring portion. Heretofore the cut has been made through the pipe while hot and having a uniform temperature thereby deforming the ends of the pipe and producing rough edges as indicated at 139 in Figs. 20 and 21, which had to be cut off or straightened.

In partially cooling the pipe at the point where it is to be severed and then cutting it through the dark ring 138 a clean cut is produced as indicated at 140 in Figs. 18 and 19. A few seconds after the pipe has been cut these dark rings disappear owing to the heat of the adjacent portions of the pipe and the pipe will then be of uniform color.

In our invention we have shown mechanism for operating a saw which is moved transversely as well as longitudinally while the pipe or other material is being cut, so that the saw is moved in timed relation with the longitudinal movement of the continuously advancing pipe during the cycle of the cutting operation.

The speed of the driving means is controlled to suit the speed of the pipe through synchro-tie generators and motors. As the speed and stroke of the saw carriage will vary with the adjustment of the pivotal end of the pitman rod 50 on the rocking lever 39, and the connecting rod 53 having a relative fixed pivotal connection at 52 in relation to the rocking arm 39 with the other end of said rod pivoted to the cam 19 and adapted to travel in a concentric path would also produce a variable stroke, it is necessary to compensate for this variation during the cutting operation.

In Figs. 1 and 2 we have shown a cam 19 engaging a cam roller 20 adapted to transmit motion to the reciprocating saw carriage 51 for accomplishing this purpose. This cam 19 which has a portion of its cam roller engaging surface reduced in height is secured to one end of the shaft 10 for the gear wheel 6 mounted in the pivoted casing 11. This cam 19 is adapted to be held at all times in contact with the cam roller 20 by means of the spring 17 and is so adjusted and timed that the cut will be made during the interval that the cam roller 20 engages this reduced height area of the cam.

The cam 19 and control segments 22, 23 and 24 of the limit switch 25 rotate one revolution for each reciprocation of the saw carriage 51 and the control for the sequence operation which will determine the number of revolutions of the cam per cut is indicated in Fig. 14. This diagram shows an arrangement that will accommodate any spacing from one revolution to seven revolutions of the cam 19 and control segments per cut. Referring now to Fig. 14 and assuming that the contact arm for the cut selector is set on No. 3 position and the coils for the relays are deenergized and in the position as indicated in the diagram, when control segment 22 makes contact with the fingers 141 it closes relays 142, 143, 144 and 145. A holding circuit is established through the coils 146 and 147 but current does not flow through the same until 22 breaks contact, at which time coils 146 and 147 are energized, opening contacts 148 and 149 and closing contact 150.

When control segment 22 makes contact with the contact fingers 141 on the second revolution, relays 151, 152 and 153 are closed with a holding circuit established through the coils 154 and 155 but current does not flow until control segment 22 breaks contact at which time 154 and 155 are energized thereby opening contacts 156 and 157 and closing contact 158. Coils 146 and 147 are de-

energized; closing contacts 148 and 149 and opening contacts 150, 142, 143, 144 and 145. The functioning of segments 23 and 24 has no effect on this sequence.

When control segments 22 makes contact with the contact fingers 141 for the third revolution, relays 159, 160 and 161 are closed thereby immediately closing relays 162 and 163 for controlling the saw solenoid 87 and opening relays 164 and 165. Relays 162 and 163 remain closed due to the interlocking action of the control segment 23 which engages the contact fingers 166 of the holding circuit. This closing of relays 162 and 163 opens relays 151, 152, 153, 159, 160 and 161, thus resetting the control relays. Control segment 23 then breaks contact to open relays 162 and 163 and close relays 164 and 165 after the cut is made.

Assuming that the cut selector had been set for No. 6, when control segment 22 makes contact with the fingers 141 on the third revolution, relays 159, 160 and 161 are closed and establishes its holding circuit through coils 167 and 168. When contact segment 22 breaks contact 169 closes and 170 and 171 are opened, and the holding circuit for 151, 152, 153, 154 and 155 is opened.

On the fourth revolution when control segment 22 makes contact with the fingers it closes relays 172, 173 and 174. One side of the circuit is made through contacts 169 and 160 and through 172, 173 and 174 coils to — bus bar line, and the holding circuit from the + bus bar line through relay contacts 165 and 167 coils 146 and 147 contactor 172 coils 172, 173 and 174 to the — bus bar line. When coils 146 and 147 are energized contact 169 is opened through the interruption of the holding circuit for 159, 160 and 161.

On the fifth revolution when contact segment 22 makes contact with the fingers, it closes relays 175, 176 and 177. One side of the circuit is made through contacts 170, 156, 150 and 173, coils 175, 176 and 177 to — bus bar line, and the holding circuit through contacts 165, 171, coils 154, 155 contact 175 and coils for 175, 176 and 177 to — bus bar line. When coils 154 and 155 are energized contacts 156 and 157 are opened and contact 158 is closed and interrupts the holding circuit for 172, 173 and 174.

On the sixth revolution when contact segment 22 makes contact with the fingers it closes relays 170, 179 and 180 and immediately closes relays 162 and 163 which control the saw solenoid 87 and open contacts 164 and 165 relays. Relays 162 and 163 remain closed through the interlocking action of the holding circuit and contact segment 23. The opening of relays 164 and 165 opens relays 175, 176, 177, 178, 179 and 180, thus resetting the control relays, and when contact segment 23 breaks contact it opens relays 162 and 163 and allows 164 and 165 to close. After the cut is made all the relays will be deenergized and be in the position indicated in Fig. 14, and the desired sequence can be repeated.

If a test piece is desired, the push button 181 is pressed and relays 182 and 183 will be closed and stay closed through the action of the holding circuit as established by relay 182. If this occurs during the first revolution of a sequence when relays 142, 143, 144 and 145 are closed, relays 162 and 163 will be closed by a circuit established from the — bus bar line through contacts 182, 145 and 144, coils 163, 162, 165 and 164 to the + bus bar line. This will actuate the saw cut solenoid 87 as described previously.

At the same time that this is occurring, the

interlocking and disconnecting circuit for the test piece circuit is functioning. After the closing of 182 and the resulting closing and interlocking of 182 and 183 and when contact segment 22 engages the contact fingers 141, a circuit will be established from the + bus bar line through segment 22, contacts 170, 156, 148, 183, coils of 184 and 185, contact 182 to — bus bar line. This will open 185 and close 184. At the same instant 22 closes the contact segment 24 will engage the fingers 186 and close a circuit shorting contact 185. As a result the holding circuit of 182 and 183 will be maintained until switch 24 is opened. At this same time coil 184 establishes a holding circuit for itself and 185 through its own contact.

When contacts 162 and 163 are closed contacts 164 and 165 will be opened deenergizing coils 144 and 145. However, contacts 164, 165, 162 and 163 will be interlocked by contact segment 23 until after contact segment 22 is opened and the test piece cut. When contact segments 23 and 24 are opened contacts 162 and 163 will open and the short around 185 will be withdrawn, allowing 185 to break the interlocking circuit of 182 and 183. When 182 opens, the interlocking circuit of 184 and 185 will be broken and 185 will close and 184 will open, thus restoring the test piece circuit to normal.

In case push button 181 is closed after the first revolution, the sequence will continue to completion, and on the next revolution when contact segment 22 engages contact fingers 141, a test piece will be cut as previously described.

Relays 187 and 188 are also provided for a seventh revolution per cut.

With this manner of control after the saw has made its cut all the coils for the relays will be deenergized and the desired sequence can then be repeated.

Referring now to Fig. 15 which is a view showing diagrammatically the electrical circuits for controlling the operation of the drive for the flying saw, the positive and negative bus bars are indicated by the numerals 189 and 190, respectively, 1 the mill motor, 2 the motor for adjusting the stroke of the rocking lever and 3 the motor for reciprocating the saw carriage, each of which is provided with a circuit 191, 192 and 193, respectively, extending to the bus bars 189 and 190. The mill motor 1 is connected by means of a belt 116 or the like to a synchro-tie generator 117 which is adapted to drive through the circuit connection 194 a synchro-tie motor 195 which has a shaft for actuating a mechanical differential 196 provided with a regulator 197 to adjust the speed of the driving motor 3 and a cone pulley 198 which is connected by means of a belt 199 to the cone pulley 200, having a shaft 201 rotated by means of a synchro-tie motor 202 having a circuit connection 203 extending to the synchro-tie generator 30 for the motor 3. For adjusting the speed of the driving motor 3 to compensate for various saw radii the belt 199 connecting the cone pulleys 198 and 200 is provided with a threaded belt shift 204 which is adjusted by means of a threaded rod 205 adapted to be rotated by means of a synchro-tie motor 206, having a circuit 207 extending to a synchro-tie motor 208. These two synchro-tie motors 206 and 208 receive their power from the synchro-tie generator 34 driven by the motor 2 for adjusting the stroke of the rocking lever, through the circuit 209. In order to provide for a vernier adjustment of the cone pulleys 198 and 200 and the saw stroke, the synchro-tie motor 208 has its shaft 210 connected by means of a

train of gearing 211 with the shaft of the motor 212 having a circuit connection 213 extending to the bus bars 189 and 190. Said motor 212 is also provided with a brake 214 for controlling the same.

The motor 3 for reciprocating the saw carriage has its shaft provided at one end with a D. C. magneto generator 26 having a circuit connection 27 extending to a volt meter 28 properly calibrated for indicating the gear motor speed.

The opposite end of the shaft for the driving motor 3 is connected to reduction gearing in the housing 4 adapted to drive the gears in the gear housings 9 and 11. The shaft of motor 3 is also connected by means of a belt, gearing or like 29 to the synchro-tie generator 30 and a tachometer 31 which may be used in addition to the meter 28 for indicating the speed of the driving motor 3 at this point.

Mounted on the reduction gear housing 4 is a limit switch 25 having the contact segments 22, 23 and 24 therein for engaging the contact fingers 141, 166 and 186 for the saw cut control circuits.

The synchro-tie generator 34 has a circuit connection 215 extending to a synchro-tie motor 216 provided with a shaft 217 having a beveled gear 218 mounted thereon meshing with a beveled gear 219 which engages a dial 36 adapted to indicate the pipe lengths being cut.

The motor 2 for adjusting the stroke of the rocking lever and the synchro-tie generator 34 are connected together by means of a shaft 220 by which is driven by means as at 221 a limit switch 35 for controlling the dial indicator, the operation of which will be more clearly understood by referring to the diagram shown in Fig. 22. In this diagram illustrated in Fig. 22 there is shown the indicating dial 36 with an arrangement to preset the length of the pipe to be cut. This dial has a scale 222 which reads in inches corresponding to the length of the travel of the pivotal point upon the swinging lever which controls the saw carriage. This dial is driven through a synchro-tie connection to the lever stroke adjusting motor 2 comprising shaft 220 synchro-tie generator 34, circuit connection 215, synchro-tie motor 216, and shaft 217 provided with a beveled gear 218 meshing with a beveled gear 219 which engages the periphery of the dial 36.

Pivoted centrally on the dial 36 is a contact arm 223 having a pointer 224 which can be moved to any predetermined value desired upon the scale 222, depending upon the length of the pipe to be cut, by means of an adjusting knob 225. With this device the operator while rolling a schedule of pipe of a given length will determine the next length of pipe to be cut and will move the contact arm 223 to a value on the scale 222 that will correspond to the arc through which the rocking lever arm will travel. To illustrate this, assume that the operator by means of the adjusting knob 225 moves the contact arm 223 to the right which would permit cutting a longer length of pipe than is being cut at the time this change is being made. Nothing will happen until the double throw switch 226 which is marked "manual" at the top and "automatic" at the bottom is thrown to the bottom. When this is done the left-hand blade of the switch 226 shown in Fig. 22 will be active and will close the circuit to the operating coils 227 and 228 marked "long" in the diagram. The circuit will be from the left-hand bus bar through coils 227 and 228

marked "long" and then back to the revolving segment 229, contact arm 223, middle stud or knob 225 of dial 36 and then back to the opposite side of the control bus bar. This will start motor 2 in the direction to increase the length or radius of the rocking lever arm and by means of the synchro-tie equipment the dial 36 will rotate until its automatic position corresponds to the preset position of the contact arm 223 at which time the motor 2 will stop.

If the operator desires to cut a shorter length of pipe he moves the contact arm 223 to the left which will permit cutting a shorter length of pipe than is being cut at the time this change is being made. When the switch 226 is thrown into the "automatic" position the right-hand blade of said switch will be active and will close the circuit to the operating coils 230 and 231 marked "short." The circuit will then be from the left-hand bus bar through coils 230 and 231 marked "short" and then back to the revolving segment 232, contact arm 223 middle stud or knob 225 of dial 36, and then back to the right-hand bus bar. This will start motor 2 in the reverse direction to that above described and will decrease the length or radius of the rocking lever and by means of the synchro-tie equipment the dial 36 will rotate until its off position corresponds to the preset position of the contact arm 223 at which time the motor 2 will stop.

If for any reason it is desirable to inch the motor 2 to change the radius of travel of the rocking lever arm, the switch 226 can be moved to the upper position marked "manual" after which motor 2 can be moved in one direction or the other depending upon which way the vertical handle 233 of the master switch 234 is moved. It will be noted that on the left-hand side the master switch 234 is marked "long" and on the right-hand side "short." The switch 226 is a standard double-pole type of control switch and is adapted for the operator to hold it in position until the desired movement is completed and then return it to the off position.

If there is any over-travel the said two-pole switch 226 will cause the motor 2 to start in the reverse direction to come back to position.

In Fig. 16 we have shown a device that will indicate the travel of the pipe in feet per minute, and a corresponding instrument that will be calibrated on a similar scale that is operated by a magnet generator on the motor 2 that rotates the rocking lever arm. This consists of a pinch roll 235 which contacts with the traveling pipe 113 which drives a D. C. magneto generator 236 to which is connected a volt-meter 237 calibrated in feet per minute. A similar instrument 28 is connected to the magneto generator 28 driven by the motor 3.

Having thus given the foregoing general and detailed description of our invention, we will now further describe the operation of the same:

Assuming that the cut selector is set on No. 3 position as indicated in Fig. 14, the pipe after leaving the welding and sizing rolls is advanced through the channel or trough 114 adjacent to the continuously reciprocating saw carriage 51, which is provided with rollers 52 and 53 for engaging tracks 58 and 61 secured to the stationary end frames 56 for guiding and supporting the saw carriage.

The saw carriage is reciprocated by means of a motor 3, through pinion 5 and gear 6 having a shaft 10 which has one end connected by means of a universal coupling 21 to a limit switch 25

having segment contacts 22, 23 and 24 mounted therein for controlling the saw cut, while the opposite end of said shaft 10 has a cam 19 for engaging a cam roller 20. A connecting rod 53 has one end pivoted to the cam 19 by means of a crank pin 54 while the other end is pivoted to the rocking lever 39 by a relatively fixed bolt 52. A pitman 50 has one end pivoted to the reciprocating saw carriage 51, while the other end is pivoted to the adjustable block 47 on the threaded end 45 which can be raised and lowered to give a greater or less stroke to the saw carriage to change somewhat the speed of its travel, and owing to the fact that the pivotal point at 48 on the rocking lever for the pitman 50 will have a greater movement than the pivoted ends of the connecting rod 53 the saw carriage will travel at a slightly greater speed than the pipe. In order to allow for this variation so that the speed of travel of the saw carriage will be the same as the movement of the pipe the gear shaft 10 is provided with a cam 19 for engaging a cam roller 20. As indicated in Fig. 2 the cam 19 and the cam roller 20 are in the position they will assume during the cutting operation. It will be noted that the pivotal connection for the rod 53 on the cam will travel in the arc of a circle during the cutting operation which will produce a variable speed, and to compensate for this the cam is provided with a peripheral portion which is reduced in height or flattened and the cam is also adapted to swing laterally, as its shaft 10 is journaled in the pivoted casing 11 and held in contact with the cam roller at all times by means of spring 17. In this manner the speed of the saw carriage is slightly reduced and a uniform speed with the pipe is produced.

At the end of the third revolution of the cam 19 the limit switch 25 will close the circuit to energize the solenoid 97 thereby swinging the frame 95 with the cam roller 93 mounted thereon into the path of the saw tilting cam 82 thereby tilting the frame 92 and saw 67 carried thereby to make the cut. After which the tilting frame and saw are returned to the normal position by means of the combined spring balances and dash pots 118, and the spring 110 on the shaft 94 will swing the frame 95 with the cam roller 93 out of alignment with the cam 82.

Although we have shown and described our invention in considerable detail, we do not wish it to be limited to the exact construction shown and described, but may use such substitutions, modifications or equivalents thereof, as are embraced within the scope of our invention, or as pointed out in the claims.

Having thus described our invention, what we claim as new and desire to secure by Letters Patent is:

1. A machine for severing continuously moving material into lengths, comprising a carriage, means for reciprocating the carriage, a frame pivotally mounted on the carriage, means mounted on the pivoted frame for cutting the material, means for normally retaining the cutting means out of cutting engagement with the material during the reciprocation of the carriage, electrically controlled means for tilting the pivoted frame and cutting means laterally to cut the material into predetermined lengths during a reciprocation of the carriage, and preset means electrically actuated for automatically controlling the lengths of material cut.

2. A machine for severing continuously moving material into lengths, comprising a stationary

frame, a reciprocating carriage mounted thereon, a frame pivoted to the reciprocating carriage, a saw continuously driven mounted on the pivoted frame for cutting the continuously moving material, means for retaining the saw out of cutting engagement with the material during the reciprocation of the carriage, and means automatically controlled for tilting the pivoted frame to cut the material into predetermined lengths during a reciprocation of the carriage.

3. A machine for severing continuously moving pipe or the like, comprising a stationary frame, a carriage mounted on the stationary frame, means for reciprocating the carriage, a frame pivotally mounted in the reciprocating carriage, cutting means continuously driven mounted on the pivoted frame, means for normally retaining the cutting means out of cutting engagement with the pipe during the reciprocation of the carriage, electrically controlled means for tilting the pivoted frame to cut the pipe into predetermined lengths during a reciprocation of the carriage, and resilient means for returning the tilted frame to its normal position after the cutting operation.

4. A machine for severing a continuously moving pipe or the like into predetermined lengths, comprising a reciprocating carriage, a frame pivoted to the reciprocating carriage, a saw mounted on the pivoted frame, means for continuously rotating the saw, means for normally retaining the saw out of cutting engagement with the pipe during the reciprocation of the carriage, means electrically controlled for tilting the pivoted frame and saw laterally into cutting engagement with the pipe during a reciprocation of the carriage, and resilient means for returning the tilted frame to its normal position.

5. A machine for severing a continuously moving pipe or the like into predetermined lengths, comprising a stationary frame, a carriage mounted to reciprocate in the stationary frame, actuating means for reciprocating the carriage, means for adjusting the stroke of the carriage, a frame pivoted to the carriage, a saw mounted on the pivoted frame, means mounted on the pivoted frame for continuously rotating the saw, means for retaining the saw out of cutting engagement with the pipe during a reciprocation of the carriage, means electrically controlled by the actuating means for the carriage for tilting said pivoted frame and saw laterally into cutting engagement with the pipe, and means for returning the pivoted frame and saw to their normal positions.

6. A machine for severing continuously moving pipe or the like, comprising a pair of spaced stationary side frame members, tracks connecting the upper and lower portions of the stationary side frame members, a rectangular frame having wheels attached thereto for engaging the tracks, means for reciprocating the rectangular frame, a frame pivoted to the opposite ends of the rectangular frame, a saw mounted on the pivoted frame, means mounted on the pivoted frame for continuously rotating the saw, a cam pivotally attached to the pivoted frame, a cam roller adapted to engage the cam to tilt the pivoted frame and saw mounted thereon into cutting engagement with the pipe, and automatic means for controlling the length of pipe cut.

7. A machine for severing continuously moving pipe or the like, comprising a stationary frame, a carriage mounted in the stationary frame, means for reciprocating the carriage, a

frame pivotally mounted in the carriage, a saw mounted on the pivoted frame, a motor mounted on the pivoted frame for continuously rotating the saw, means for automatically controlling the stroke of the reciprocating carriage, means for normally retaining the saw out of cutting engagement with the pipe during the reciprocation of the carriage, electrically operated means for tilting the pivoted frame and the saw into cutting engagement with the pipe, and resilient means for returning the pivoted frame to its normal position after the cutting operation.

8. A machine for severing continuously moving pipe or the like, comprising a carriage, a frame pivotally mounted on the carriage, a saw mounted on the pivoted frame, means for reciprocating the carriage, means for indicating the relative speeds of the carriage and the moving pipe, means for synchronizing the speed of the carriage with the moving pipe, means for retaining the saw out of cutting engagement with the pipe during reciprocations of the carriage, electrically operated means for tilting the pivoted frame to project the saw into cutting engagement with the pipe, and means for returning the pivoted frame and saw to their normal position.

9. A machine for severing continuously moving pipe or the like, comprising a stationary frame, tracks supported by the stationary frame, a carriage having wheels engaging the tracks, means for reciprocating the carriage on the tracks, a frame pivotally mounted on the carriage, a saw mounted on the pivoted frame, means for adjusting the speed of the carriage, means for synchronizing the speed of the carriage with the moving pipe, means for retaining the saw out of cutting engagement with the pipe during a reciprocation of the carriage, selective means electrically operated for tilting the pivoted frame to project the saw into cutting engagement with the pipe, and resilient means for returning the pivoted frame and saw to their normal position.

10. A machine for severing continuously moving pipe or the like, comprising a stationary frame, tracks supported by the stationary frame, a carriage having wheels engaging the tracks, means for reciprocating the carriage on the tracks, a frame pivotally mounted on the carriage, a saw mounted on the pivoted frame, means mounted on the pivoted frame for continuously rotating the saw, a cam pivotally connected to the reciprocating carriage and pivoted frame, a cam roller laterally movable in relation to the cam, electrically actuating means for projecting the cam roller into the path of the cam to tilt the pivoted frame to swing the saw into cutting engagement with the pipe, resilient means for retracting the cam roller from the path of the cam, and means for returning the pivoted frame and saw to their normal position.

11. A machine for severing continuously moving pipe or the like, comprising a carriage, means for reciprocating the carriage, a frame pivotally mounted on the carriage, cutting means mounted on the pivoted frame, means for adjusting the stroke of the reciprocating carriage, means electrically actuated for automatically controlling the lengths of pipe cut, means for normally retaining the cutting means out of cutting engagement with the pipe during the reciprocation of the carriage, and means electrically controlled for tilting the pivoted frame and cutting means laterally to cut the pipe into predetermined lengths

during one of the reciprocations of the carriage.

12. A machine for severing continuously moving pipe or the like, comprising a stationary frame, tracks on the stationary frame, a carriage having wheels engaging the tracks, means for reciprocating the carriage, a frame pivotally mounted on the carriage, a saw mounted on the pivoted frame, means for continuously rotating the saw mounted on the pivoted frame, means for adjusting the stroke of the reciprocating carriage, means for automatically controlling the length of pipe cut, means for normally retaining the cutting means out of cutting engagement with the pipe during the reciprocation of the carriage, means for tilting the pivoted frame laterally to swing the saw into cutting engagement with the pipe during a reciprocation of the carriage, and means for synchronizing the movement of the reciprocating carriage with the pipe during the cutting operation.

13. A machine for severing continuously moving pipe or the like, comprising a carriage, means for continuously reciprocating the carriage, cutting means mounted on the carriage, means for adjusting the stroke of the carriage, means electrically actuated for automatically controlling the lengths of the pipe to be cut during the reciprocation of the carriage, means for normally retaining the cutting means out of cutting engagement with the pipe during the reciprocation of the carriage, preset means electrically controlled for tilting the cutting means laterally to cut the pipe into predetermined lengths during the first or after a plurality of reciprocations of the carriage, and means for synchronizing the movement of the cutting means with the pipe during the cutting operation.

14. A machine for severing continuously moving pipe or the like, comprising a stationary frame, tracks on the frame, a carriage having wheels engaging the tracks, driving means for reciprocating the carriage, a frame pivotally mounted on the carriage, a saw mounted on the pivoted frame, means for continuously rotating the saw mounted on the pivoted frame, means for normally retaining the saw out of cutting engagement with the pipe during the reciprocation of the carriage, a rocking lever mounted adjacent to the carriage, a pitman having its ends pivoted to the carriage and the rocking lever, means for adjusting the pivoted end of the pitman on the rocking lever to vary the stroke of the reciprocating carriage, a rod connecting the driving means with the rocking lever, means for varying the stroke between the driving means and the rocking lever, and means for tilting the saw into cutting engagement with the pipe during a reciprocation of the carriage.

15. A machine for serving continuously moving pipe or the like, comprising a stationary frame, tracks secured thereto, a carriage having wheels engaging the tracks, driving means for reciprocating the carriage, a saw mounted on the carriage, a rocking lever mounted adjacent to the carriage, a connection between the carriage and the rocking lever, means for adjusting the connection between the carriage and the rocking lever to vary the stroke of the carriage, a connection between the driving means and the rocking lever, means for varying the stroke between the driving means and the rocking lever, means for normally retaining the saw out of cutting engagement with the pipe during the reciprocation of the carriage, and means for tilting

the saw into cutting engagement with the pipe during a reciprocation of the carriage.

16. A machine for severing continuously moving pipe or the like, comprising a carriage, means for reciprocating the carriage, means for adjusting the stroke of the carriage, a saw mounted on the carriage, means for normally retaining the saw out of cutting engagement with the pipe during the reciprocation of the carriage, means electrically actuated for tilting the saw into cutting engagement with the pipe during a reciprocation of the carriage, preset means electrically controlled for governing the number of reciprocations of the saw carriage before the cutting operation, means for synchronizing the movement of the pipe with the carriage during the cutting operation, and means electrically actuated for automatically controlling the lengths of pipe cut.

17. A machine for severing continuously moving pipe or the like, comprising a stationary supporting frame, a carriage mounted on said supporting frame, a frame pivotally mounted on the carriage, a continuously rotating saw mounted on the pivoted frame, means for reciprocating the carriage, means for normally retaining the saw out of cutting engagement with the pipe during the reciprocation of the carriage, means for tilting the saw into cutting engagement with the pipe during a reciprocation of the carriage, and means for automatically controlling the length of pipe to be cut.

18. A machine for severing continuously moving pipe or the like, comprising a stationary supporting frame, tracks mounted on the supporting frame, a carriage mounted on said supporting frame, means for reciprocating the carriage, a frame pivotally mounted on the carriage, a saw mounted on the pivoted frame, means for continuously rotating the saw mounted on the pivoted frame, a cam pivotally attached to the carriage and the pivoted frame and movable therewith, a cam roller normally disposed adjacent to the path of the cam, automatic means for projecting the cam roller into alignment with the path of the cam during the reciprocation of the carriage to tilt the saw into cutting engagement with the pipe, and means for retracting the cam roller from the path of the cam after the cutting operation.

19. A machine for severing continuously moving pipe or the like, comprising a stationary frame, a carriage mounted on the stationary frame, means for continuously reciprocating the carriage, a frame pivotally mounted in the carriage, a continuously rotating saw mounted on the pivoted frame, means for normally retaining the saw out of cutting engagement with the pipe during the reciprocation of the carriage, means for successively tilting the saw into cutting engagement with the pipe during a reciprocation of the carriage to produce pipe sections of equal lengths, and means automatically controlled for cutting pipe sections in successively different lengths.

20. A machine for severing continuously moving pipe or the like, comprising a stationary frame, a carriage mounted on the stationary frame, means for continuously reciprocating the carriage, a frame pivotally mounted on the carriage, a continuously rotating saw mounted on the pivoted frame, means for adjusting the stroke of the carriage, means for normally retaining the saw out of cutting engagement with the pipe during the reciprocation of the car-

riage, means for tilting the saw into cutting engagement with the pipe, and automatic means for controlling the length of the pipe to be cut.

21. A machine for severing continuously moving pipe or the like, comprising a carriage movable longitudinally of the pipe to be severed, driving means for continuously reciprocating the carriage, a rotatable saw mounted on the carriage, means for retaining the saw out of cutting engagement with the pipe during a reciprocation of the carriage, automatic means for moving the saw into cutting engagement with the pipe, and automatic means actuated by the driving means for the carriage for controlling the length of the pipe to be cut.

22. A machine for severing continuously moving pipe or the like, comprising a carriage movable longitudinally of the pipe to be severed, actuating means for continuously reciprocating the carriage, a rotatable saw mounted on the carriage, means for retaining the saw out of cutting engagement with the pipe during a plurality of reciprocations of the carriage, automatic means for moving the saw into cutting engagement with the pipe, means for synchronizing the movement of the carriage with the pipe during the cutting operation, and means for indicating the length of pipe cut.

23. A machine for severing continuously moving pipe or the like, comprising a carriage movable longitudinally of the pipe to be severed, actuating means for reciprocating the carriage, a rotatable saw mounted on the carriage, means for normally retaining the saw out of cutting engagement with the pipe during the reciprocation of the carriage, automatic means for moving the saw into cutting engagement with the pipe for each reciprocation of the carriage, means for indicating the lengths of pipe cut, a regulator for adjusting the speed of the actuating means for the carriage, and means for adjusting the speed of the carriage to compensate for various saw radii.

24. A machine for severing continuously moving pipe or the like, comprising a stationary frame, a carriage adapted for reciprocation on said stationary frame, a saw mounted on the carriage, means for normally retaining the saw out of cutting engagement with the pipe during the reciprocation of the carriage, preset means for automatically moving the saw into cutting engagement with the pipe during a reciprocation of the carriage, a motor having a connection with driving gearing for reciprocating the carriage, a rocking lever mounted between the driving gearing and the carriage, a connecting rod between the driving gearing and the rocking lever, a pitman rod connecting the carriage with the rocking lever, a screw-threaded rod journaled in the rocking lever, a block screw-threaded to engage the screw-threaded rod, a pivoted connection between one end of the pitman rod and the adjustable block, and means for rotating the screw-threaded rod to adjust the block to change the stroke of the carriage.

25. A machine for severing continuously moving pipe or the like comprising a stationary frame, a carriage mounted on the stationary frame, means for continuously reciprocating the carriage, a frame pivotally mounted in the reciprocating carriage, a saw continuously driven mounted on the pivoted frame, preset electrically controlled means for tilting the pivoted frame to cut the pipe into lengths in succession during the reciprocation of the carriage, a spring bal-

ance provided with a dash pot connecting the carriage with the pivoted frame for returning the pivoted frame to its normal position, means for adjusting the spring balance, and adjustable means for limiting the movement of the pivoted frame on the carriage.

26. A machine for severing a continuously moving pipe or the like into predetermined lengths, comprising a stationary frame, a carriage mounted to reciprocate in the stationary frame, actuating means for reciprocating the carriage, a frame pivoted to the carriage, a saw mounted on the pivoted frame, means mounted on the pivoted frame for continuously rotating the saw, preset means electrically controlled by the actuating means for the carriage for tilting said pivoted frame and saw laterally into cutting engagement with the pipe for successively cutting pipes of uniform length, resilient means for returning the pivoted frame and saw to their normal positions, and means for normally retaining the saw out of cutting engagement with the pipe during the reciprocation of the carriage.

27. A machine for severing a continuously moving pipe or the like, comprising a stationary frame, a carriage mounted to reciprocate longitudinally of the moving pipe in the stationary frame, actuating means for reciprocating the carriage, a frame pivoted to the carriage, a saw mounted on the pivoted frame, means mounted on the pivoted frame for rotating the saw, means electrically controlled by the actuating means for the carriage for tilting said pivoted frame to project the saw into cutting engagement with the pipe for automatically cutting pipe of different lengths in succession during a reciprocation of the carriage, means for returning the pivoted frame and saw to their normal positions, and means for normally retaining the saw out of cutting engagement with the pipe during the reciprocation of the carriage.

28. A machine for severing continuously moving pipe or the like, comprising a pair of spaced stationary side frame members, tracks connecting the upper and lower portions of the stationary side frame members, a rectangular frame having wheels attached thereto for engaging the tracks, means for reciprocating the rectangular frame, a frame pivoted to the opposite ends of the rectangular frame, a saw mounted on the pivoted frame, means mounted on the pivoted frame for continuously rotating the saw, a vertically movable cam having link connections pivotally attached to the pivoted frame and the carriage, a cam roller mounted for movement transversely of the cam, electrically actuated means for advancing the cam roller into the path of the cam during the reciprocation of the carriage to tilt the pivoted frame and project the saw mounted thereon into cutting engagement with the pipe, and means for automatically returning the pivoted frame and saw to their normal positions.

29. A machine for severing successively lengths of pipe or the like, comprising a carriage, a motor mounted adjacent thereto for reciprocating the carriage, gearing driven by the motor, a rocking lever mounted between the motor and the carriage, a screw-threaded rod journaled in the rocking lever, an adjustable block screw-threaded to engage the threaded rod, a rod connecting the driven gearing with the rocking lever, a pitman connecting the carriage with the adjustable block, means for rotating the threaded rod to raise or lower the adjustable block to vary the stroke of the carriage, a pipe guide disposed parallel

to the direction of the path of travel of the reciprocating carriage, a saw pivotally mounted on the carriage, means for tilting the saw into cutting engagement with the pipe, means for returning the saw to its normal position after the cutting operation, and means for normally retaining the saw out of cutting engagement with the pipe during the reciprocation of the carriage.

30. A machine for severing continuously moving pipe or the like, comprising a carriage, a motor mounted adjacent thereto for reciprocating the carriage, gearing driven by the motor, a rocking lever mounted between the motor and the carriage, a screw-threaded rod journaled in the rocking lever, an adjustable block screw-threaded to engage the screw-threaded rod, a rod connecting the driven gearing with the rocking lever, a pitman connecting the carriage with the adjustable block, a motor geared to the threaded rod for raising or lowering the adjustable block to vary the stroke of the carriage, a pipe guide disposed parallel to the direction of the path of travel of the reciprocating carriage, a saw pivotally mounted on the carriage, means for synchronizing the movement of the carriage with the pipe during the cutting operation, means for returning the saw to its normal position after the cutting operation, means for normally retaining the saw out of cutting engagement with the pipe during the reciprocation of the carriage, and means for advancing the saw laterally into cutting engagement with the pipe during a reciprocation of the carriage.

31. A machine for severing continuously moving pipe or the like, comprising a carriage, a motor mounted adjacent thereto for reciprocating the carriage, a gear driven by the motor having its shaft journaled in a gear casing, a cam secured to one end of the gear shaft, a cam roller rotatably mounted on the gear casing for engaging the cam, a rocking lever mounted between the motor and the carriage, a screw-threaded rod journaled in the rocking lever, an adjustable block screw-threaded to engage the screw-threaded rod, a connecting rod pivotally attached to the cam and rocking lever, a pitman connecting the carriage with the adjustable block, means for rotating the screw-threaded rod for adjusting the screw-threaded block to vary the stroke of the carriage, a pipe guide disposed parallel to the direction of the path of travel of the reciprocating carriage, a saw pivotally mounted on the carriage, means for tilting the saw into cutting engagement with the pipe during the reciprocation of the carriage, means actuated simultaneously with the rotation of the cam for synchronizing the movement of the carriage with the pipe during the cutting operation, and means for returning the saw to its normal position after the cutting operation.

32. A machine for severing continuously moving pipe or the like, comprising a carriage, a motor mounted adjacent thereto for reciprocating the carriage, a gear driven by the motor having its shaft journaled in a pivoted gear casing, a cam secured to one end of the gear shaft adapted for lateral movement therewith, a cam roller rotatably mounted on a stationary portion of the gear casing for engaging the cam, resilient means for holding the cam at all times in contact with the cam roller, a rocking lever mounted between the motor and the carriage, a connecting rod pivotally attached to the cam and the rocking lever, a pitman connecting the carriage with the rocking lever and pivoted thereto,

means for adjusting the pivotal end of the pitman on the rocking lever for varying the stroke of the carriage, a pipe guide disposed parallel to the direction of the path of travel of the reciprocating carriage, a saw pivotally mounted on the carriage, means for tilting the saw into cutting engagement with the pipe during the reciprocation of the carriage, and means actuated simultaneously with the rotation of the cam for synchronizing the movement of the carriage with the pipe during the cutting operation, and means for returning the saw to its normal position after the cutting operation.

33. A machine for severing continuously moving pipe or the like, comprising a carriage, a motor mounted adjacent thereto for reciprocating the carriage, a gear driven by the motor having its shaft journaled in a pivoted gear casing, a cam secured to one end of the gear shaft adapted for lateral movement therewith, a cam roller rotatably mounted on a stationary portion of the gear casing for engaging the cam, resilient means for holding the cam at all times in contact with the cam roller, a rocking lever mounted between the motor and the carriage, a connecting rod pivotally attached to the cam and the rocking lever, a spindle journaled in the rocking lever, a beveled gear secured to the upper and lower ends of the spindle, a screw-threaded rod journaled in a slide-way adjacent to the spindle, a beveled gear secured to the upper end of the threaded rod meshing with a beveled gear secured to the upper end of the spindle, an adjustable block screw-threaded to engage the screw-threaded rod adapted for longitudinal movement in the slide-way, a trunnion extending laterally from opposite sides of the adjustable block, a pitman having one end pivoted to the trunnions and the opposite end of said pitman pivoted to the carriage, a motor having a shaft provided with a bevel gear meshing with a beveled gear on the lower end of the spindle adapted to adjust the screw-threaded block to vary the stroke of the carriage, a pipe guide disposed parallel to the direction of the path of travel of the reciprocating carriage, a saw mounted on the carriage, means for tilting the saw into cutting engagement with the pipe, means actuated simultaneously with the rotation of the cam for synchronizing the movement of the carriage with the pipe during the cutting operation, and means for returning the saw to its normal position after the cutting operation.

34. A machine for severing continuously moving pipe or the like, comprising a carriage, a motor mounted adjacent thereto for reciprocating the carriage, a gear driven by the motor having its shaft journaled in a pivoted gear casing, a cam secured to one end of the gear shaft adapted for lateral movement therewith, a cam roller rotatably mounted on a stationary portion of the gear casing for engaging the cam, resilient means for holding the cam in contact with the cam roller, a rocking lever mounted between the motor and the carriage, a connecting rod pivotally attached to the cam and the rocking lever, a pitman rod connecting and pivotally attached to the carriage and the rocking lever, a pipe guide disposed parallel to the direction of the path of travel of the reciprocating carriage, a saw pivotally mounted on the carriage, means for

tilting the saw into cutting engagement with the pipe during the reciprocation of the carriage, means for adjusting the pivotal connection of the end of the pitman on the rocking lever to vary the reciprocating stroke of the carriage, and means actuated by the cam for synchronizing the movement of the carriage during the cutting operation.

35. A machine for severing continuously moving pipe or the like, comprising a carriage, a motor mounted adjacent thereto for reciprocating the carriage, a gear driven by the motor having its shaft journaled in a gear housing pivotally mounted on a stationary gear casing, a cam secured to one end of the gear shaft adapted for lateral movement therewith, a cam roller rotatably mounted on the stationary portion of the gear casing for engaging the cam, resilient means for holding the cam in contact with the cam roller, a rocking lever mounted between the motor and the carriage, a connecting rod pivotally attached to the cam and the rocking lever, a pitman rod connecting and pivotally attached to the carriage and the rocking lever, means for adjusting the pivoted end of the pitman rod on the rocking lever for varying the stroke of the carriage, a pipe guide disposed parallel to the direction of the line of travel of the reciprocating carriage, a saw pivotally mounted on the carriage, and means for tilting the saw into cutting engagement with the pipe during the reciprocation of the carriage.

36. A machine for severing continuously moving pipe or the like, comprising a carriage movable longitudinally of the pipe to be severed, driving means for continuously reciprocating the carriage, a rotatable saw mounted on the carriage, means for retaining the saw out of cutting engagement with the pipe during a reciprocation of the carriage, automatic means for effecting a relative movement between the saw and the pipe for cutting the pipe, and automatic means actuated by the driving means for the carriage for controlling the length of pipe to be cut.

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