June 5, 1928. 1,672,652

J. H. MANSFIELD

TIE ADZING MACHINE

Filed April 27, 1925 7 Sheets-Sheet 1

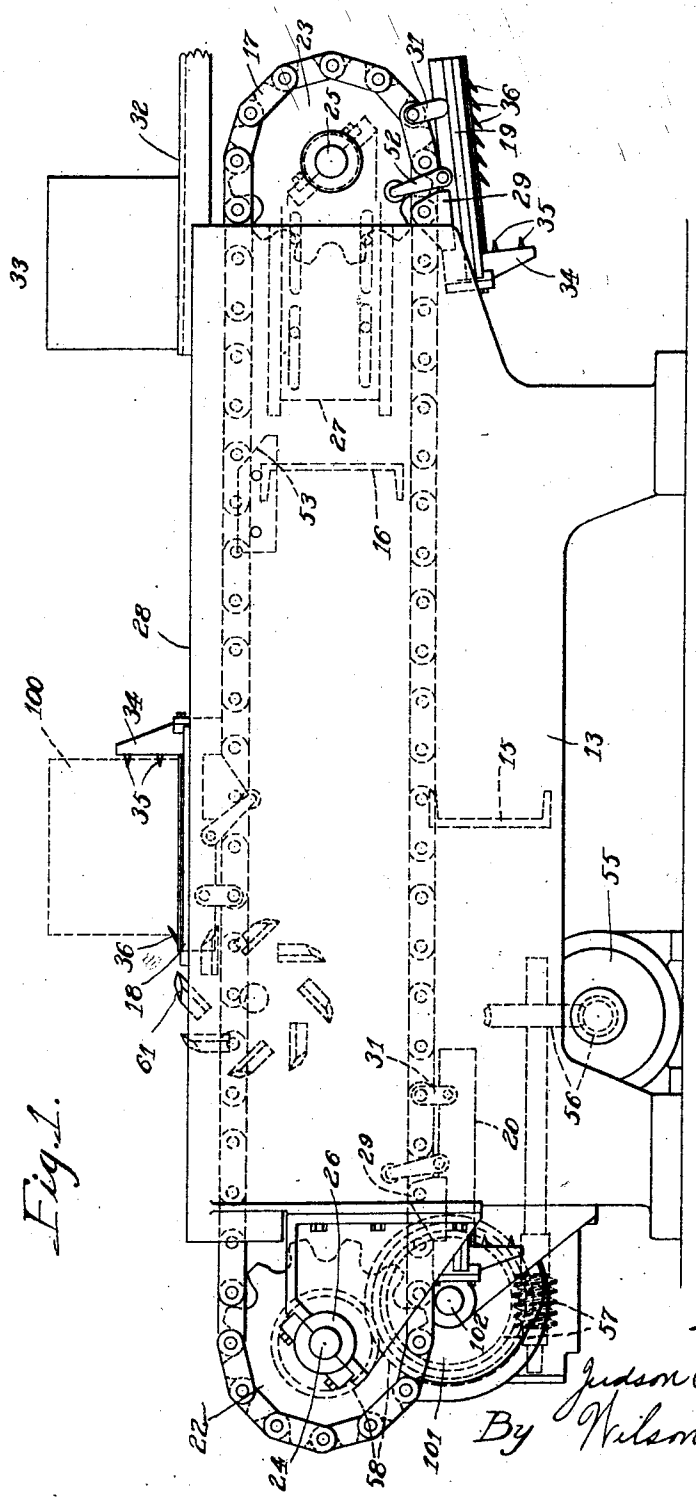



Fig. 1.

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TIE ADZING MACHINE

Filed April 27, 1925 7 Sheets-Sheet 2

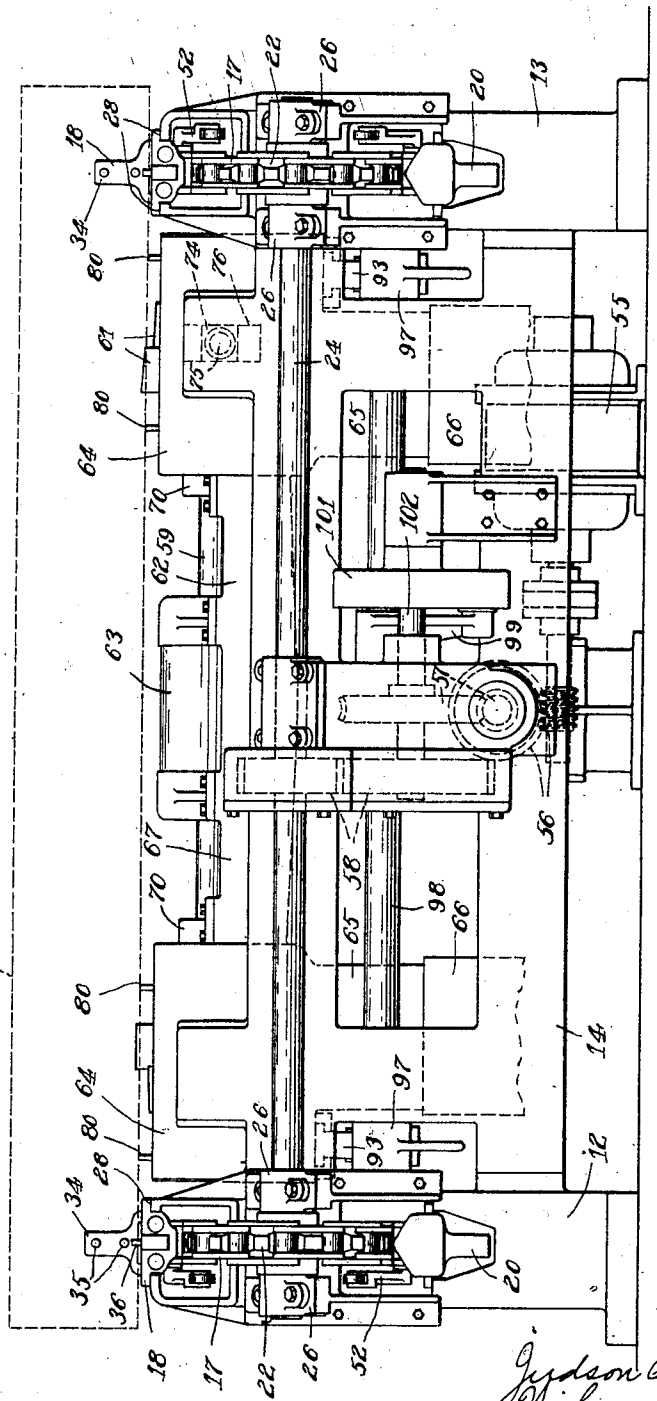



Fig. 2.

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TIE ADZING MACHINE

Filed April 27, 1925 7 Sheets-Sheet 3

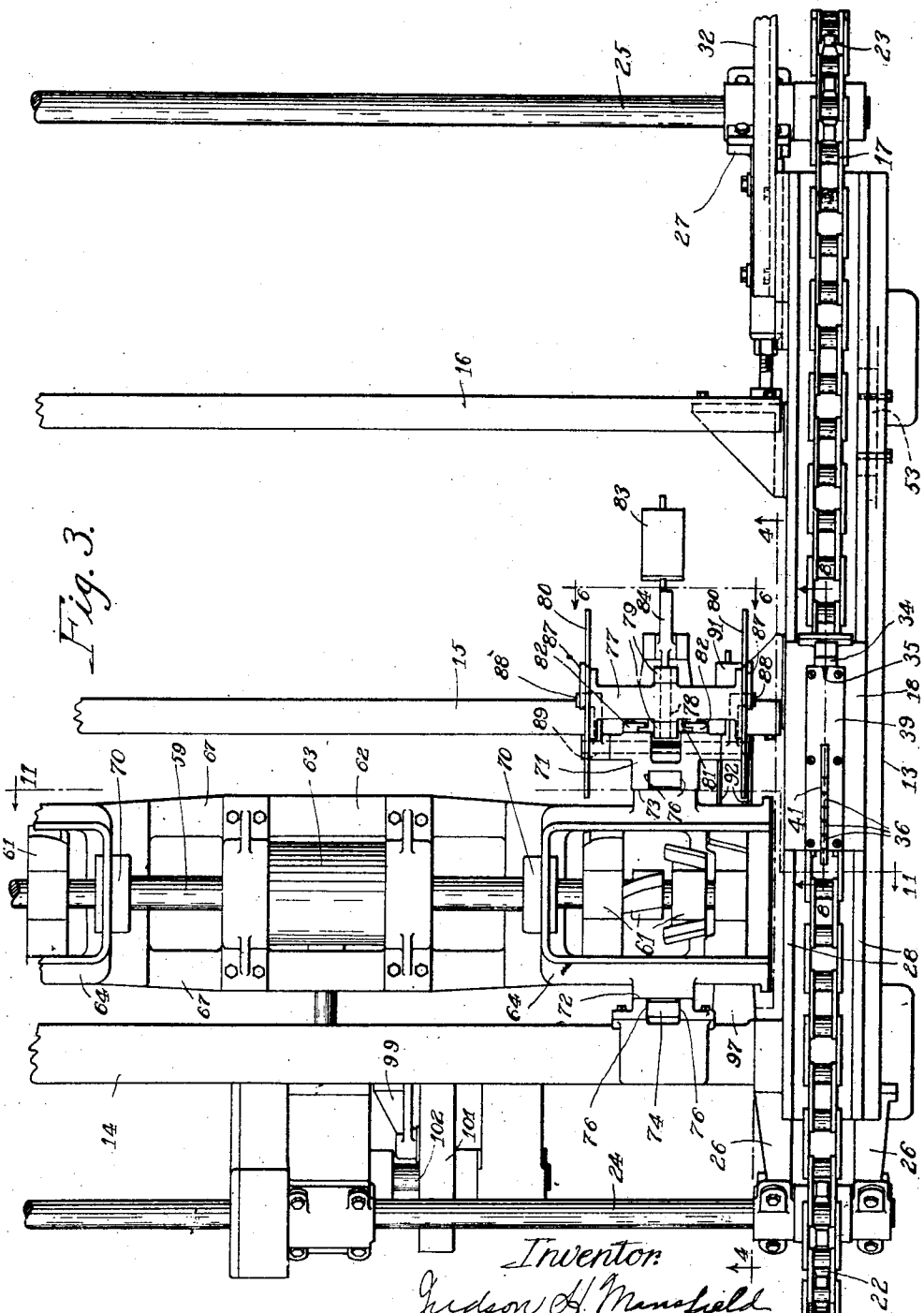


Fig. 3.

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TIE ADZING MACHINE

Filed April 27, 1925 7 Sheets-Sheet 4

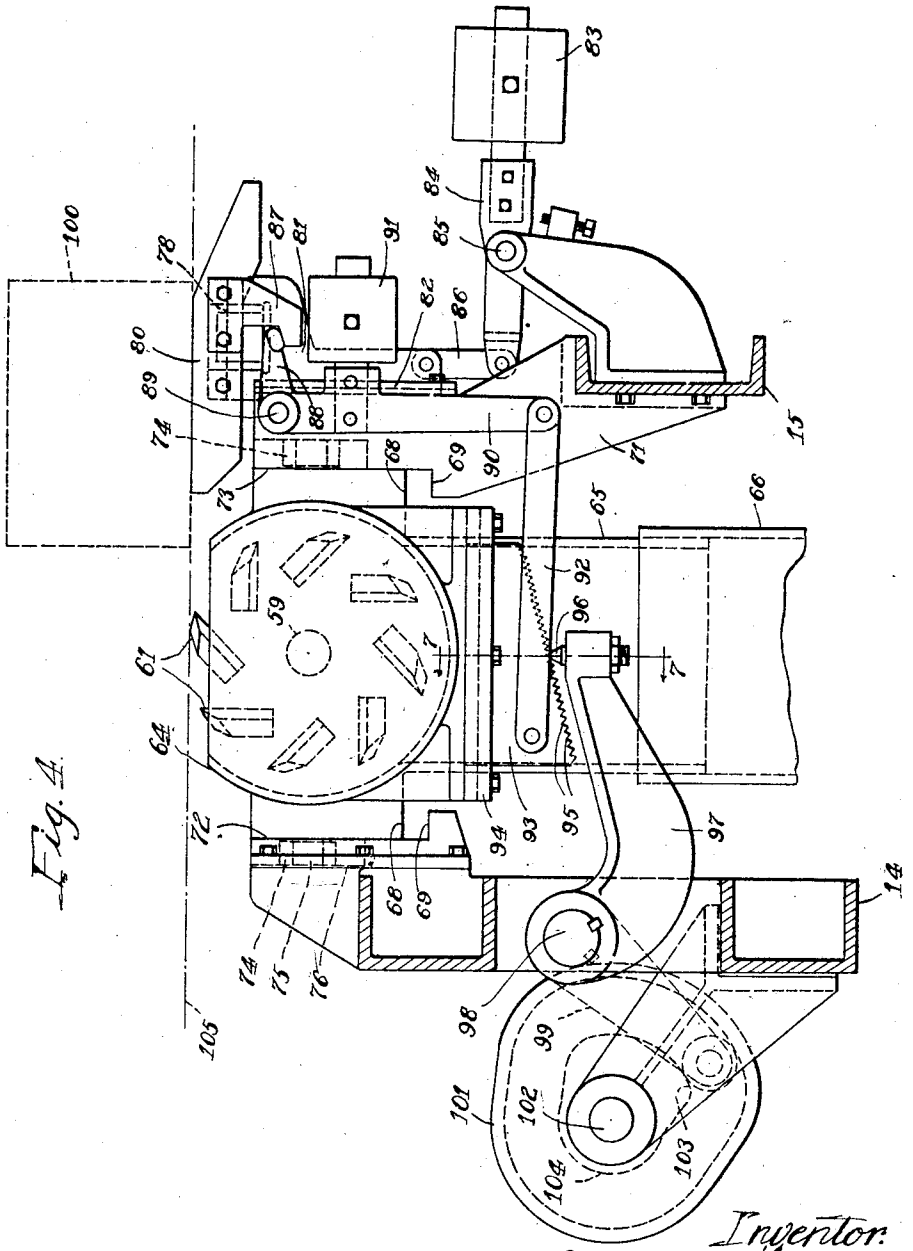



Fig. 4

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June 5, 1928. **1,672,652**

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TIE ADZING MACHINE

Filed April 27, 1925 7 Sheets-Sheet 5

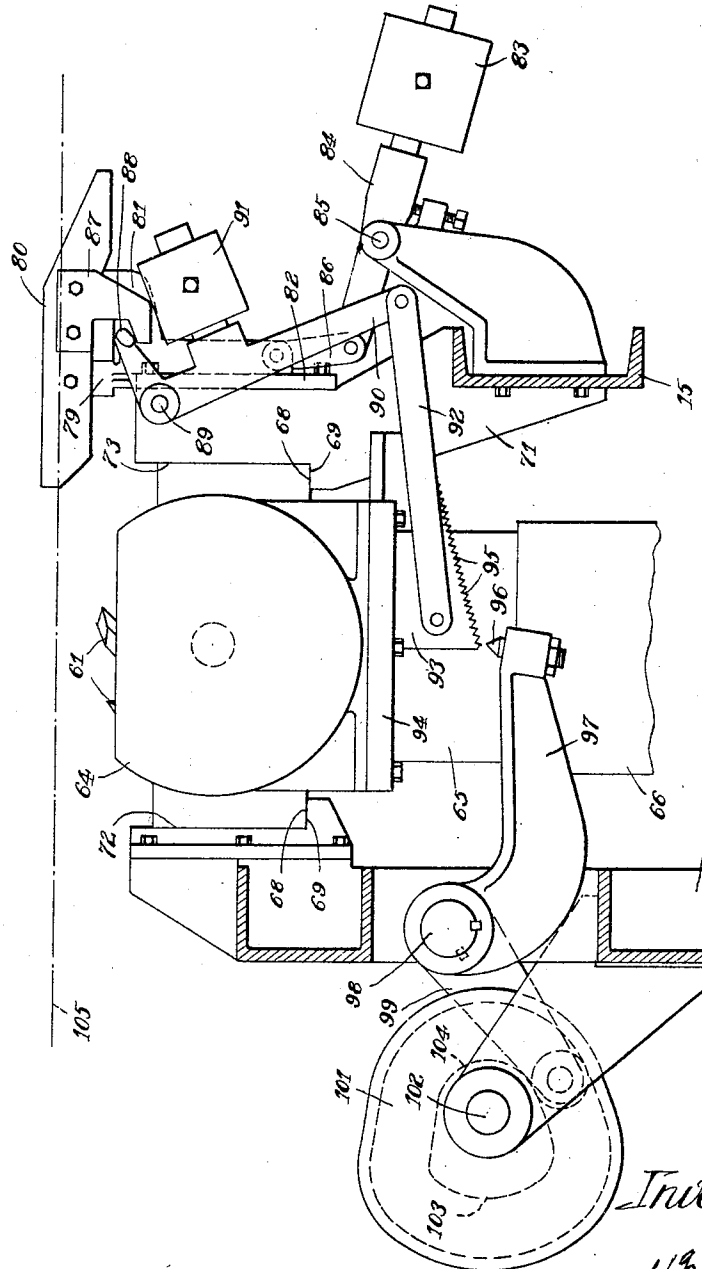



Fig. 5.

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TIE ADZING MACHINE

Filed April 27, 1925 7 Sheets-Sheet 6

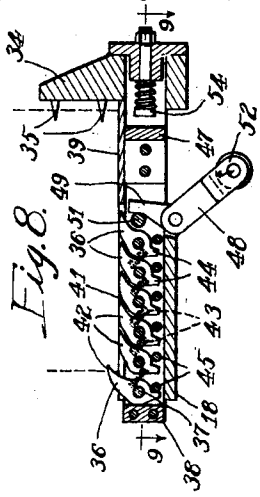


Fig. 8.

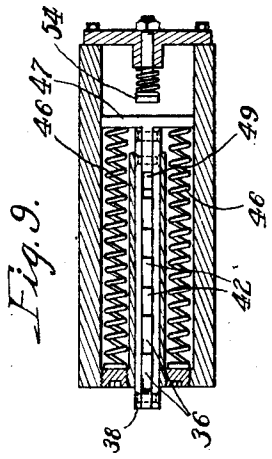


Fig. 9.

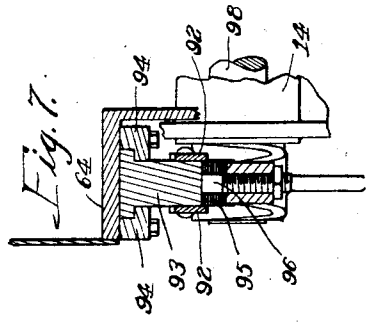


Fig. 7.

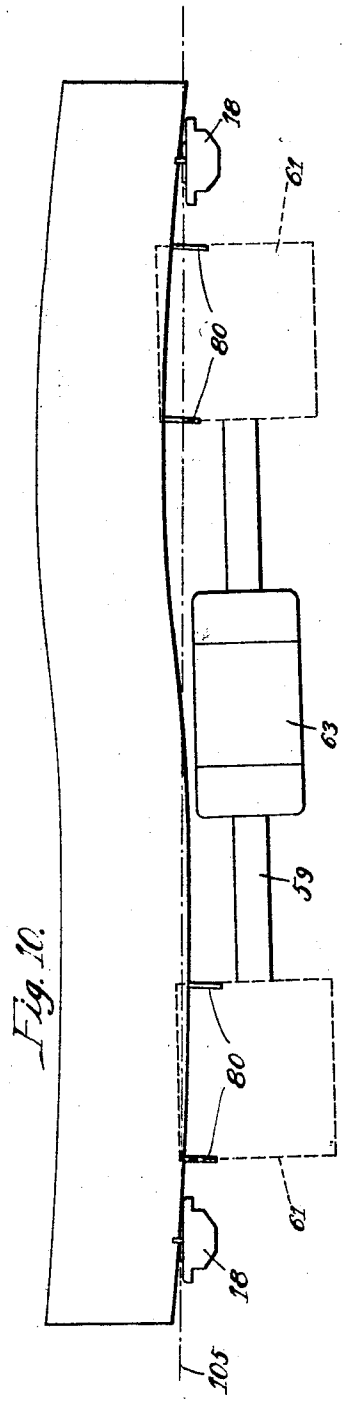


Fig. 10.

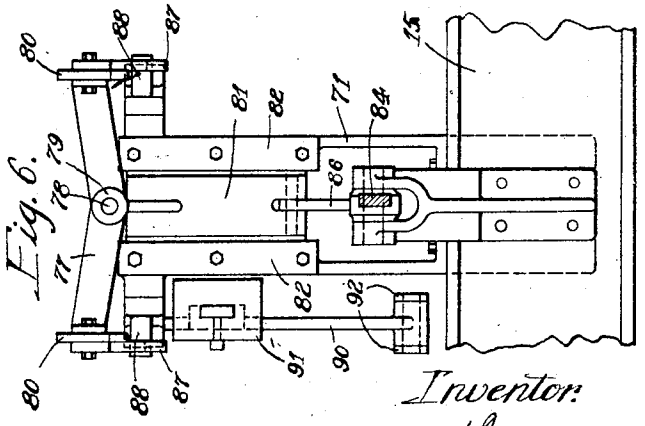


Fig. 6.

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TIE ADZING MACHINE

Filed April 27, 1925

7 Sheets-Sheet 7

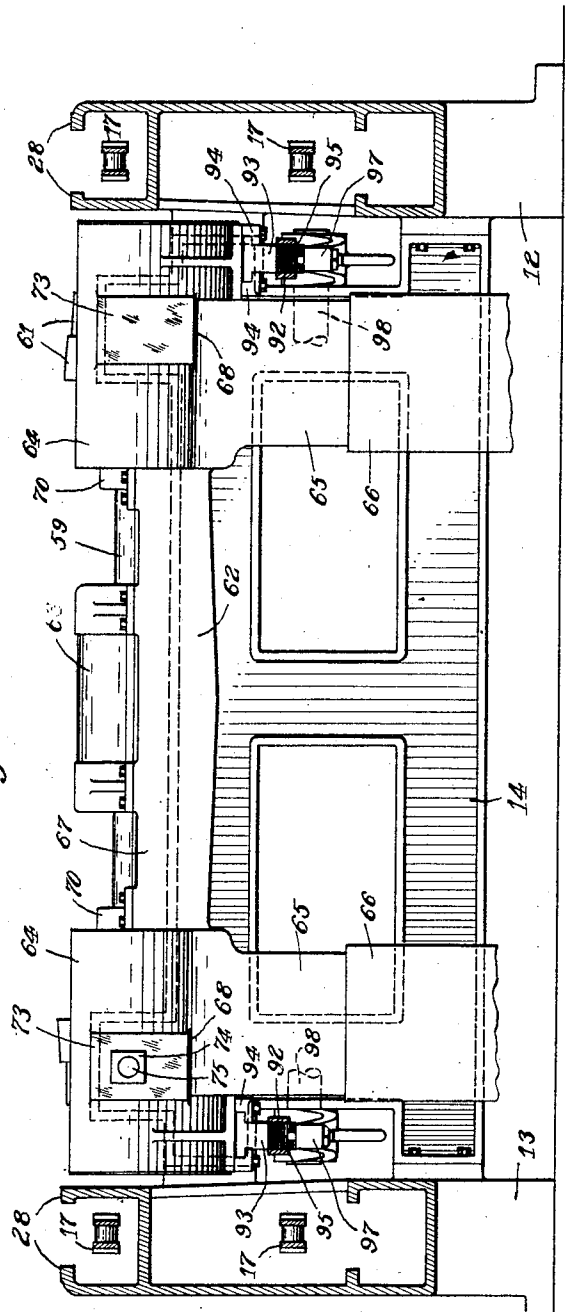



Fig. 11

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Patented June 5, 1928. 1,672,652

# UNITED STATES PATENT OFFICE.

JUDSON H. MANSFIELD, OF ROCKFORD, ILLINOIS, ASSIGNOR TO GREENLEE BROS. & CO., OF ROCKFORD, ILLINOIS, A CORPORATION OF ILLINOIS.

## TIE-ADZING MACHINE.

Application filed April 27, 1925. Serial No. 25,981.

This invention relates to machines for adzing timbers and has more particular reference to the adzing of railway ties to provide seats for the rail plates.

In adzing or gaining ties it is desired to produce as nearly a uniform result as possible and to this end it is considered essential that the adzing surfaces on each tie shall be flat, parallel and coplanar, and that the adzing cuts shall be substantially of a uniform depth. It is found however, in practice that the ties vary considerably in size, shape and proportions and that some are warped and twisted. The problem therefore, of uniformly adzing railway ties having such irregularities presents many difficulties, especially when it is considered that a commercially practical machine for this purpose must necessarily be automatic in the sense that the ties, fed in succession to the machine, must be adzed in accordance with the requirements above-mentioned irrespectively of the irregularities referred to in the shape of each tie. The primary purpose therefore, of the present invention is to provide an improved machine for automatically adzing railway ties to meet the requirements of the trade, irrespective of irregularities in shape, size or proportions of each tie.

In furtherance of this general object my invention contemplates adzing each tie in succession while it is securely and rigidly held in a fixed position or plane and automatically locating the adzing cutters in a working position determined by the particular shape of the face or surface to be adzed. The adzing feed may be accomplished either by movement of a tie past the cutters or of the cutters past the tie. In the present example the tie to be adzed is moved past the cutters located at an adzing station. Furthermore, it is preferred to move or feed the ties in succession past the adzing station and to automatically position the cutters for adzing each tie, the positioning of the cutters being determined and controlled by the particular shape of the tie with the view to effecting the uniform result desired.

With the foregoing in mind my invention aims to move the ties in succession in a fixed plane past the adzing station by means of a traveling conveyor having carriages on which the tie rests at each end and which securely grips and holds the tie so that there is no chance for it to rock, slip or be otherwise displaced from a fixed determined position while being adzed. The adzing cutters are mounted on a unitary structure so as to be in fixed relationship for adzing parallel coplanar surfaces, and said unitary structure is normally out of working position and adapted to be moved into the working position as determined by the particular shape of the tie. The adzing unit is therefore, in the present embodiment of the invention, mounted with capacity for movement in a plane perpendicular to the fixed plane in which the tie is moved by said conveyor means and each adzing cutter is movable independently of the other toward and from the tie to accommodate the varying irregularities at opposite ends of a tie although such movement is in the nature of a tilting movement of the entire adzing unit in order to maintain the fixed relationship of the cutters. Such positioning of the adzing cutters, is effected by novel means actuated by a cutter control device normally located in the path of the tie just before it reaches the adzing station and adapted to be engaged or actuated by the face of the tie to be adzed for effecting movement of the adzing cutters to the particular working position determined by the shape of such tie. In the present example, this control device includes a cradle in advance of each adzing cutter for determining the depth of the cut and equalizing such depth in the event that the surface to be adzed is inclined with respect to the fixed plane in which the tie travels. Each cradle actuates a variable cutter positioning means which in turn is acted on by a power operated means for advancing its cutter a variable degree to the working position, which variable degree is determined by the particular shape of the surfaces to be adzed. The cutters remain in the set working position until after the tie has been adzed and will then be returned to a normal position withdrawn from the path of the tie. The cutters will be subsequently repositioned by the controlling device for adzing the next succeeding tie in accordance with its particular characteristics.

I have also aimed to provide improved means for gripping and holding a tie while it is being adzed or acted upon by any

instrumentality, either adzing cutters or otherwise.

Still another object is to provied a tie adzing machine having such characteristics and functions as to make it possible of embodiment in a thoroughly practical machine for the purposes intended.

Other objects and attendant advantages will be appreicated by those skilled in this art as the invention becomes better understood by reference to the following description when considered in connection with the accompanying drawings, in which—

Figure 1, is a side elevation of a tie adzing machine embodying my invention;

Fig. 2, is an end elevation of the machine looking at the delivery end;

Fig. 3, is a fragmentary top view of the machine;

Fig. 4, is an enlarged vertical section taken substantially on the line 4—4 of Fig. 3 showing the parts in the working or operative position in which they are shown in the preceeding figures;

Fig. 5, is a similar vertical section but showing the parts in the normal position;

Fig. 6, is an enlarged vertical section taken on the line 6—6 of Fig. 3;

Fig. 7, is a detail section taken on the line 7—7 of Fig. 4;

Fig. 8, is an enlarged vertical section through one of the tie gripping carriages;

Fig. 9, is a horizontal section taken on the line 9—9 of Fig. 8;

Fig. 10, is a diagrammatic view showing the position of the adzing unit as determined by the control device in this particular instance; and

Fig. 11, is a vertical transverse section through the machine taken substantially on the line 11—11 of Fig. 3.

As explained above my invention is capable of embodiment in various forms, the present example being one in which the ties are carried in succession past an adzing station at which the adzing cutters are located and at which the cutters as a unit are automatically positioned for adzing each tie. It should be understood therefore, that the present disclosure is merely for purpose of illustration. For clarity the several cooperating mechanisms making up this embodiment will be described separately and in combination wherever necessary under subject headings as follows:

*Frame structure.*

Any suitable or preferred frame structure may be employed to properly support and coordinate the working parts. In the present case I have provided upright side frames designated generally by 12 and 13 extending longitudinally of the machine and rigidly joined together by a cross frame 14 adjacent to the delivery end of the machine and a suitable number of cross-connections such as channel bars 15 and 16 spaced apart longitudinally of the machine.

Each side frame is especially shaped to accommodate and provide a support for an endless conveyor or carrier for moving the ties, which conveyor structure will now be described.

*Tie conveyor.*

Inasmuch as the conveyor structure on each side frame is identical a detailed description of one will be sufficient for an understanding of the invention.

The tie conveyor on the side frame 13 comprises, in this instance, an endless chain 17 having a plurality, three in the present instance, of tie carriages designated generally by 18, 19 and 20 attached to the peripheral side of the conveyor chain at equally spaced points thereon. The conveyor chain is trained over sprocket wheels 22 and 23 fixedly secured to cross shafts 24 and 25 respectively, in turn journaled on suitable bearing brackets 26 and 27 on the side frame, the latter bracket being adjustable thereon to keep the conveyor chain taut.

The side frame provides a housing through which the conveyor chain passes and the top of said frame provides spaced horizontal track-ways 28 upon and between which each carriage is adapted to ride and be moved lengthwise there-along by travel of the conveyor chain. Each carriage is suitably connected to the conveyor chain as by means of links 29 and 31.

A tie will be loaded onto each carriage when it is moved to a loading station at the right hand end of the machine viewing Fig. 1 and will be carried by the carriage along the track 28 to the adzing station at which the tie will be adzed. The ties may be loaded onto the carriage by any suitable means and at present I have shown merely a supporting rail 32 on which a tie is advanced to the loading station designated by 33 past which each carriage passes in succession. Each carriage has an upstanding fixed dog or abutment 34 provided at its face with suitable gripping means such as teeth 35 adapted to engage the tie and remove it from the supporting rail onto the carriage as the latter advances.

In order to securely grip and hold the tie on the carriage so that there will be no chance of its being displaced in any way from a fixed set position thereon I have equipped each carriage with a series of pivoted dogs 36 so mounted and arranged as to engage the side of the tie opposite from that engaged by the teeth or spurs 35 and force the tie against the latter and at the same time draw and hold the tie onto the carriage. As shown in Figs. 8 and 9 said dogs 36 are pivotally mounted at 37 on a

slide 38 located centrally between the sides of the carriage and movable lengthwise thereon. The carriage top 39 has an opening 41 through which the pointed gripping ends 42 of the dogs normally project. The dogs are held in this normal position by suitable yielding means, such for example, as coiled compression springs 43 interposed between adjoining dogs as clearly shown in Fig. 8, the extended position of the dogs being limited by their opposite ends 44 striking against suitable stops 45. The dog-carrying slide 38 is consequently urged toward the rear end of the carriage by coiled compression springs 46 which act between the carriage body and a cross-head 47 on the slide. Said slide is adapted to be moved forwardly on the carriage against the pressure of said springs 46 by means of a lever 48 pivotally mounted on the underside of the carriage and having an upstanding arm 49 engaging a pin 51 on the slide and a depending roller-equipped arm 52 adapted to be actuated by a stationary cam 53 (Figs. 1 and 3) on the side frame.

When the carriage passes under the tie at the loading station the upstanding pointed ends of the dogs 36 will be pressed down by contact with the underside of such tie. After the tie has been fully removed from the rails 32 so that it rests upon and is supported adjacent to its ends by the carriages at both sides of the machine, the depending roller arm 52 of each carriage will be brought into contact with its cam 53 and swung thereby in a counter-clockwise direction viewing Fig. 8, thereby moving the slide 38 to the left upon the carriage. This movement of the slide will withdraw one or more of the dogs from beneath the tie and permit such dogs to assume an operative position under the influence of their springs 43 with the pointed ends projecting up through the opening 41. When the roller lever passes the cam block 53 the springs 46 will force the slide 38 to the right, thereby fixedly pressing the first projecting dog into the front side of the tie. Because of the inclination of this pointed end of the dog the tie will be drawn down onto the carriage so as to securely and immovably hold the tie thereon. Thus the tie will be so gripped and held by the spurs 35 at the rear side and the dog 36 at the front side as to prevent it from rocking, shifting or being otherwise displaced or moved from a fixed, set position on the carriage. The tie held in this manner at each end will be carried by the carriages in the plane of travel thereof past the adzing station and will adzed while so held by the carriages and as they are being moved past the adzing cutters. The tie will be discharged from the carriages at the discharge end of the machine by actuating the roller arms 52 by any suitable means (not shown) to withdraw the gripping dogs, thus permitting the tie to fall or be otherwise removed from the carriage. A suitable spring cushion buffer 54 cushions the striking impact of the slide when discharging the tie.

*Conveyor drive mechanism.*

The conveyor may be driven, preferably at a constant speed, by any suitable mechanism. That shown comprises a motor 55 connected by two sets of worm and worm gears 56 and 57 and spur gears 58 to the conveyor cross-shaft 24. This driving train is also employed to operate mechanism described hereinafter for moving the adzing cutters into the working position. Said mechanism is therefore, operated in timed relation with the travel of the tie carriages as will be presently described.

*Adzing unit.*

The adzing unit, best shown in Figs. 3, 4 and 11, comprises a mandrel 59, a suitable adzing cutter mounted on each end of the mandrel, each cutter comprising in this instance a series of cutter heads 61 equipped with cutting blades arranged to cut a flat surface, and a frame structure or yoke designated generally by 62 providing bearing support for the mandrel and a housing about each cutter. In this instance the cutter mandrel is driven by an electric motor 63 which forms part of the adazing unit, the mandrel 59 serving as the armature shaft or rotor for the motor. The cutter housings 64 are suitably shaped to enclose each adzing cutter except at the top through which the cutter projects, and are further shaped to provide directly beneath each cutter a chip chute 65 which cooperates with and discharges into a chip delivery chute 66. The cutter housings are joined together in rigid relationship by spaced intermediate frame or yoke parts 67 upon and between which the motor 63 is mounted. The mandrel 59 is suitably journaled on this yoke frame structure as in a bearing 70 supported on the inner wall of each cutter housing.

The adzing unit normally rests on the main frame structure in a non-working or inoperative position shown in Fig. 5. To this end each cutter housing is provided at its front and back with projecting bosses 68 which rests on ledges 69 on said main frame structure. In this instance the ledges for the front bosses are carried by the front cross-frame 14 and the ledges at the rear are carried by upstanding brackets designated generally by 71, rigidly mounted on the cross-channel bar 15, there being one of these brackets for each end of the adzing unit.

The adzing unit is further mounted so that it may be moved vertically as by raising it

from said supporting ledges 69 and is given proper lateral support to hold it in a vertical plane so that it will not be displaced longitudinally of the machine. Said unit is further guided so that it will not be displaced crosswise of the machine, that is, longitudinally of its mandrel axis. To this end each cutter housing has front and rear vertical bearing faces 72 and 73 which bear against complemental bearing faces on the crossframe 14 and the yoke-supporting brackets 71, which bearing faces maintain the adzing unit in a vertical plane but permit free movement of the unit in said frame. The means for holding the unit from displacement lengthwise of the mandrel comprises a bearing block or slide 74 mounted on a trunnion 75 on the front of one of the cutter housings 64 (in this instance the left hand housing viewing Fig. 11) and a similar bearing block and trunnion at the back thereof, said bearing blocks being guided between vertical ways 76 on the cross frame 14 and the adjacent bracket 71.

By reason of the foregoing construction the adzing unit may be raised as an entirety from its mounting on the ledges 69 and may be tilted in its vertical plane as about the center of the trunnions 75 for moving the right hand cutter higher or lower than the left hand cutter, although without disturbing the fixed relationship of the cutters at opposite ends of the unit. The mechanism for raising and lowering the adzing unit will be presently described.

*Automatic control mechanism.*

An independent control mechanism is provided for automatically raising each end of the adzing unit and consequently each adzing cutter to a working position determined by the shape and location of the surface to be adzed. Since the construction of the control devices are identical a detailed description of one will suffice. It should be understood however, that the control mechanism disclosed herein is for purpose of illustration merely, and that the function contemplated, namely of automatically moving the adzing cutters to a working position determined by the shape of the surfaces to be adzed, might be accomplished by other means. My invention should not therefore, be confined to the construction herein illustrated.

The mechanism shown in detail in Figs. 3 to 6 inclusive for controlling the adzing cutter at the left hand end (above referred to) of the adzing unit comprises a control means adapted to be actuated by the tie, a variable height regulating means adapted to be positioned by said control means, and power operated means adapted for raising the adzing cutter to a working position determined by said height regulating means.

In this instance the control means comprises a cradle located adjacent to and in advance of the adzing cutter and having a pair of spaced, parallel rails 80 joined and carried by a cross-member 77. Said cross-member is pivotally mounted on a pin 78 upon and between the bifurcated upper end 79 of a bracket 81 which in turn is mounted to slide vertically on the adjacent stationary bracket 71 above refered to, and guided thereon by slide bearing plates 82. The cradle-supporting bracket is normally held in an elevated position with the cradle rails in the path of an approaching tie and adapted to be depressed by such tie in a cutter-controlling movement. Any suitable means such as a weight 83 on a lever 84 fulcrumed at 85 on a stationary frame bracket and pivotally connected by a link 86 to the cradle-supporting bracket 81, may be employed for holding the cradle elevated but permitting it to be depressed. To each cradle rail 80 is secured a depending hook-shaped arm 87 the lower end of which is adapted to lift the outer end of an arm 88 fixed to a rock-shaft 89 mounted on the upper end of the stationary bracket 71. To one end of this rock-shaft is fixed a pendant lever 90 which has an offset weight 91 serving to constantly urge the shaft 89 in a clockwise direction (viewing Fig. 4) to hold either one or both arms 88, as the case may be, in contact with the lower end of the complemental cradle arm 87. Said pendant lever is connected by a pair of links 92 (Fig. 7) to the variable height regulating means above refered to consisting of a slide 93 held by guide plates 94 on the underside of the adjacent cutter housing 64. The underside of the slide 93 has an inclined serrated face 95 against which a power operated lifting abutment 96 is adapted to act for lifting the adzing cutter to the working position. This abutment is adjustable on a lifting arm 97 fixed to a rock shaft 98 which is mounted on the cross-frame 14 and adapted to be rocked in a lifting and a return stroke by a roller-equipped arm 99 by operation of a rotary cam 101. Said cam is fixed to a shaft 102 which forms part of the driving train above referred to. The roller on the arm 99 rides in a cam-way which has a high part 103 for holding the adzing cutter in the working position during the entire adzing operation and a low part 104 for holding the lifting abutment 96 retracted while the adzing unit rests on the ledges 69 during the interval between adzing operations. While there is only a single cam for rocking the shaft 98 there is a lifting lever 97 for the control mechanism for lifting each end of the adzing unit.

*Operation.*

The normal non-working or inoperative

position of the control mechanism is shown in Fig. 5, from which it will be seen that the cradle is held in an elevated position by the weight 83 which is heavy enough to overcome the weight 91. If a substantially straight, regular tie 100 is now advanced to the adzing station by the conveyor carriages as above described, it will strike the cradle rails and depress both cradles substantially uniformly to the position shown in Fig. 4. The arms 88 of each control mechanism will swing down according to the extent of downward movement of the complemental cradle arms 87 by reason of the action of the weights 91, thus moving each height-regulating slide 93 to the position shown. When now the cam 101 swings each lifting lever 97 upwardly to its fixed limit its abutment 96 will engage the serrated face 95 of the complemental slide 93 and lift the adjacent end of the adzing unit and consequently its cutter to a working position determined by the degree of depression of its cradle. The cutters will be held in this position throughout the adzing operation by reason of the length of the high portion 103 of the cam.

It will be noted that while the lifting abutment 96 of each control mechanism is lifted to a uniform height each time, nevertheless each cradle may be depressed a different or variable degree according to the shape of the particular surface to be adzed, and consequently that each adzing cutter may be elevated a corresponding variable degree by reason of the position of its variable height-regulating means 93. It follows from the construction disclosed that if by reason of the peculiar shape of a tie it sags at one end below a given horizontal plane 105 (Fig. 10), in this case coincident with the top of the carriage tie-supporting faces, the cradle at such end will be depressed below said plane and its cutter will be raised to a lesser degree than if the tie curves above said plane as shown at the right hand side of Fig. 10, in which event the cradle will be but slightly depressed if at all and the high portion of the slide 93 will be positioned over the abutment 96 so that the cutter at such end will be raised substantially the maximum amount. Thus each adzing cutter will be automatically and simultaneously moved to a working position by an independent control mechanism so that the positioning of each cutter is independent of the other and dependent on the other only in the sense that both cutters are mounted in fixed relationship on the unitary frame structure for the purpose of preserving the parallel coplanar relation of the adzing surfaces.

The tiltable cradles perform the function of equalizing the depth of the cuts when an inclined or irregular tie surface is encountered as shown in Fig. 10 so that the adzing cuts will be of substantially uniform depth and in any event so that the cuts will be of a certain minimum depth consistent with adzing from end to end of the proposed surface. This is accomplished by reason of the gaging rails being located at each end of the surface to be adzed as distinguished from a single gaging element and because the cradle is pivoted intermediate said rails so as to produce a mean gaging effect rather than the full gaging effect of a single element. Regarding the cradle action in actuating the arms 88 it will be observed that when the cradle rails are in a horizontal plane both arms 87 will be in contact with the complemental arms 88 to govern the follow-up movement of the latter. However, when the cradle is tilted in either direction only the higher arm 87 will remain in contact with its complemental arm 88 (the other arm 87 being moved downwardly away from its complemental arm 88) and thereby gage or control the positioning of the variable height regulating means 93.

From the foregoing it will be manifest that the ties will be fed in succession to the adzing station and the adzing cutters will be automatically moved to the working position in timed relation. It will be further noted that the ties are securely held so as to be immovable from the fixed plane in which they travel, and that each adzing cut will be complete by reason of the action of the automatic control mechanism regardless of irregularities and variations in shape and proportion of each tie. It should be further manifest that the principles of operation disclosed herein are likewise applicable to an organization of parts in which the relative feed movement between the tie and adzing cutters is effected by movement of the cutters instead of the tie. In the instant case it will be manifest that the depth of each adzing cut is automatically controlled from the surface to be adzed or from the surfaces adjacent thereto depending on the particular spacing of the cradle rails and that the greater degree of depression of the cradles the smaller will be the degree of raising the adzing cutters. Thus the approach of the cutters to the tie or, in other words, the depth of the adzing cut is proportional inversely to the depression of its control cradle or device.

It is believed that the foregoing conveys a clear understanding of the objects prefaced above, and while I have illustrated but a single working embodiment it should be understood that many changes might be made in the design and construction of a machine for practicing my invention without departing from the spirit and scope thereof as expressed in the appended claims, in which—

I claim as my invention:

1. In a tie adzing machine, the combina-

tion of a tie-supporting means, a pair of adzing cutters in fixed coaxial relation, means for feeding the ties in succession past the cutters, and mechanism controlled by the shape of each tie for automatically moving the cutters, in said relation, to make complete adzing cuts to a mean depth in the tie.

2. In a tie adzing machine, the combination of tie supporting means, adzing cutters in fixed coaxial relation, and mechanism for automatically moving the adzing cutters, in said relation, to a working position with respect to the tie supporting means, in which position the adzing depth of each cutter is automatically determined by the particular shape of the surface to be adzed.

3. In a tie adzing machine, the combination of means for securely holding a tie, adzing cutters in fixed coaxial relation, means for producing relative movement between the held tie and the cutters for adzing the tie, and mechanism for automatically moving the cutters, in said relation, to a working position in which the adzing depth of each cutter is automatically determined by the particular shape of the surface to be adzed.

4. In a tie adzing machine, the combination of means for securely holding a tie, an adzing unit including cutters in fixed relationship for adzing parallel coplanar surfaces at opposite ends of the tie, means for producing relative movement between the tie and adzing unit for adzing the tie, and mechanism for moving the adzing unit to a working position in which the cutters, while still in fixed relationship to make coplanar cuts, are brought to such a position that each cutter operates to a mean adzing depth governed by the particular shape or curvature of the surface to be adzed.

5. In a tie adzing machine, the combination of means for feeding ties in succession past an adzing station and securely holding each tie while so moving it, adzing cutters at said station, and mechanism for automatically moving the cutters to a working position in which the adzing depth of each cutter is governed by the particular shape or curvature of the surface to be adzed, the mechanism for each cutter including means arranged to gauge the surface at both sides of the place where the cut is to be made whereby to cause each cutter to operate to a mean depth.

6. In an adzing machine, the combination of conveyor means for moving ties in succession past an adzing station and for securely holding each tie in a fixed plane while so moving it, an adzing unit at said station, including a pair of adzing cutters in fixed coaxial relation, and mechanism for automatically moving said unit to a working position in which the adzing depth of each cutter is governed by the particular shape of the surface to be adzed.

7. In an adzing machine, the combination of means for moving ties in succession past an adzing station, adzing cutters at said station, control means adapted to be actuated by the surface of the tie to be adzed, variable height regulating means adapted to be positioned by said control means for regulating the height to which the adzing cutters will be raised, and power operated means adapted for raising the adzing cutters to a working position determined by said height regulating means.

8. In a tie adzing machine, the combination of tie-supporting means, a pair of adzing cutters in fixed coaxial relation, means for feeding the ties in succession past the cutters, and mechanism controlled by the shape of each tie for automatically moving the cutters, in said relation, to an adzing position in which the cutters make complete, parallel, coplanar cuts of mean depth irrespective of irregularities in the shape of the tie.

9. In an adzing machine, the combination of tie supporting means, adzing cutters, means for producing a relative movement between the tie and cutters for adzing the tie, control means adapted to be actuated by the surface of the tie to be adzed, variable adzing-depth regulating means adapted to be positioned by said control means, and power operated means adapted for moving said adzing-depth regulating means and the cutters to move the latter to a working position determined by the positioning of said adzing-depth regulating means.

10. In a tie adzing machine, in combination, laterally spaced traveling carriages upon and between which a tie is carried, an adzing unit interposed between the carriages and having a pair of adzing cutters in fixed relationship for adzing parallel coplanar surfaces, said unit being vertically movable with respect to said carriages, and means actuated by the under surface of each tie to be adzed for automatically vertically moving said unit to a working position in which the cutters in said relation are individually positioned to make a complete adzing cut of mean depth irrespective of irregularities in the shape of the tie.

11. In a tie adzing machine, in combination, means for supporting a tie in fixed relation to a given plane substantially parallel with its major axis, means for moving the tie in said plane past an adzing station, adzing cutters at said station, and mechanism including control means governed by the shape of the tie for moving the adzing cutters to a working position for performing complete, parallel, coplanar adzing cuts substantially parallel with said longitudinal

plane, the advance of the respective cutters to the working position being inversely proportional to the movement of the control means for each cutter.

12. In a tie adzing machine, in combination, laterally spaced traveling carriages upon and between which a tie is carried, an adzing unit interposed between the carriages and having a pair of adzing cutters in fixed relationship for adzing parallel coplanar surfaces, said unit being vertically movable with respect to said carriers, and means for automatically controlling said vertical movement by the under surface of each tie to be adzed, said means including a cradle gage for determining the depth of each adzing cut, each cradle having a guide rail adjacent to each end of its cutter adapted to bear against the under side of the tie as the latter approaches the cutter, the cradle being pivotally mounted intermediate its guide rail for equalizing the depth of the adzing cut.

13. In a tie adzing machine, the combination of adzing cutters at an adzing station, means for feeding ties in succession past said station, and mechanism including control means actuated by engagement with the face of the tie and in accordance with the particular shape thereof for automatically advancing the cutters to the adzing position inversely proportional to the movement of the control means.

14. In a tie adzing machine, the combination of an adzing unit including a pair of adzing cutters, means for supporting and moving a tie over said adzing unit so that the tie will be adzed on its underside by the cutters, and mechanism controlled by the shape of the underside of the time for automatically moving said unit to a working position in which to adz the tie irrespective of irregularities in its underside.

15. In a tie adzing machine, the combination of an adzing unit including a pair of adzing cutters in fixed relationship for adzing parallel coplanar surfaces, means for moving said tie in a fixed plane past said unit for adzing the tie, and mechanism controlled from the side of the tie to be adzed for automatically positioning the adzing unit so that both of its adzing cutters will make complete adzing cuts irrespective of irregularities in said face of the tie.

16. In an adzing machine, the combination of traveling conveyor means for holding a tie adjacent to each end and moving it in a fixed plane past an adzing station, vertically movable adzing cutters at said station for adzing the underside of the tie, said cutters being in fixed relationship for adzing parallel coplanar surfaces, and means controlled by the underside of the tie for automatically positioning said cutters to adz the tie irrespective of irregularities in the underside thereof.

17. In a tie adzing machine, the combination of means for supporting a tie adjacent to each end and moving it past an adzing station, the supporting points on which the tie rests being in a fixed plane, adzing cutters intermediate said supporting means each having capacity for vertical movement with respect thereto, the adzing cutters in all positions being in such relation that they will adz parallel coplanar surfaces in the underside of a tie, and means controlled from said underside of the tie for vertically positioning the cutters to adz the tie.

18. In a tie adzing machine, the combination of laterally spaced carriages on which a tie is adapted to rest adjacent to its ends and by which the tie is adapted to be moved past an adzing station in a fixed plane, an adzing unit at said station comprising a pair of adzing cutters in fixed relationship for adzing parallel coplanar surfaces in the underside of the tie as it is moved past said station, said adzing unit being vertically movable with respect to said carriages and being tiltable so that either cutter may be moved vertically with respect to the other without disturbing said relation of the cutters, and means controlled by the under face of the tie adjacent to the surfaces to be adzed for automatically vertically positioning said adzing unit so that its cutters will each adz substantially to a uniform depth irrespective of irregularities in the shape of said face.

19. In a tie adzing machine, the combination of laterally spaced carriages on which a tie is adapted to rest adjacent to its ends and by which the tie is adapted to be moved past an adzing station in a fixed plane, an adzing unit at said station comprising a pair of adzing cutters in fixed relationship for adzing parallel coplanar surfaces in the underside of the tie as it is moved past said station, said adzing unit being vertically movable with respect to said carriages and being tiltable so that either cutter may be moved vertically with respect to the other without disturbing said relation of the cutters, and means controlled by the under face of the tie adjacent to the surfaces to be adzed for automatically vertically positioning said adzing unit so that its cutters will each adz substantially to a uniform depth irrespective of irregularities in the shape of said face, said means including and being actuated by equalizing cradles having tie-engaging members at each end of the adzing cutters, each cradle being pivotally mounted intermediate its rails and adapted to be tilted for automatically equalizing the adzing depth of its cutter.

20. In a tie adzing machine, the combina-

tion of laterally spaced carriers for moving ties in succession past an adzing station and supporting them in a fixed plane during and while moving them past said station, vertically movable adzing cutters maintained in fixed relationship for adzing parallel coplanar surfaces in each tie as it moves past said station, and means for automatically vertically positioning said adzing cutters with respect to said fixed plane by gauging the extent of irregularities in the face to be adzed so that the cutters will each adz substantially to a uniform mean depth.

21. In a tie adzing machine, the combination of conveyor means for moving ties in succession past an adzing station, an adzing unit at said station including a pair of adzing cutters in fixed relationship for adzing parallel coplanar surfaces, said adzing unit being movable in a plane perpendicular to the travel of the ties, and means controlled by the face of the tie to be gained for automatically positioning the adzing unit with respect to each tie so that its cutters will adz complete surfaces substantially to a uniform depth irrespective of irregularities in said face.

22. In a tie adzing machine, the combination of a traveling conveyor for moving ties in succession past an adzing station, an adzing unit at said station including a pair of adzing cutters in fixed relationship for adzing parallel coplanar surfaces, said unit being mounted with capacity for vertical movement with respect to the tie at said station, and mechanism for automatically moving the adzing unit to a working position, said mechanism comprising power operated means acting on said unit adjacent to each cutter for raising the unit to a determined height, and means controlled by the face of the tie and acting between the power operated means and each cutter end of the unit for raising the latter a variable degree depending on the shape of the tie.

23. In a tie adzing machine, the combination of traveling conveyor means for moving ties in succession past an adzing station, adzing cutters at said station, a pivoted cradle in advance of each cutter normally located in the path thereof and adapted to be repositioned by contact with the surface of the tie to be adzed, and means controlled by the repositioning of each cradle for moving its adzing cutter into adzing position.

24. In a tie adzing machine, the combination of traveling conveyor means for moving ties in succession past an adzing station, adzing cutters at said station, a cradle in advance of each cutter normally located in the path thereof and adapted to be repositioned by contact with the surface of the tie to be adzed, and means controlled by the repositioning of each cradle for moving the adzing cutter into adzing position, said means comprising power operated means and a variable height regulating means for each cutter, the latter means being positioned by the cradles in accordance with irregularities in the shape of each tie and being acted on by the power operated means for raising each cutter to a working position determined by the repositioning of its respective cradle.

25. In a tie adzing machine, the combination of traveling conveyor means for moving ties in succession past an adzing station, adzing cutters at said station normally out of working position, cutter controlling elements normally in the path of a tie approaching the cutters and adapted to be repositioned by engagement with the face of the tie to be gained, and mechanism automatically operated by the repositioning movement of said elements for moving the cutters into working positions in which to make complete adzing cuts of mean depth irrespective of irregularities in the shape of the tie.

26. In a tie adzing machine, the combination of traveling conveyor means for moving ties in succession past an adzing station, an adzing unit at said station normally out of working position and having a pair of adzing cutters in fixed relationship for adzing parallel coplanar surfaces, means normally located in the path of a tie approaching the cutters and adapted to be repositioned by engagement with the face of the tie to be adzed, and power operated mechanism for moving the adzing cutters into working position including means controlled by the repositioning of said tie engaging means for determining the working position of the cutters.

27. In a tie adzing machine, the combination of traveling conveyor means for moving ties in succession past an adzing station, adzing cutters in fixed coaxial relation at said station normally out of working position, and mechanism for moving the cutters into working position including control means operated by engagement with the face of the tie to be adzed for automatically positioning the cutters, in said relation, to respectively make complete adzing cuts of means depth, irrespective of irregularities in the shape of the tie.

28. In a tie adzing machine, the combination of traveling conveyor means for moving ties in succession past an adzing station, adzing cutters at said station normally out of working position, and mechanism for moving the cutters into working position including means operated by engagement with the face of the tie at more than a single point at each place to be adzed for automatically positioning the cutters to operate at a mean depth as determined in accordance with this gauging of the shape

of said face, said mechanism including a power operated device for moving the cutters into said working position, and means controlled by said tie engaging means for determining the degree of cutter positioning movement of said power operated means.

29. In a tie adzing machine, the combination of means for moving ties in succession past an adzing station, adzing cutters at said station normally out of working position, and power operated mechanism for moving said cutters into the working position including means controlled by gauging the shape of the tie surface, by engagement therewith at more than a single point at each place to be gained for determining the degree of movement of each cutter in accordance with the shape of said surface, the movement of each cutter being inversely proportional to the tie-actuated movement of the control means.

30. In a tie adzing machine, the combination of means for moving ties in succession past an adzing station, an adzing unit including a pair of adzing cutters in fixed relationship for adzing parallel coplanar surfaces, and power operated means for moving the cutters into the working position, the power operated means having a variable action against the adzing unit so as to position each adzing cutter independently of the other but without disturbing said relation of the cutters, said variable movements being controlled by the shape of the tie surface to be adzed.

31. In an adzing machine, means for feeding a tie in a fixed plane past a cutting station, a plurality of cutters in fixed coaxial relation positioned at said station and adapted to be moved into and out of the path of each tie for simultaneously performing cutting operations, and mechanism including a control device actuated by contact with the face of the tie to be cut for automatically advancing the cutters to a depth inversely proportional to the movement of said control device.

32. In a tie adzing machine, the combination of means for moving ties in a fixed plane past an adzing station, adzing cutters at said station normally out of working position and adapted to be moved into working position in which the cutters will adz parallel coplanar surfaces, means for determining the working position of each cutter, said means being controlled by the shape of the tie surface to be adzed and by movement of the tie when it approaches the cutters and power operated mechanism for moving the cutters into the working position in accordance with the action of said control means.

33. In a tie adzing machine, the combination of means for moving ties in a fixed plane in succession past an adzing station, an adzing unit at said station comprising a mandrel having an adzing cutter at each end, means normally supporting said unit out of working position, an equalizing cradle positioned in advance of each cutter and normally in the path of a tie approaching the cutter, a variable height regulating means for each cutter adapted to be operated by its cradle in accordance with the positioning thereof by contact with the tie for predetermining the working position of such cutter, and power operated means for moving the cutters to the working position determined by said height regulating means.

34. An adzing machine comprising, in combination, a pair of laterally spaced endless conveyors, tie carriages on said conveyors adapted for gripping and securely holding a tie adjacent to each end, an adzing unit interposed between said conveyors comprising a mandrel, an adzing cutter on each end of the mandrel, a frame structure supporting the mandrel and providing a housing about each cutter, each housing being open at the top to allow projection of its cutter therethrough and having a chip discharge opening, means supporting the adzing unit with capacity for it to move vertically as an entirety or independently at either end, said adzing unit being normally supported in a non-working position below the path of the ties, and means for raising said adzing unit to a working position.

35. An adzing machine comprising, in combination, a pair of laterally spaced endless conveyors, tie carriages on said conveyors adapted for gripping and securely holding a tie adjacent to each end, an adzing unit interposed between said conveyors comprising a mandrel, an adzing cutter on each end of the mandrel, a frame structure supporting the mandrel and providing a housing about each cutter, each housing being open at the top to allow projection of its cutter therethrough and having a chip discharge opening, means supporting the adzing unit with capacity for it to move vertically as an entirely or independently at either end, said adzing unit being normally supported in a non-working position below the path of the ties, and power operated mechanism for automatically raising the adzing unit to a working position in which the adzing depth of each cutter is governed by the particular shape of the tie surface to be adzed.

36. An adzing machine comprising, in combination, a pair of laterally spaced endless conveyors, tie carriages on said conveyors adapted for gripping and securely holding a tie adjacent to each end, an adzing unit interposed between said conveyors comprising a mandrel, an adzing cutter on each end of the mandrel, a frame structure sup-

porting the mandrel and providing a housing about each cutter, each housing being open at the top to allow projection of its cutter therethrough and having a chip discharge opening, means supporting the adzing unit with capacity for it to move vertically as an entirety or independently at either end, said adzing unit being normally supported in a non-working position below the path of the ties, power operated means for raising each end of the adzing unit to a working position, said power operated means having a uniform lifting stroke, variable height regulating means interposed between the power operated means and each end of the adzing unit, and control means automatically operated by each tie as it approaches the cutters for positioning said variable height regulating means in accordance with the shape of the tie surface to be adzed.

37. In an adzing machine, in combination, means for feeding a work-piece past a cutting station and preventing displacement of the work-piece while so moving it, a plurality of cutters in fixed coaxial relation at said station, and mechanism for automatically moving the cutters to a working position for adzing the work-piece, the cutter advancing movement being controlled by the face of the work-piece to be cut and being inversely proportional to the movement of the control device.

38. In a tie adzing machine, in combination, means for supporting a tie adjacent to its ends and holding it from displacement while it is moved past an adzing station, a pair of adzing cutters in fixed coaxial relation interposed between said tie supporting means beneath the tie and adapted to be raised to a working position for adzing the tie, and means controlled by the shape of the under face of the tie intermediate said supporting means for automatically positioning both of said adzing cutters to make complete, parallel, coplanar adzing cuts irrespective of irregularities in the shape of the tie.

39. In a tie adzing machine, in combination with means for supporting a tie, of an adzing unit including a pair of adzing cutters in fixed coaxial relation, and mechanism controlled by the shape of the tie for automatically moving the adzing unit to a working position in which both adzing cutters will be advanced to the tie inversely proportional to the advance of the control device actuated by the shape of the tie.

JUDSON H. MANSFIELD.

## CERTIFICATE OF CORRECTION.

Patent No. 1,672,652. Granted June 5, 1928, to

JUDSON H. MANSFIELD.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 6, line 1, claim 1, strike out the article "a" first occurrence; page 7, line 40, claim 14, strike out the word "time" and insert the word "tie"; page 8, line 117, claim 27, for "means" read "mean"; and that the said Letters Patent should be read with these corrections therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 10th day of July, A. D. 1928.

M. J. Moore,
Acting Commissioner of Patents.

(Seal)