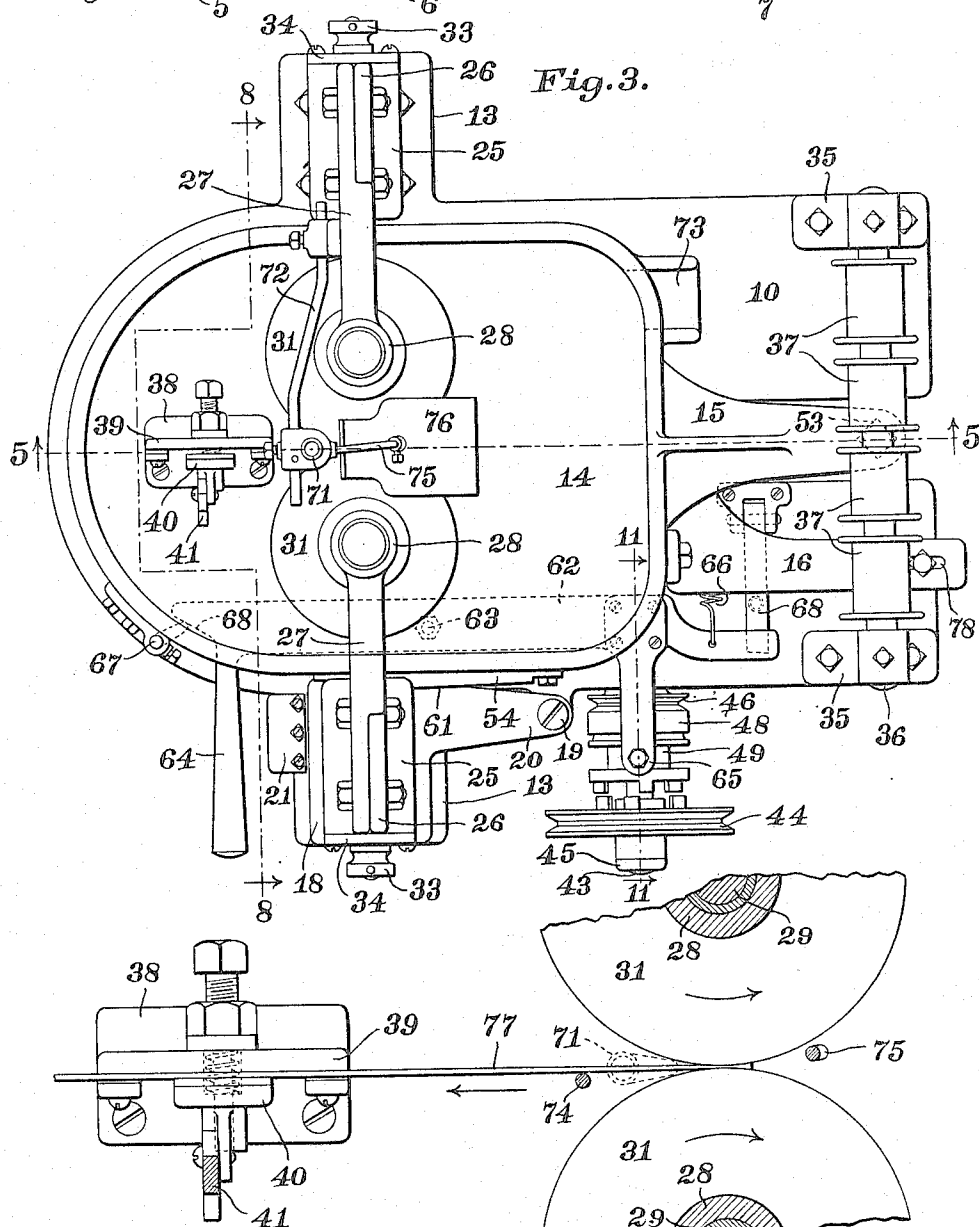
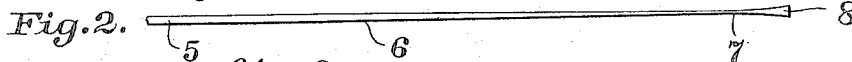


1,131,119.

3 SHEETS—SHEET 1.



Witnesses:
H. A. Leard
S. M. Bader

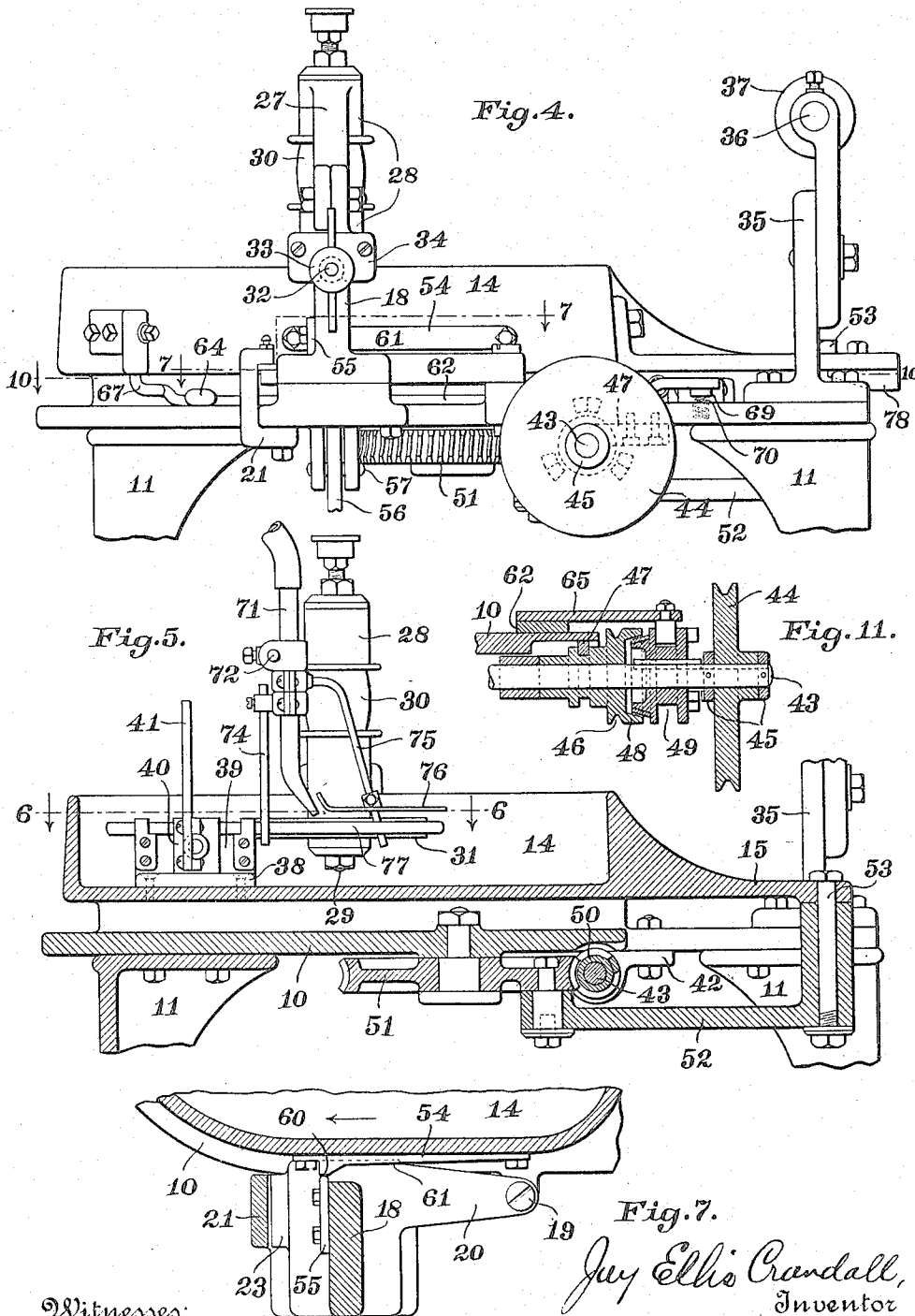
Fig. 6.

Inventor
Jury Ellis Crandall
By his Attorneys
Mustick & Lucke

J. E. CRANDALL.
METHOD OF GRINDING.
APPLICATION FILED JULY 17, 1914.

Patented Mar. 9, 1915.
3 SHEETS—SHEET 2.

1,131,119.



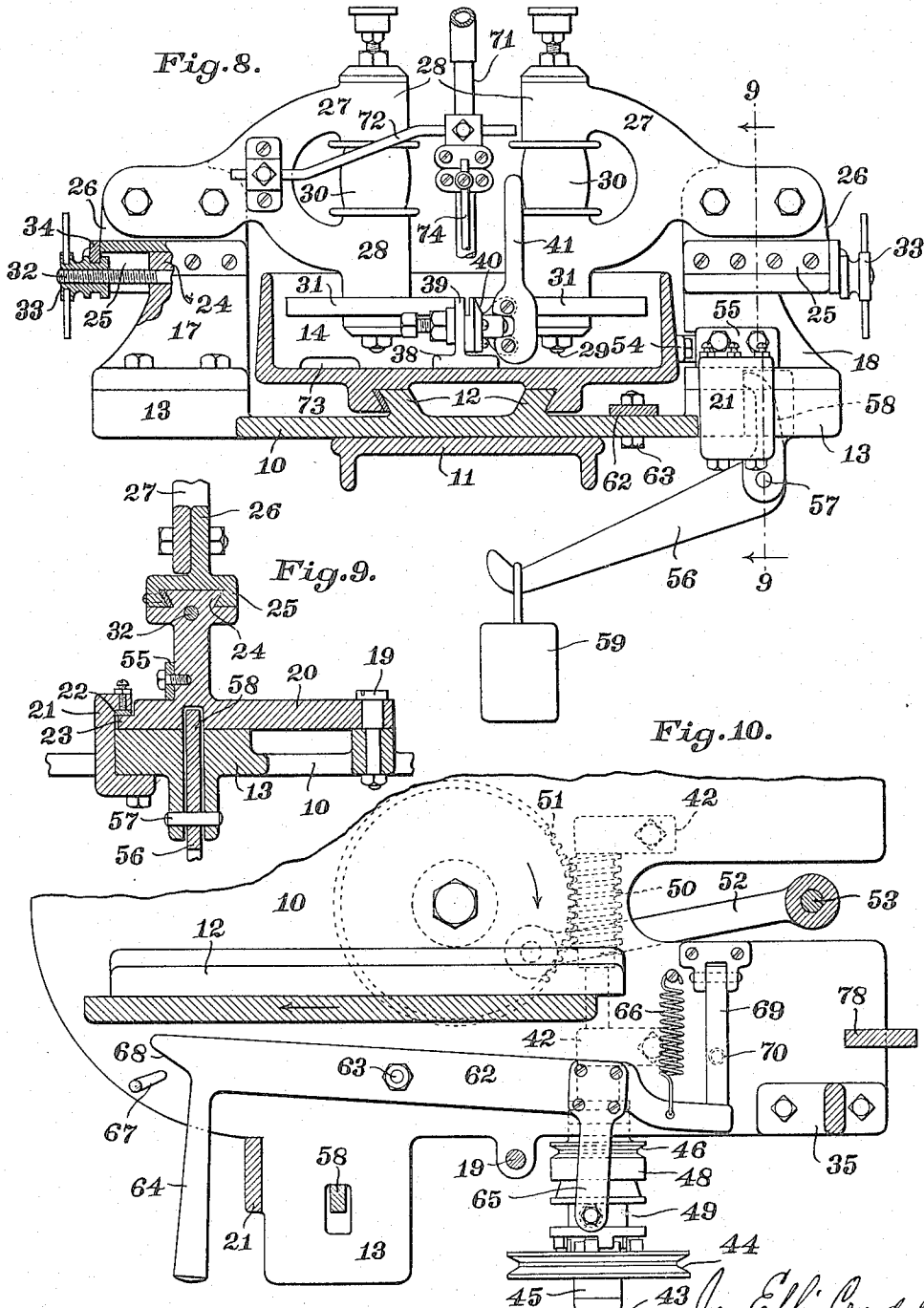
Witnesses:
K. G. Leach
S. M. Baeder

Jay Ellis Crandall,
Inventor
By his Attorneys
Mastick & Lucke

J. E. CRANDALL.
METHOD OF GRINDING.
APPLICATION FILED JULY 17, 1914.

Patented Mar. 9, 1915.
3 SHEETS—SHEET 3.

1,131,119.



Witnesses:
R. G. Leard
S. M. Baeder

Jay Ellis Crandall
Inventor
By his Attorney
Mastick & Lucke

UNITED STATES PATENT OFFICE.

JAY ELLIS CRANDALL, OF BELVIDERE, ILLINOIS, ASSIGNOR TO THE WARNER BROTHERS COMPANY, OF BRIDGEPORT, CONNECTICUT, A CORPORATION OF CONNECTICUT.

METHOD OF GRINDING.

1,131,119.

Specification of Letters Patent.

Patented Mar. 9, 1915.

Application filed July 17, 1914. Serial No. 851,485.

To all whom it may concern:

Be it known that I, JAY ELLIS CRANDALL, a citizen of the United States, residing at Belvidere, in the county of Boone and State of Illinois, have invented new and useful Methods of Grinding, of which the following is a specification.

This invention relates to methods of grinding, and more particularly to the method of grinding the opposite surfaces on a thin article of tempered material without drawing the temper from the article.

An object of this invention is to form corset-stays such as are described in my Patent No. 1,085,799 patented Febry. 3, 1914. In the manufacture of this and similar types of corset-stays and other like articles, it is desired to form a portion of the length of the stay gradually tapering toward one end, so that the tapered portion will be more flexible than the body portion of the stay; it is preferable to leave an enlarged head at said end whereby such enlarged head will serve as a holding means to retain a protecting cap fastened thereto. I accomplish this and other objects by drawing a stay between two adjacent grinding wheels of circular or other suitable periphery, so as to grind with the adjacent peripheries; providing the grinding wheels with mountings through which certain desired movements are resultant; and by controlling the driving means and both the stay carrying and grinding means.

A further object is to preclude vibrating of the stay during the course of its grinding.

Further objects and features of my invention are more fully described hereinafter, and by reference to the accompanying drawings in which—

Figures 1 and 2 are respectively side and edge views of one form of article, such as a corset steel, produced by my method; Fig. 3 is a plan view of one form of apparatus for carrying out my method; Fig. 4 is a view in elevation of the drive side of the machine; Fig. 5 is a longitudinal vertical section on the line 5—5 of Fig. 3, showing a corset stay mounted in the vise; Fig. 6 is an enlarged plan section on the line 6—6 of Fig. 5 showing the vise moved to the end of its movement; Fig. 7 is a detailed plan section on the line 7—7 of Fig. 4, showing the cam for actuating the grinding spindle; Fig. 8 is a transverse vertical section on the line

8—8 of Fig. 3; Fig. 9 is a vertical section on the line 9—9 of Fig. 8; Fig. 10 is a plan section on the line 10—10 of Fig. 4 illustrating the parts in a position when the carriage has just started its forward feed strike; and Fig. 11 is a vertical section on the line 11—11 of Fig. 3.

In accordance with my invention, a band or strip of steel 5 of uniform or other suitable cross section, is subjected on its opposite sides to grinding action, whereby a portion of the steel adjacent the end or other predetermined point, is narrowed in cross sectional thickness at a taper commencing at a point on the body of the steel and gradually diminishing as the taper nears the end or said other predetermined point, thus making this tapered portion 6—7 more flexible than the main body portion of the steel. When forming this taper with circular grinding wheels, the feed of the steel through the wheels in forming the taper, may be stopped at the point 7, thereby leaving the head 8 at the end of the steel, the sides thereof tapering outwardly because of the circular periphery of the grinding wheels.

In the particular machine illustrated for carrying out my method, the base 10 is shown supported by standards 11, has two centrally disposed longitudinal ways 12 formed therewith, and has oppositely extending wing sections 13. Mounted upon the extending sections 13 are supports 17 and 18, the support 17 being secured fixedly in position and the support 18 being movably mounted, movable from the pivot 19 of its arm 20 from the base 10, as is seen in Fig. 9, and is held in position by the clamp 21 bolted to the base 10, having an adjustable bearing plate 22 engaging an extension of the support. The upper ends of these supports are formed with horizontal ways 24 upon which are slidably mounted spindle bracket supports 25 having upstanding bracket portions 26. Bolted to said bracket portions are the spindle supports 27 each having an upper and lower vertically disposed bearing 28 and journaled in the bearings are spindles 29 having fixedly mounted at their center portion the drive pulleys 30 and at their lower ends the grinding wheels 31 of a suitable composition of material, the spindle supports capable of being raised from position by removing their inner sup-

porting bolts and being pivoted from their outer supporting bolts. Screws 32 (Fig. 8) are fixedly carried by supports 17 and 18 and have hand feed nuts 33 rotatably mounted thereon, the spindle bracket supports 25 being movable with the hand nuts 33 by the end plate connections 34, so that by rotating the hand nuts 33 the grinding wheels are adjusted toward or away from one another.

10 Journaled brackets 35 bolted to the rear end of the base 10 carry a shaft 36 upon which is mounted idler pulleys 37 adapted to guide driving belts (not shown) which are adapted to rotate the spindle pulleys 30 at a high rate of speed. A vise 38 of a suitable construction is fixed to the reservoir 14, having in this case shown one with a rigid jaw 39 and an adjustable jaw 40 actuated by the hand lever 41, the vise being so disposed that when

20 a corset-stay is clamped horizontally therein in the inoperative position of the machine as in Fig. 3, said stay will lie intermediate the grinding wheels, projecting beyond their center as is clearly shown in Fig. 5.

25 Mounted in journal brackets 42 to the underside of the base is the drive-shaft 43 which carries (Fig. 11) a drive pulley 44 loosely mounted between the fixed collars 45, a smaller drive pulley 46 loosely mounted, held from longitudinal movement by the guide bracket 47 and having a female clutch member 48 formed therewith, a clutch 49 splined to the shaft having a male clutch portion adapted to engage member 48 and lug clutch members adapted to engage corresponding lugs on pulley 44, and a screw-worm 50 fixedly mounted upon the shaft. A worm-gear 51 is rotatably mounted to the underside of the base meshing with screw-worm 50, and a crank arm 52 operable with the worm-wheel is connected to the end of arm 15 through bolt 53; thus rotation of the drive shaft will reciprocate crank 52 and feed the carriage longitudinally upon the ways 12.

A cam face 54 (Fig. 7) is fixed adjustably with the outer side of carriage 14 adjacent support 18, and bolted to said support is a cam follower plate 55 which is held yieldingly into contact with the face of the cam. This contact is yielding in the sense that the support 18 is pivotally mounted at 19 and the bell-crank lever 56 pivotally carried at 57 has an upstanding arm 58 held into contact with the said support by the weight 59 at the lower arm of the bell-crank, thus always holding the plate 55 into contact with the cam face but leaving it free to move in the opposite direction. Movement of the support 18 following the cam face moves the grinding wheel carried thereby to and away from the fixed wheel. Fig. 5 shows the inoperative position of the machine with the cam follower on the highest portion 60 of the cam which maintains the grinding

wheels spaced apart inoperatively, but when the carriage 44 is fed forward the cam follower will move to the tapered face 61 and follow the gradual taper thereof, and thus bring the grinding wheels close together, gradually as they perform their grinding operation.

A clutch lever 62 is pivoted at 63 to the base 10, has an operating handle 64 and an arm 65 which carries a roller in engagement with the clutch 49. A spring 66 tends to hold the clutch lever with the clutch in engagement with the female clutch 46, and is adapted to be disengaged from the clutch lever by the cam 78 carried by arm 16; but with the machine in its operative position as in Fig. 3, the adjustable stop 67 carried by carriage 14 will contact the face 68 of the lever and hold it from engaging said clutch members. When the lug clutch is engaged with pulley 44 the catch 69 pivoted to the base will be raised by spring 70 and hold the parts in such engagement as seen at Fig. 8.

A continuous feed of water is supplied to the grinding wheels while in operation, through pipe 71 carried by the support 72, the water being suitably drained through the outlet 73, and a covering (not shown) is provided for the open top of the carriage to confine the water from splashing onto adjoining parts.

Anti-vibrator rods 74 and 75 are carried through the support 72, positioned at opposite sides of a stay being ground, and at each side of the grinding point of the wheel. A water baffle-plate 76 is carried by rod 75 to help direct sprayed water to be confined to the grinding wheels.

In the operation of the machine, with the several operable parts in the position as shown in Fig. 3, grinding wheels 31 will be rotated as above stated, and both clutch members 44 and 46 will be rotated in opposite directions without affecting any of said operable parts. With a corset-stay mounted in the vise, as is seen in Fig. 5, the hand lever 64 will be pulled forward as shown in Fig. 10, thereby driving shaft 43 through pulley 44 and being held in such position by the catch 69. Rotation of the drive-shaft will feed the carriage 14 forward through the worm-gear 51 and crank 52, thereby allowing plate 55 to follow the cam face 61 and bring the grinding wheels into grinding contact with the sides of the corset-stay at a point, as illustrated in this case in Fig. 6, at 77. As the feed of the carriage continues the grinding wheels will be brought closer together grinding a gradual taper to the end of the stay until the very end of the stay has been ground, when the traveling cam 78 will contact catch 69, disengaging it from lever 62 and allowing the spring 66 to throw the clutch 59 into engagement with member

46 and thereby reverse the direction of shaft 43. At this point the crank 52 does not reach the top of its stroke so that it will return the carriage, allowing the grinding wheels to polish the ground surface of the stay. When the high point 60 in the cam has been reached, the wheels will be parted as above described and the stop 67 will contact face 68 of the lever 62, thereby disengaging the clutch members and stopping the operation of the operable parts. During the feed strokes of the carriage the stay, because of its light body, is often caused to vibrate with such force that if it were not for the anti-vibrator rods 74 and 75, the stay would be immediately severed by the grinding wheels.

In the present embodiment I have illustrated but one of the grinding wheels as being mounted to follow the contour of the grinding operation, and it will be seen that both wheels might be so mounted and to follow cam-movements of whatsoever design desirable.

By my method, very narrow and flexible articles may be ground without drawing the temper therefrom, and furthermore through control of the grinding wheels, varying shaped faces may be obtained.

One form of apparatus suitable for carrying out my method is disclosed in my application Ser. No. 760,163, filed April 10, 1913, now Patent No. 1,073,097, issued September 16, 1913.

What I claim and desire to secure by Letters Patent is:

1. The method of producing an elongated tempered article having a relatively more flexible portion, which comprises feeding a strip of tempered material with relation to suitable grinding devices to contact with the opposite flat faces of said strip, moving said strip in the direction of length thereof while moving said grinding devices one toward another with their grinding faces in substantial parallelism to each other until a pre-determined point is reached and simultaneously cooling the portion of the article subjected to grinding, and then separating said grinding devices.

2. The method of producing an elongated tempered article having a relatively more flexible portion, which comprises feeding a strip of tempered material having a substantially uniform thickness with relation to suitable grinding devices to contact with the opposite flat faces of said strip, moving said strip in the direction of length thereof at a certain rate of speed while moving said grinding devices one toward another with their grinding faces in substantial parallelism to each other at a speed related to said certain speed and simultaneously cooling the portion of the article subjected to grinding, and then after a pre-

determined point has been reached separating said grinding devices.

3. The method of producing a tempered corset-stay having a relatively more flexible portion, which comprises feeding a tempered steel in the form of a strip intermediate oppositely disposed grinding devices to contact with the opposite flat faces of said strip, imparting to said strip a certain rate of speed in its direction of length while moving said grinding devices one toward the other with their grinding faces in substantial parallelism to each other at a rate of speed related to said certain speed to form a gradual taper in the direction of length of the corset-stay and simultaneously subjecting the strip to a flow of cooling fluid.

4. The method of producing a tempered steel corset-stay having a relatively more flexible portion, which comprises feeding a strip of tempered steel intermediate oppositely disposed grinding devices to contact with the opposite flat faces of said strip, imparting to said strip a certain rate of speed in its direction of length while moving said grinding devices one toward the other at a rate of speed related to said certain speed to form a gradual taper and simultaneously subjecting the strip to a flow of cooling fluid, and then separating said grinding devices at a rate of speed greater than said related rate of speed.

5. The method of producing a corset steel having a relatively more flexible portion, which comprises feeding a strip of tempered material intermediate oppositely disposed grinding devices to contact with the opposite flat faces of said strip, imparting to said strip a certain rate of speed in its direction of length while moving said grinding devices one toward the other at a rate of speed related to said certain speed to form a taper and simultaneously subjecting the strip to a flow of cooling fluid, and then reversing the direction of movement of said strip while moving said grinding devices away from one another.

6. The method of producing tempered steel corset-stays having a relatively more flexible portion, which comprises feeding a strip of tempered steel intermediate oppositely disposed grinding devices to contact with the opposite flat faces of said strip, moving said strip in its direction of length while moving said grinding devices one toward the other with their grinding faces in substantial parallelism to each other and simultaneously precluding vibration of said strip, and subjecting said strip to a flow of cooling fluid to prevent undue rise of temperature during the grinding operation.

7. The method of producing a tempered steel corset-stay having a portion more flexible than another portion longitudinally dis-

placed thereof, which comprises feeding a strip of tempered steel intermediate oppositely disposed grinding devices to contact with the full width of the opposite flat faces of said strip, moving said strip in its direction of length while moving said grinding devices one toward the other and simultaneously subjecting said strip to a flow of cooling fluid.

8. The method of producing a flexible strip having a relatively more flexible portion which comprises feeding the strip with relation to suitable grinding devices to contact with the opposite flat faces of said strip, moving said strip and grinding devices relatively to each other in the direction of length of said strip while moving said grinding devices one toward another with their grinding faces in substantial parallelism to each other.

9. The method of producing a flexible

strip having a relatively more flexible portion which comprises feeding the strip with relation to suitable grinding devices to contact with the opposite flat faces of said strip, moving said strip and grinding devices relatively to each other in the direction of length of said strip at a certain rate of speed while moving said grinding devices relatively toward each other with their grinding faces in substantial parallelism to each other and at a rate of speed related to said certain rate of speed to form a gradual taper in the direction of length of the strip.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

JAY ELLIS CRANDALL.

Witnesses:

N. O. MOTT,
L. E. McKIM.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."