F. L. O. WADSWORTH.

METHOD OF MAKING GARMENT STAYS.

APPLICATION FILED JULY 1, 1912. RENEWED OCT. 21, 1914.

**1,123,823.** Patented Jan. 5, 1915.

Fig. 1

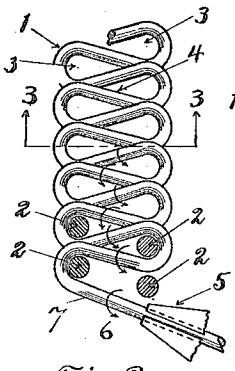



Fig. 2

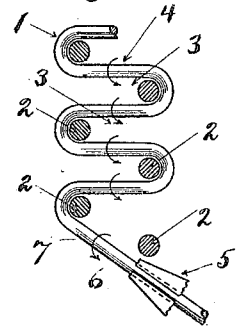



Fig. 4

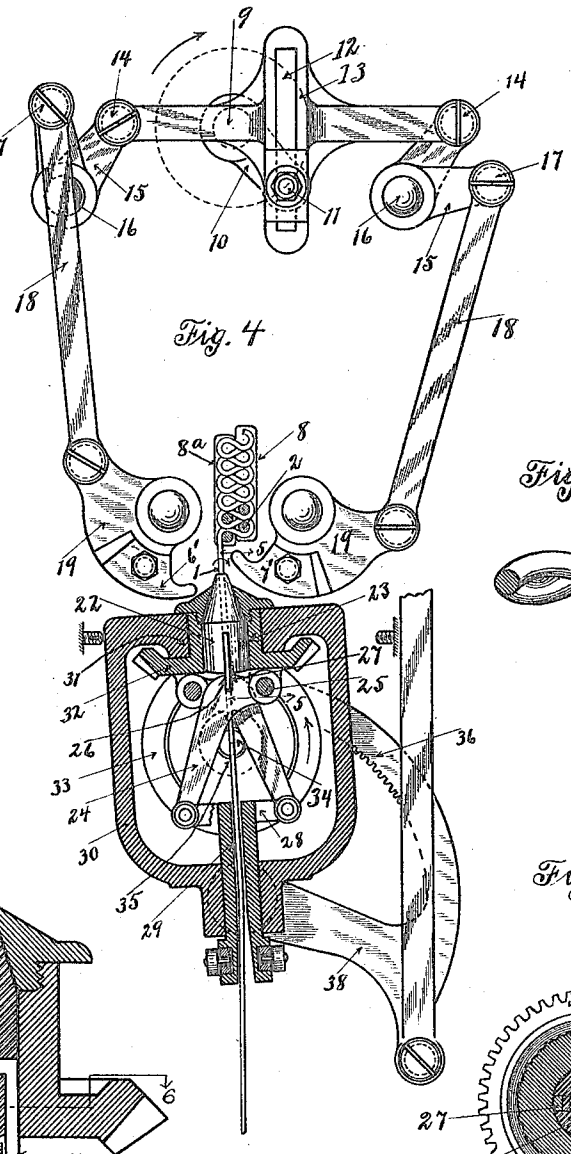



Fig. 3



Fig. 5

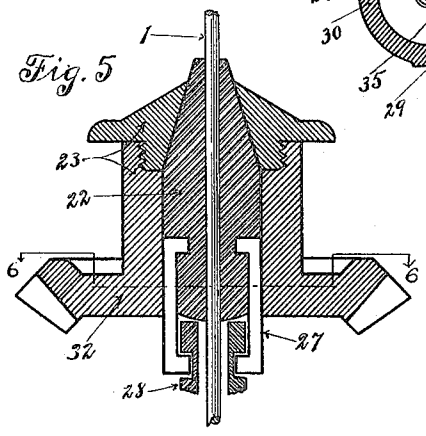
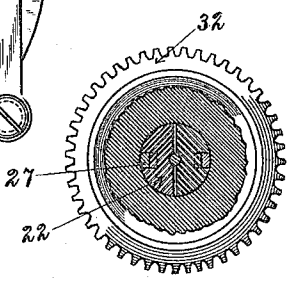



Fig. 6




WITNESSES

E. E. Wright

Elbert L. Hyde.

INVENTOR

Frank L. O. Wadsworth

By Frick W. Hules

Attorney

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

# UNITED STATES PATENT OFFICE.

FRANK L. O. WADSWORTH, OF SEWICKLEY, PENNSYLVANIA, ASSIGNOR, BY MESNE ASSIGNMENTS, TO THE SPIRELLA COMPANY, OF MEADVILLE, PENNSYLVANIA, A CORPORATION OF PENNSYLVANIA.

## METHOD OF MAKING GARMENT-STAYS.

1,123,823. Specification of Letters Patent. Patented Jan. 5, 1915.

Application filed July 1, 1912, Serial No. 706,956. Renewed October 21, 1914. Serial No. 867,897.

*To all whom it may concern:*

Be it known that I, FRANK L. O. WADSWORTH, a resident of Sewickley, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Methods of Making Garment-Stays, of which the following is a specification.

This invention relates to the manufacture of wire garment stays, and particularly to that form of stay which is made up of wire bent back and forth alternately in opposite directions to form two series of oppositely disposed loops or eyes lying along the edges of the stay and united by a series of intermediate transverse portions or crossings lying at nearly right angles to the length of the stay.

In such stays the resistance to flatwise bending is due almost entirely to the torsional stiffness of the transverse portions or crossings, while the resistance to edgewise bending is due almost entirely to the lateral stiffness, or the resistance to bending of those portions of the wire which form the edge loops. Usually such stays are subjected to much more severe bending stresses in a flatwise direction than they are in an edgewise direction. It is, therefore, important to form the stays in such a manner that the torsional stiffness and resiliency of the crossing portions of the wire be as great as possible.

The object of the invention is to provide a method of forming stays of the character described whereby such stays are not only rendered stiffer in one flatwise direction than in the other, but also possess an increased resiliency and increased ability to withstand short bends and avoid taking permanent bends or sets as compared with such stays as heretofore constructed.

It is well known that when wire is subjected to twisting stresses sufficient to impart a permanent torsional set thereto, the torsional resistance of the wire against a further twist in the same direction is greatly increased and the elastic limit or resiliency of the wire is likewise increased. I take advantage of this characteristic of twisted wire, and form the stays in such a manner that the portion of the wire forming each crossing or transverse portion of the wire body is first twisted to a sufficient degree to impart a permanent set thereto, and then form the stay in such manner as to cause the twisted portions to form the transverse portions or crossings,—the successive portions of the wire being alternately twisted in opposite directions, so that in the finished stay the twists in all of the crossings run in the same direction. The result is a stay which is considerably stiffer against flatwise bending in both directions than a similar stay having no twist in the crossings; which, further, is stiffer against bending in the flatwise direction which produces a further twist in the crossings in the same direction in which they have already been twisted, than against bending in the opposite flatwise direction; and which, finally is considerably more elastic and resilient and, therefore, capable of being subjected to shorter bends without permanent distortion than it would otherwise be. As a consequence, a stay manufactured according to this method can be made of smaller and lighter wire than when made according to the old method, without rendering the stay unduly flexible, as well as possessing other advantages which will be readily appreciated by those skilled in the art.

In the accompanying drawing, Figure 1 illustrates diagrammatically the method of making one form of stay in accordance with this invention; Fig. 2 is a similar illustration of another form of stay; Fig. 3 is a transverse section on the line 3—3, Fig. 1; Fig. 4 is a plan view of essential parts of apparatus necessary for manufacturing stays commercially in accordance with the improved method; and Figs. 5 and 6 are detail cross sectional views of said mechanism on the lines 5—5, Fig. 4 and 6—6, Fig. 5, respectively.

In producing the form of stay shown in Figs. 1 and 2 according to this method, a wire 1 of suitable size is bent around a series of pins 2, arranged in two rows with the pins of one row staggered or set intermediate those of the other row, to produce a stay body having two series of oppositely disposed eyes or loops 3 lying along the two side edges and united by the transverse portions or crossings 4. The pins 2 of each row may be located sufficiently close together, as shown in Fig. 1, to cause the adjacent loops at each edge of the stay to overlap, or they may be spaced so far apart that the loops or

eyes remain open, as shown in Fig. 2. The particular feature of the method, however, consists in twisting a short length of the unformed portion of the wire before bending the wire to its form, and giving successive portions of the wire twists in opposite directions. Such twisting may be performed in any suitable way, such as by means of a pair of ordinary pliers 5 held in the hands of the operator. By suitably rotating the pliers in the direction of the arrow 6, the short portion of the wire 7 between the end of the pliers and the last pin around which the wire is looped is twisted as indicated by the arrow, to a sufficient degree to impart a permanent set thereto. The length of the wire 7 between the pliers and the pin around which it is looped must not be greater than the length of a crossing or transverse portion of the finished stay. Inasmuch as the wire is bent alternately back and forth, successive portions must be twisted in opposite directions, so that in the completed stay, the twists in all of the crossings run in the same direction, as indicated by the arrows in Figs. 1 and 2. It is immaterial in which direction the wire is twisted, but in the form of stay shown in Fig. 1, in which the sides of adjacent loops overlap, it is preferable to impart the twist to the wire in the direction indicated by the arrows, so that the recoil of the wire tends to bring the overlapping portions into close and intimate contact. In this form of stay, the successive loops or eyes necessarily lie at an angle to the plane of the stay, to permit the overlapping of the loops so that said loops when viewed edgewise present a shingled appearance.

In forming stays in the manner described, each crossing portion may be left straight or it may be curved upwardly or downwardly out of the plane of the stay to produce a body which is of general concavo-convex form in cross section, that is to say, a wire body in which the general plane of the two series of edge loops or eyes is above or below the general plane of the central portions of the crossings, as shown in Fig. 3. In making the concave stay by hand, the process above described is followed, except that the surfaces of the blocks in which the pins 2 are set are made convex instead of flat.

It is obvious that with this method any desired amount of twist may be imparted to the portions of the wire which form the crossings and, therefore, any degree of increased resiliency and increased stiffness to flatwise bending in one direction as compared with the other, may be secured. It is obvious that this method will produce the desired result entirely irrespective of the particular form of the stay body, whether with overlapping loops, as shown in Fig. 1, or with open loops, as shown in Fig. 2, and irrespective of whether the stay in cross sectional shape is flat or of general concavo-convex form.

In the commercial manufacture of stays according to the method described, a suitable organized machine will be employed and in Figs. 4, 5 and 6 the essential portions of one form of such organized machine are shown. This mechanism in some of its features and general operation is similar to that illustrated and described in Patent No. 1,009,823, granted November 28, 1911 to Marcus M. Beeman, and similar to that described and claimed in patent granted Marcus M. Beeman and John F. Kitchen, October 29, 1912, No. 1,042,756. The drawings hereto annexed illustrate in detail only those features of construction which particularly adapt the mechanism to effect the essential steps of the improved method above described, to-wit, the twisting of the wire.

The mechanism illustrated comprises two oscillating or swinging bending fingers 6′ and 7′ which are arranged to engage alternately with the unformed portion 1 of the wire and bend the same around suitable pins 2 mounted on pin blocks 8 and 8ª which are alternately raised and lowered by any suitable mechanism, such as fully illustrated and described in the patents above identified. The operation of this part of the mechanism is the same as that of the machines of the patents identified, the bending fingers moving alternately from opposite sides to catch the unformed portion of the wire and bend it around a pin to the opposite side of the machine and over a pin which is then depressed, after which the bending finger recedes, the last-named pin rises and catches the newly formed portion of the wire, the opposite pin is depressed and the opposite bending finger swings inwardly and repeats the operation from the opposite side. The particular mechanism illustrated for oscillating the bending finger is somewhat different from that in the patents above identified, being more nearly similar to that of my companion application for a machine for effecting this method, filed October 28, 1912, Serial No. 728,277 and comprising a suitable rotary shaft 9 carrying a crank 10 having a crank pin 11 engaging slot 12 in the transverse connecting bar 13 having its ends pivotally connected at 14 to one arm of bell crank levers 15 fulcrumed at 16, and whose opposite arms are pivotally connected at 17 to connecting rods 18 which are operatively connected to the oscillating carriers 19 of the bending fingers 6′ and 7′ respectively. Any other suitable mechanism may be employed for oscillating the bending fingers.

The effect of the operation of the mechanism so far described is to bend the wire alternately in opposite directions back and forth to form the two series of oppositely

disposed loops or eyes with the transverse connection portions or crossings above described. These mechanisms, however, do not impart the twist to the wire which is the essential step of the present method but this is performed by the following mechanism: The wire is led through a suitable clutching or gripping member comprising a pair of jaws 22 endwise movable in a jaw holder 23, said holder and jaws having cooperating wedge shaped portions so that when said jaws are forced inwardly into the holder they are brought together to grip the wire. These jaws are forced into the holder and retracted therefrom by a pair of levers 24, oppositely arranged and pivoted at 25 and having cam portions 26 engaging the ends of the jaws to force the latter into the holder and being connected to jaw members by hook members 27 in order to retract the jaw members. The free ends of these levers are connected by toggle links 28 to whose pivotal point is secured a pushing member 29 arranged to be alternately reciprocated in and out by suitable connections from a cam driven from the main shaft of the machine, and which is not illustrated. It is obvious that the reciprocation of the member 29 alternately straightens and flexes the toggle links 28, thereby alternately forcing the jaws 22 into the holder 23 and retracting the same therefrom, thereby causing the jaw members to alternately grip the wire and be released therefrom. In order to twist a portion of the wire between the end of the gripping mechanism and the pin around which the wire is looped, the holder 23 is rotatably mounted in a suitable bearing 31 and is provided with miter gear 32 meshing with a similar gear 33 on one end of a short shaft 34 rotatably mounted in the frame 30 and at its opposite end carrying a pinion 35 which is engaged by a gear segment 36 arranged to be rotated alternately in opposite directions, by any suitable means such for instance as the oscillating arm 38 which is actuated intermittently by any suitable cam or link mechanism.

The parts of the machine are so arranged that when the bending fingers are retracted and the formed portion of the wire is clamped between the pin block and the cooperating presser foot plate, the jaw members 22 are forced inwardly into holder 23 to grip the wire, and said holder 23 is then rotated to a sufficient degree to impart the necessary amount of twist to that portion of the wire between the end of the gripping jaws and the pin around which the formed portion of the wire is looped, this length of wire being not greater than one complete transverse portion or crossing of the completed stay. The gripping jaws are then retracted to release the wire, allowing the wire to feed through the gripping device as the bending finger catches it and carries it across the stay to form a new loop, after which, and as soon as the bending finger has been retracted the gripping device again grips the wire and is again rotated, but this time in the opposite direction, to impart the necessary alternately opposite successive twists which are necessary, as hereinbefore described.

The extent of twist which can be imparted to the wire may be varied to any desired degree by altering or varying the amount of movement given to the segmental gear 36, which will, of course, vary the extent of rotation of the wire gripping member.

Various other forms of mechanisms may be designed for carrying into effect the method, the essential of which consists in bodily gripping the wire and imparting a rotary motion to the gripping device, alternately in opposite directions, and thereby twisting successive short portions of the wire so that when bent to the desired form these twisted portions form the transverse portions or crossings. The twisting action described is entirely independent of the form of the loops or their relative positions or of the cross-sectional form of the finished stay. Consequently, there is no limitation imposed upon the amount of twist or torsional set which may be imparted to the transverse portions or crossings.

What I claim is:—

1. The method of forming garment stays, which consists in twisting short sections of the wire sufficiently to impart a permanent set thereto, and then forming said twisted wire into oppositely disposed loops or eyes with the twisted portions of the wire forming the transverse portions or crossings of the stay.

2. The method of forming garment stays, which consists in twisting short sections of the wire alternately in opposite directions sufficiently to impart a permanent twist or torsional set thereto, and then bending the twisted wire back and forth in opposite directions to form oppositely disposed loops or eyes with the twisted portions of the wire forming the transverse portions or crossings of the stay and having the twists therein all in the same direction, viewing the stay as a whole.

3. The method of forming garment stays, which consists in successively gripping successive short portions of the wire and rotating the gripping device first in one direction and then in the other to thereby twist successive portions of the wire alternately in opposite directions, and after the wire has been twisted bending the same to bring said twisted portions substantially transverse to the longitudinal axis of the stay with the twists therein running in the same direction, viewing the stay as a whole.

4. The method of forming garment stays, which consists in gripping successive portions of the wire and rotating the gripping device alternately in opposite directions to twist successive portions of the wire alternately in opposite directions, and then bending the twisted wire alternately back and forth to bring the twisted portions substantially transverse to the longitudinal axis of the stay.

In testimony whereof, I have hereunto set my hand.

FRANK L. O. WADSWORTH.

Witnesses:

ELBERT L. HYDE,

WILLIAM B. WHARTON.

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