

F. H. WILLIAMS.
TWISTING DIE.
APPLICATION FILED FEB. 19, 1910.

Patented Feb. 11, 1913.
2 SHEETS—SHEET 1.

1,053,081.

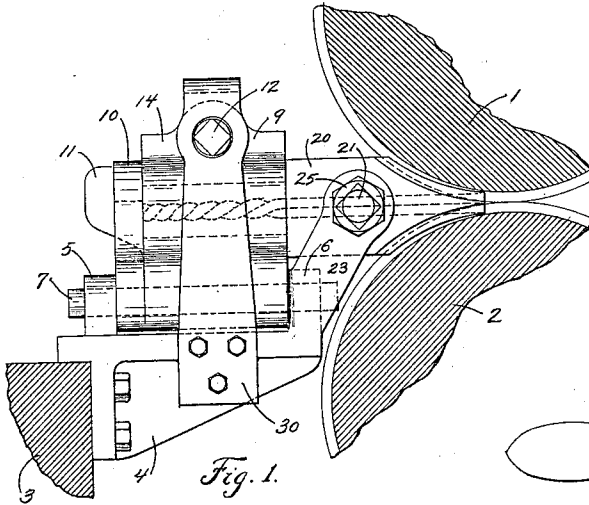


Fig. 1.

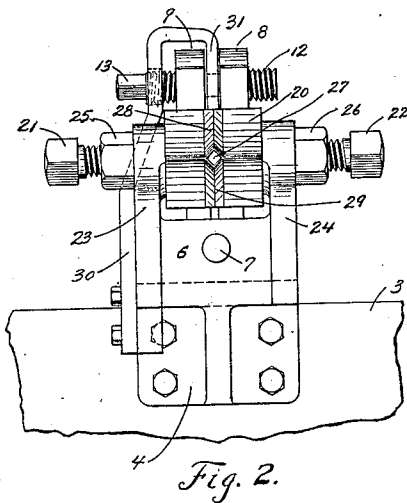


Fig. 2.

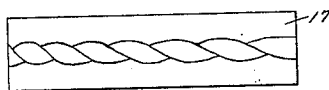


Fig. 5.



Fig. 6.

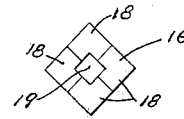


Fig. 7.

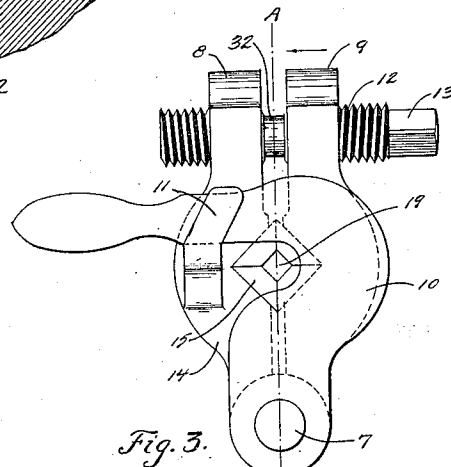


Fig. 3.



Fig. 8.

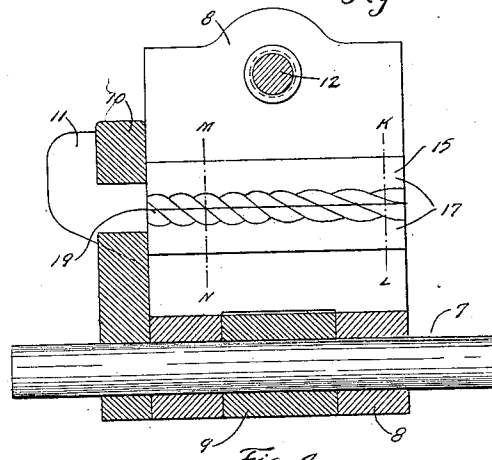


Fig. 4.

WITNESSES:

Walter A. Kelly
Ottel A. Kelly

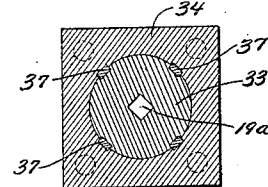
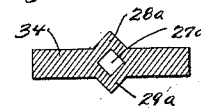
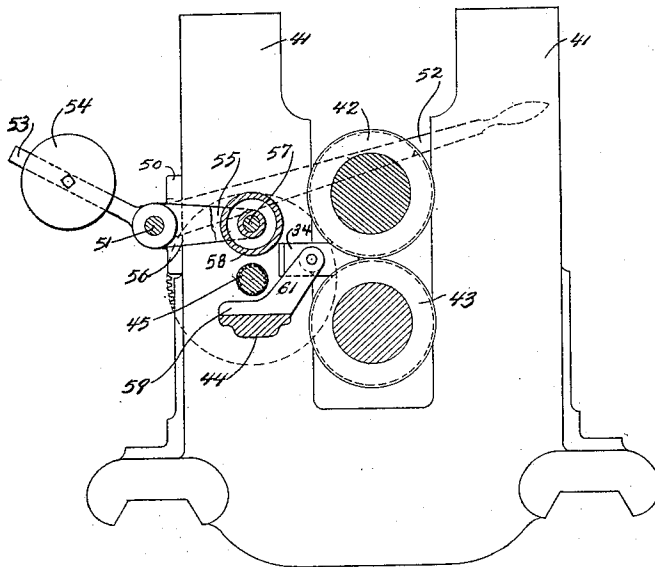
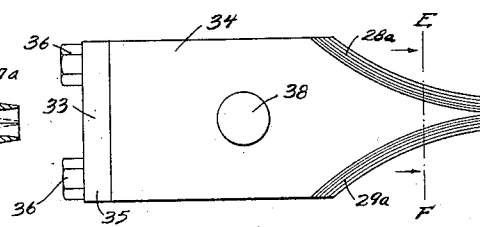
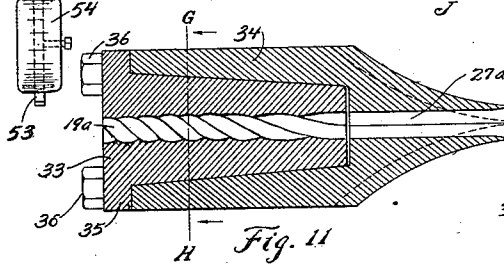
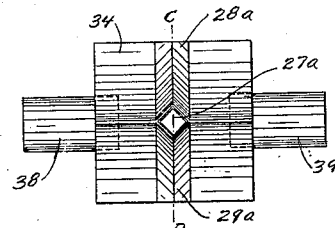
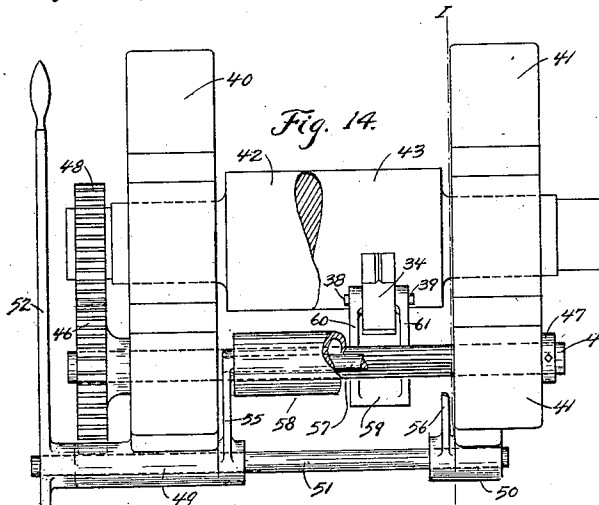
INVENTOR
Frank H. Williams
BY *J. W. Ellis*

ATTORNEY.

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WITNESSES
Sheldon H. Kelly
Edith A. Kelly

Fig. 15.

INVENTOR
Frank H. Williams
BY *J. W. Ellis*
ATTORNEY.

UNITED STATES PATENT OFFICE.

FRANK H. WILLIAMS, OF BUFFALO, NEW YORK.

TWISTING-DIE.

1,053,081.

Specification of Letters Patent.

Patented Feb. 11, 1913.

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To all whom it may concern:

Be it known that I, FRANK H. WILLIAMS, a citizen of the United States of America, residing in the city of Buffalo, county of Erie, and State of New York, have invented certain new and useful Improvements in Twisting-Dies, of which the following is a full, clear, and exact description.

My invention relates to dies for twisting bars and more particularly to dies for twisting metal bars after they have passed through the pass rolls of a rolling mill and while such bars are still hot.

In producing my invention I have sought to provide a device which is compact and which can be quickly and easily attached near the pass rolls of any mill where it is desired to produce a twisted product. Moreover, due to the peculiar conformation of the bore of the twisting die, the operation of making the twisted product while being forced through the die is performed in a very smooth and easy manner thus making the texture of the metal in the finished twisted bar very uniform. Furthermore I have sought to provide a device which shall produce bars of a uniform twist throughout their length as well as any number of bars of the same degree of twist without any delay or loss of time.

I have attained the advantages above set forth by the device herein described, but many other advantages resulting from its use will be apparent to those skilled in the art.

In the drawings which form part of this specification, similar characters of reference indicate similar parts in the different views of which:

Figure 1 is a side elevation of my twisting die as mounted near the pass rolls of a rolling mill. Fig. 2 is an elevation of the same as it appears from the rolls. Fig. 3 is an enlarged rear elevation of the twisting die clamp and latch and shows an end view of the split die. Fig. 4 is a sectional view taken on line A—B of Fig. 3. Fig. 5 is a plan view of one of the twisting die sections. Fig. 6 is an end elevation of the same. Fig. 7 is an end elevation of a slightly modified split twisting die. Fig. 8 is a view of

the finished product. Fig. 9 is a front elevation of a modified form of my invention. Fig. 10 is a side elevation of the same. Fig. 11 is a sectional elevation taken on line C—D of Fig. 9 and shows a solid twisting die. Fig. 12 is a sectional view taken on line E—F of Fig. 10. Fig. 13 is a sectional view taken on line G—H of Fig. 11. Fig. 14 is a plan view of an ordinary rolling mill and shows the application of my twisting die and an extracting device connected therewith. Fig. 15 is a sectional end elevation taken on line I—J of Fig. 14.

1 and 2 represent fragmental sections taken through the finishing pass of any pair of pass rolls and 3 represents a fragmental section of the ordinary rest bar of any rolling mill. To the rest bar 3 is secured, by any suitable means, a bracket 4 which supports the different parts of the device. On the top of the bracket, and preferably made integral therewith, are lugs 5 and 6 in which is mounted the hinge-pin 7. Upon the pin 7 is rotatably mounted the die clamp 14 comprising clamping members 8 and 9 which are hinged together and provided at their upper ends, one with a right-hand and the other with a left-hand screw-threaded aperture, said apertures being disposed opposite each other. A latch 10 is rotatably mounted on the hinge-pin 7 at the back of the die clamp 14 and serves to prevent the split twisting die from being pushed out of the clamp while the bar is being forced through. A catch 11 is preferably made integral with one of the die clamping members and supports the latch 10 in the position shown.

12 is a right and left hand screw-threaded stud which is disposed in the screw-threaded apertures in the die clamping members 8 and 9. This screw-threaded stud is provided at one end with a square portion 13 by means of which it may be revolved. By revolving the stud 12 the clamping members 8 and 9 are either drawn toward each other or forced apart.

In the inner faces of the clamping members 8 and 9 are formed preferably 90° V-grooves. Fitting in these grooves is the split twisting die 15 (Fig. 3), or 16 (Fig. 7), which is comprised preferably of quartered

die sections 17 (Fig. 3), or 18 (Fig. 7). The twisting die in my device is provided with a bore 19 of a peculiar conformation and it is this which constitutes one of the chief features of my invention. This bore, which is clearly shown in Figs. 4, 5 and 11, provides a three step process of twisting. In Fig. 4 from the entering end of the die to the line K—L, the bore 19 is straight which thus confines all of the twisting strains within the die and thus prevents the deformation of the bar as it passes from the rolls to the said die which would be the case when the entering end of the die became worn were it not for the said straight portion. From lines K—L to M—N, the bore 19 of my twisting die is in the form of a differential twist of constantly increasing twist or decreasing pitch. In this step of the twisting operation, the bar which is passing through the die is twisted from zero at the line K—L to a maximum twist at the line M—N. During the operation the bars are subjected to a gradually increasing degree of twist, which causes the metal in the bar to flow very uniformly. From the line M—N to the delivery end of my twisting die, the bore 19 is of a constant degree of twist which insures perfect uniformity of twist in the finished product. The short length of constant twist at the delivery end of my die answers a purpose similar to the short straight end at the entering end. Both said end portions are conservers or wearingsurfaces. Preferably, therefore, my twisting die consists of the three parts hereinbefore referred to, viz., a holder, a twister and a finisher, corresponding to the straight, the differential and the constant twisted portions of the bore 19.

Between the pass rolls and the twisting die I provide a guide block 20 (Fig. 1). This guide block is pivoted on two set screws 21 and 22 the points of which set into the side of said block 20. These screws pass through lugs 23 and 24 preferably made integral with the bracket 4. Lock nuts 25 and 26 are preferably employed on the set screws to prevent their becoming loosened. The guide block is provided with a longitudinal bore 27 passing through its center and preferably of the same cross section as the twisting die. The outer end of the block is pointed and projects in between and close to the point of contact of the pass rolls 1 and 2 and the said pointed end is provided on the top and bottom with ridges 28 and 29 (or 28^a and 29^a as clearly shown in Fig. 12) which fit into the pass in the pass rolls and serve to keep the bore in the block in line with the said pass.

In order to keep the bore in the die in line with the bore in the guide block, a brace 30 is provided. This brace is secured by any suitable means to the side of the bracket 4

and extends upwardly and then downwardly between the clamping members 8 and 9. The upper end 31 is slotted and fits over a groove 32 cut in the screw 13 (Fig. 3), a hole being provided in the side of the brace through which the head of the said screw projects (Figs. 1 and 2).

In Figs. 9 to 13, I show a slightly modified form of my invention where it will be seen that the twisting die 33 is solid and made in one piece. This twisting die is provided longitudinally through its center with a twisted bore 19^a identical to the bore 19 in the split die and as hereinbefore described. The twister die 33 is preferably made tapered on its outside and fits into a like tapered bore in the guide block 34. This guide block is made pointed at its outer end on the top and bottom of which it is provided with the ridges 28^a and 29^a for the purpose hereinbefore described. The outer end of the guide block 34 is also provided with a longitudinal bore 27^a of preferably the same cross section as the bore of the die. The die 33 is provided with a flange 35 and bolts 36 pass through said flange and are screwed into the end of the guide block whereby the twisting die is held in place in the guide block. Some means may be employed for further preventing the rotation of the twisting die within the guide block, such as, for instance, the keys 37, shown in Fig. 13, but this shows only one of the many means by which this may be accomplished. Pins 38 and 39 are set into the guide block (Fig. 9) and support the same. When using the solid twisting die it becomes necessary to employ some means for extracting the twisted bar from the die after the bar has ceased to contact with the pass rolls.

In Figs. 14 and 15, I have shown an extractor as a preferred means for accomplishing this end. In these figures 40 and 41 represent the housings, 42 and 43 the pass rolls and 44 the rest bar of an ordinary rolling mill. 45 is a small roller which is journaled in the housings 40 and 41 just above the rest bar and in such a position as to bring its periphery tangent with the bottom of the twisted bar as it comes from the twisting die. The portion of this roller between the housings has its periphery knurled or corrugated and the ends thereof project beyond the said housing, one of the ends having mounted thereon a spur gear 46 and the other a shaft collar 47. A gear 48, which is rigidly mounted upon one end of the shaft of preferably the upper roll 42, meshes with the gear 46 and thus drives the knurled roller 45. Secured to the outside of the housing 41 are bearings 49 and 50. In these bearings is rotatably mounted the shaft 51 on the outer end of which is securely mounted an operating lever 52. Made integral with the operating lever 52

and extending in an opposite direction is a lever 53 upon which is mounted a weight 54. This weight is for the purpose of keeping the operating lever in a raised position and is only one of the many means which may be employed. Rigidly mounted upon the shaft 51, between the housings 40 and 41 and extending inwardly are levers 55 and 56 (the outer end of the lever 56 is broken away for clearness). Supported by the levers 55 and 56 is a shaft 57 which is in a position vertically above the knurled roller 45 and upon which is rotatably mounted a pinch roller 58 which may be brought to bear upon the bar as it is passing over the knurled roller 45 by means of the operating lever 52. 59 is a bracket which is secured to the rest bar 44 and which being provided with arms 60 and 61 serves to support the die holder 34 by means of the pins 38 and 39.

Having thus described my invention, I will now describe its operation. When it is desired to use my split twisting die, it is fastened by means of the bracket 4 to the rest bar of the mill and in such a position as to cause the ridges 28 and 29 of the guide block 20 to lie in the finishing pass in the pass rolls. While the bar is being passed through the finishing pass in the pass rolls, and while it is still hot, it is guided by means of the guide block 20 to the entering end of the twisting die 15 where it is forced through and twisted. As hereinbefore stated, this twisting starts at zero and gradually increases to the maximum twist, thus the operation is accomplished with such ease as to make deformation of the bar between the rolls and the entrance end of the twisting die impossible. When the bar has traveled through the pass rolls it may be followed immediately by a second bar and thus force the last end of the first bar through the twisting die but when this is not the case, all that is necessary to do to remove the twisted bar is to turn the right and left hand screw 13 and thus spread the clamping members 8 and 9 sufficient to allow the end of the bar to be easily pulled out of the twisting die. While the end of the twisted bar is being pulled out of the said die the latch 10 will prevent the die sections from being drawn therewith. When the bar has been removed from the twisting die, the screw 13 is turned in the opposite direction which again clamps the die sections, whereupon the twisting die is ready for immediate use on the next bar.

The modified form or solid twisting die shown in Figs. 9 to 14, is fastened to the rest bar of the mill in a similar manner as the split die hereinbefore described. The process of twisting with my solid twisting die is identical with that already described, but on account of its being solid it cannot be opened to release the last end of the

twisted bar, as can the split twisting die. When twisting a bar with the solid twisting die, after the end of the bar has passed the point of contact or bite of the pass rolls the lever 52 of the extractor is pressed downwardly which brings the pinch roller 58 down upon the bar and, as the pinch roller 45 is always revolving, the remaining end of the bar will thereby be pulled through and out of the die. When the lever 52 is released the weight 54 will raise the pinch roller out of its operative position where it will remain until the next bar has been twisted up to within a short distance from the last end.

It will be seen that with my device the twisted product is produced immediately after the finishing in the rolls and does not, therefore, require an additional heat or a separate operation, as is sometimes the case at the present time. It will also be evident that the twisted bars from my die will all be accurately and uniformly twisted.

Obviously my twisting die may be provided with a bore of a different polygonal section than that shown in the drawing and many other detail changes may be made without departing from the spirit of my invention and I do not therefore, wish to be limited to the exact embodiment herein shown and described.

Having thus described my invention, what I claim is:

1. A device of the character described comprising a twisting die provided with a bore formed with a gradually increasing degree of twist.

2. A device of the character described comprising a twisting die provided with a progressively increasing twisting bore and a straight portion at the entering end of said die, whereby the bars are held against rotation while being twisted by said twisting die.

3. A device of the character described comprising a twisting die provided with a progressively increasing twisting bore, a straight portion at the entering end of said die and a constant twist portion at the delivery end of said die.

4. A device of the character described comprising a die clamp, a split twisting die made in longitudinal sections held in said die clamp and provided with a bore formed with a gradually increasing degree of twist and means for quickly opening said clamp whereby the twisted bar may be easily removed from said die.

5. A device of the character described comprising a die clamp, a split twisting die made in longitudinal sections held in said clamp and provided with a progressively increasing twisting bore, a straight portion at the entering end of said twisting bore and means for quickly opening said clamp,

whereby the twisted bars may be easily removed from said die.

6. A device of the character described comprising a die clamp, a split twisting die
5 made in longitudinal sections held in said clamp and provided with a progressively increasing twisting bore, a straight portion at the entering end of said twisting bore, a constant twist portion at the delivery end of
10 said twisting die, and means for quickly opening said clamp, whereby the twisted bars may be easily removed from said die.

7. The combination with pass rolls and a rest bar; of a twisting die provided with a
15 bore formed with a gradually increasing degree of twist, whereby bars as they come from the pass rolls are twisted by being forced therethrough.

8. The combination with pass rolls and
20 rest bar; of a twisting die provided with a progressively increasing twisting bore and a straight portion at the entering end of said die, whereby the bars as they come from the pass rolls are held against rotation by said
25 straight portion and gradually twisted by said twisting portion while being forced therethrough.

9. The combination with pass rolls and rest bar; of a twisting die provided with a
30 progressively increasing twisting bore, a straight portion at the entering end of said die, a constant twist portion at the delivery end of said die, whereby the bars as they come from the pass rolls are held against
35 rotation by said straight portion, gradually twisted by said progressive twisting portion and finished by said constant twisting portion while being forced therethrough.

10. The combination with pass rolls and a
40 rest bar; of a split twisting die made in longitudinal sections, a die clamp, said split die being held in said clamp and provided with a bore formed with a gradually increasing degree of twist, whereby bars as
45 they come from the pass rolls are twisted by being forced therethrough.

11. The combination with pass rolls and a rest bar; of a split twisting die made in longitudinal sections, a die clamp, said split
50 die being held in said clamp, provided with a progressively increasing twisting bore and a straight portion at the entering end of said die, whereby the bars as they come from the pass rolls are held against rotation by
55 said straight portion and gradually twisted by said twisting portion while being forced therethrough.

12. The combination with pass rolls and a rest bar; of a split twisting die made in longitudinal sections, a die clamp, said split
60 die being held in said clamp and provided with a progressively increasing twisting bore, a straight portion at the entering end of said die, a constant twist portion at the
65 delivery end of said die, whereby the bars

as they come from the pass rolls are held against rotation by said straight portion, gradually twisted by said progressive twisting portion and finished by said constant twisting portion while being forced there-
70 through.

13. The combination with pass rolls and a rest bar; of a bracket carried by said rest bar, a hinge-pin carried by said bracket, a
75 split twisting die made in longitudinal section, a die clamp comprising two clamping members rotatably mounted on said hinge-pin, said split die being held in said die clamp and provided with a progressively increasing twisting bore and means for quickly
80 opening said clamp, whereby the twisted bars may be easily removed from the die.

14. The combination with pass rolls and a rest bar; of a bracket carried by said rest bar, a hinge-pin carrier by said bracket, a
85 split twisting die made in longitudinal sections, a die clamp comprising two clamping members rotatably mounted on said hinge-pin, said split die being held in said die clamp and provided with a progressively in-
90 creasing twisting bore, a right and left hand screw for opening and closing said clamp and a latch mounted on said hinge-pin at the delivery end of said die, a lug on one of said clamping members, engaging said latch,
95 whereby the sections are prevented from traveling longitudinally when the said clamp is loosened.

15. The combination with pass rolls and a rest bar; of a bracket carried by said rest
100 bar, a hinge-pin carried by said bracket, a split twisting die made in longitudinal sections, a die clamp comprising two clamping members rotatably mounted on said hinge-pin, said split die being held in said die
105 clamp and provided with a progressively increasing twisting bore, a right and left hand screw for opening and closing said clamp and a latch mounted on said hinge-pin at the delivery end of said die, a lug on one of
110 said clamping members, engaging said latch, a clamp brace carried by said bracket and extending upwardly and then downwardly between the said clamping members, its slotted upper end engaging with a groove
115 cut in the said right and left hand screw, whereby the said twisting die is held in its proper position.

16. The combination with pass rolls and a rest bar; of a bracket carried by said rest
120 bar, a hinge-pin carried by said bracket, a split twisting die made in longitudinal sections, a die clamp comprising two clamping members rotatably mounted upon said hinge-pin, said split die being held in said
125 clamp and provided with a progressively increasing twisting bore, a guide block carried by said bracket and extending between said pass rolls and in register with the pass in said pass rolls, and provided with a straight
130

longitudinal bore, said bore in said guide
block being in register with the entering end
of said twisting bore in said die, a latch ro-
tatably mounted upon said hinge-pin at the
5 delivery end of said die, means for quickly
opening and closing said clamping members
and a clamp brace.

In witness whereof I have hereunto set my
hand in the presence of two witnesses.

FRANK H. WILLIAMS.

Witnesses:

J. WM. ELLIS,
ETHEL A. KELLY.

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