My invention relates to the class of machines employed for straightening lengths of wire or similar material, and an object of my invention, among others, is the production of a machine of this kind having means to prevent rotation of the wire under forces exerted by the straightening member or arbor; and a further object of the invention is the production of a machine that shall be extremely rapid and efficient in operation.

One form of a machine embodying my invention and in the construction and use of which the objects herein set out, as well as others, may be attained, is illustrated in the accompanying drawings, in which—

Figure 1 is a view in front elevation of my improved machine.

Figure 2 is a top view of the same.

Figure 3 is a view in rear elevation of the machine.

Figure 4 is an end view looking from the left of Figure 3.

Figure 5 is an end view looking from the right of Figure 3.

Figure 6 is a detail view, scale enlarged, of the breaker mechanism looking down, with parts broken away to show construction.

Figure 7 is a similar view, but looking from the front.

My improved machine is adapted for use in straightening wire, that is, lengths of metal of various shapes but of the smaller dimensions in cross section, and particularly such as are usually put up in the form of coils and from which they are run through a straightening machine to be straightened for subsequent operations. In this operation a coil of wire is placed on a rotatably mounted reel from which it is extended into the straightening arbor, the reel rotating as the wire is taken up by the straightener. This straightener comprising a rotating arbor exercises a strong tendency, from friction by the straightening elements, to twist or rotate the wire, but this is resisted and prevented by the wire reel. This extension of the wire to the straightener deflects the wire from its original curved or coiled form and forces it into a more or less straight shape from which it has a strong tendency to resume its original curved or coiled shape. This fact is of little moment while the coil is upon the reel, but when such coil is entirely removed from the reel, there being nothing to prevent the wire from returning to its curved form, it immediately does so. This fact would not be serious were it not for the reason that the restraining influence exerted by the reel to rotation of the wire has also been removed. Consequently, the wire, through the friction caused by the rotating straightening elements, immediately begins to rotate, even before it completely leaves the reel and, owing to its curved form, a violent whipping action takes place that is a source of much danger.

My improved machine, illustrated and described herein, removes this source of danger by preventing rotation of the wire after it leaves the reel and consequently eliminating this whipping action, there being but a very short end of the wire that is left free before it finally enters the straightener and this end, having the curved form hereinafter referred to and such as would be objectionable, being removed.

My improved straightener is mounted upon a support of any desired construction and which may comprise a base 5, a frame 6 rising therefrom and a bed 7 supported at the top of said frame. Several units comprising the structure as a whole are separately formed and independently mounted upon the bed 7. Generally speaking these comprise a feed unit 8 including feed rolls to receive the advancing end of a wire extended from a reel (not shown). From the feed unit the wire passes into a horizontal straightening unit 9 to be more particularly hereinafter described, and from said straightening unit the wire passes to a vertical straightening unit 10, also to be more particularly hereinafter described. These two straightening units just referred to are commonly known in the art as "breakers" and from the unit last mentioned the wire is passed through a second feed device 11, and from thence into a flier unit 12, which comprises a straightening arbor of any old and well known construction. From said flier unit the wire extends through another feed unit similar to the two hereinbefore re-
ferred to. All of the parts thus described are, in themselves, of well known and old construction, and, except in particulars to be hereinafter referred to, form no part of my present invention.

The arbor or flier 14 that comprises the straightening member of the flier unit has straightening elements, not specifically shown, between which the wire is passed in a devious path, in a manner well known in structures of this class and for which reason a further and detailed description is omitted. This arrangement exerts a considerable amount of friction upon a length of wire, as the arbor is rotated, this friction tending to rotate the wire, as hereinbefore explained. In order to prevent this result I provide the straightening units 9 and 10, hereinbefore mentioned. The unit 10 comprises a plurality of straightening rolls arranged in sets, with: an upper set 15 and a lower set 16 with their axes horizontally arranged, the upper set being provided with any suitable means, as adjusting screws 17, for positioning the rolls relatively to those of the lower set. The mounting of these rolls may be of any well known type of construction and further and detailed reference thereto is omitted herein. The lower set 16 of rolls are each positively driven, the upper set of rolls rotating freely to respond to conditions as they may be imposed.

In the structure herein shown the roll mounted on the axis 18 has a pinion 19 rigidly connected therewith and pinion being rigidly connected with a driving gear 20 which, in fact, is a worm wheel meshing with a worm 21 secured to a driving shaft 22 mounted in bearings on the several units and extending preferably substantially from end to end of the machine. The other rolls of the set 16 are driven as by means of intermediate gears, the first of which 23 meshes with the gear 19 and with a gear 24 rigidly connected with one of said rolls, the gear 24 meshing with a second intermediate gear 25 in mesh with a gear 26 rigidly connected with the last roll of said lower set 16.

The shaft 22 is driven as by means of a gear 27 meshing with a pinion 28 on the shaft of a motor 29 that may be of any ordinary construction and that is shown herein as mounted on the base 5 and the arbor 14 is driven as by means of a pinion 30 thereon meshing with an intermediate gear that in turn meshes with a gear 31 secured to the shaft 22.

The shaft 22 has a worm 32 meshed with a worm wheel 33 secured to the shaft of one of a pair of feed rolls comprised in the feed unit 8, said rolls being connected by intermeshing gears in a manner common to structures of this kind. In a similar way a worm 34 on the shaft 22 meshes with a worm wheel 35 fast to the shaft of one of the breaker rolls of the straightening unit 9, this unit comprising two sets of breaker rolls having an intergeared connection in a manner similar to that hereinbefore described with reference to the breaker unit 10, and for which reason a further and more detailed description is omitted herein.

A feature of my invention resides in the feed device 11 that is formed as an integral part of the breaker unit 10, this feed device comprising a pair of feed rolls having an intergeared connection and the gear secured to the shaft of one of the rolls, the lower one in the present structure, being in mesh with an intermediate gear 36 having its teeth meshed with the teeth of the driven gear 20, hereinbefore referred to.

The feed unit 13 is mounted to receive the wire from the straightening arbor, the rolls of this unit acting alone to pull the wire through the straightening arbor after such wire has left the feed device 11. The feed rolls of the unit 13 have an intergeared connection and the shaft of one of said gears has a worm wheel contained in a gear case 38 that meshes with a worm in the lower part 39 of said case, said worm being secured to the shaft 22 in a manner very like that hereinbefore described with reference to the other feed devices.

Altho the wire has a more or less coiled form which its end assumes at once when such end finally leaves the reel yet a sufficient grip is maintained on the wire to prevent its rotation under the friction exerted by the straightening arbor and the whipping incident to such rotation, if permitted, is avoided. The preliminary straightening unit is located so near the straightening arbor that all chance of whipping, should there be such a tendency, is eliminated and even if the wire did rotate at this point under the influence of the straightening arbor the preliminary straightening by the breaker units removes the bends or coils in a manner to prevent such whipping action.

It is desirable that the wire, which is generally cut into lengths after being straightened, shall be clear from all marks, and to this end I have constructed a burnishing or polishing device so located as to perform the last operation of the machine prior to the cutting off operation, there being nothing in this last operation to leave a mark or marks upon the wire in the particular form of construction of the device shown herein. This operation of removing the marks or scratches from the wire is more or less in the nature of an abrading or polishing action, but as such construction forms the subject matter of a separate application to be filed by me a detailed description is omitted herein, as sufficient for the present case it being stated that this device comprises a polishing unit 40 movably secured to the frame in such prox-
imity to the feed unit 13, hereinbefore referred to, as to receive the wire directly therefrom. This polishing unit effectively removes all of the marks that may have been placed on the wire in the operation of other parts of the machine, or otherwise, and from the polishing device the wire passes, with scarcely any interval, into the cutting off device generally indicated by the numeral 41 and which may be of any desired form and construction and a description of which is unnecessary to a thorough understanding of my present invention and which is, therefore, omitted herein.

In accordance with the provisions of the patent statutes I have described the principles of operation of my invention, together with the device which I now consider to represent the best embodiment thereof; but I desire to have it understood that the device shown is only illustrative and that the invention may be carried out by other means and applied to uses other than those above set out.

I claim—

1. A wire straightening machine including a rotatably mounted straightening arbor having means for straightening the wire passed therethrough, and a breaker unit comprising sets of oppositely arranged rolls with means for positively driving one of said sets to force the wire toward and to substantially straighten said wire for delivery to said arbor.

2. A wire straightening machine including a rotatably mounted straightening arbor having means for straightening a wire passed therethrough, a breaker unit comprising sets of oppositely arranged rolls mounted on horizontal axes, a breaker unit comprising sets of oppositely arranged rolls mounted on vertical axes, and means for positively driving one of each of the sets of rolls appurtenant to each breaker to substantially straighten a wire for delivery to said arbor.

3. A wire straightening machine including a bed, a straightening arbor unit removably secured to said bed, a breaker unit removably secured to said bed to straighten a wire in one direction for delivery to said arbor, a second breaker removably secured to said bed to straighten a wire in another direction, a feed roll unit removably secured to said bed, a driving shaft, and a driving connection between said driving shaft and each of said units for driving the latter.

4. A wire straightening machine including a bed, a straightening arbor unit removably secured to said bed, a breaker unit removably secured to said bed and including a set of feed rolls for feeding wire from the breaker unit to the straightening arbor, a driving gear on said breaker unit, geared connections between said driving gear and some of the breaker elements, a geared connection between said driving gear and said feed rolls, a driving shaft, a connection between said driving