April 9, 1946. A. W. HUNZ 2,397,965

ROLLED TOOTH BAR

Original Filed Jan. 8, 1940 2 Sheets-Sheet 1

FIG. 1.

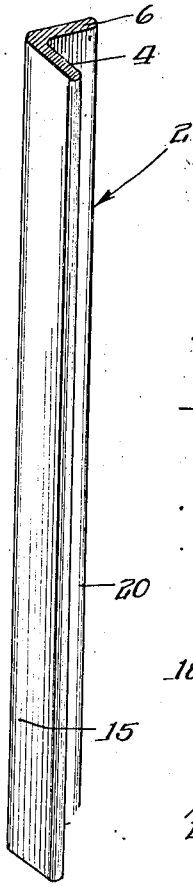


FIG. 2.

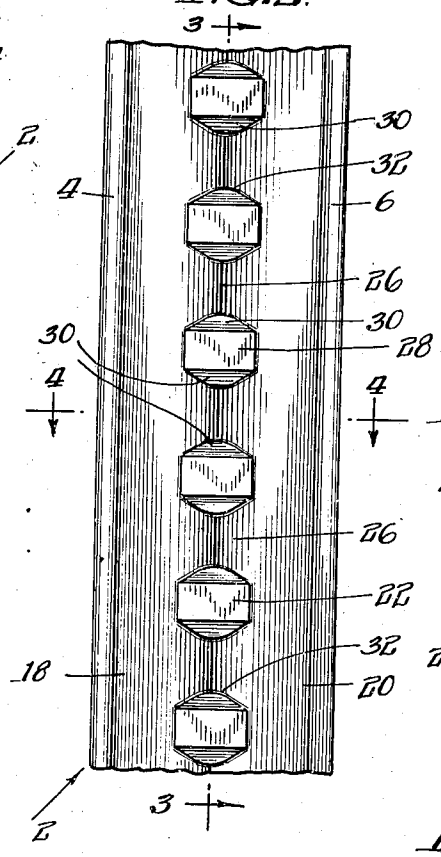


FIG. 3.

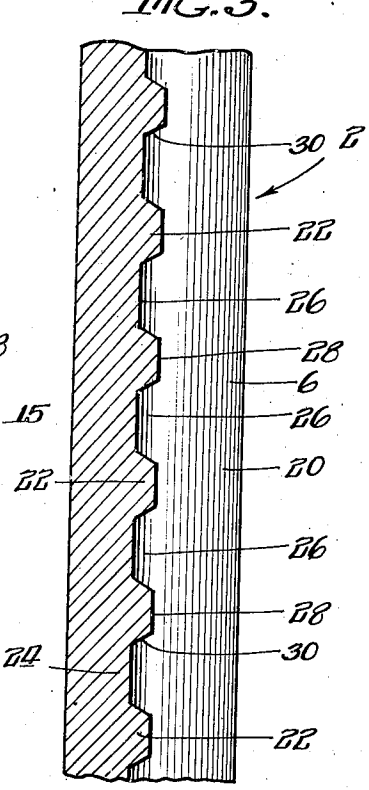


FIG. 4.

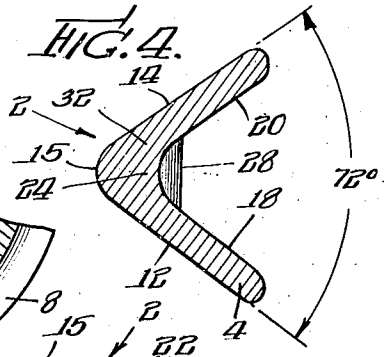


FIG. 6.

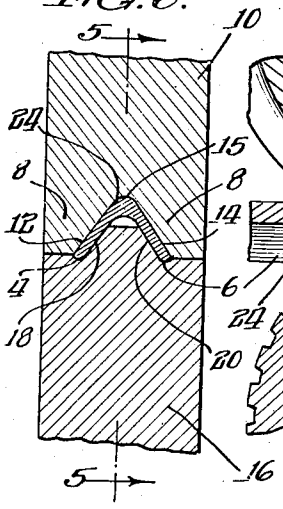


FIG. 5.

FIG. 7.

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FIG. 8.

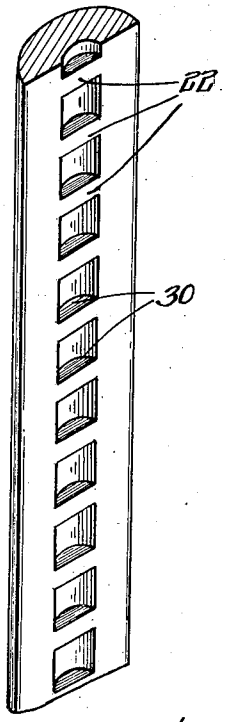


FIG. 9.

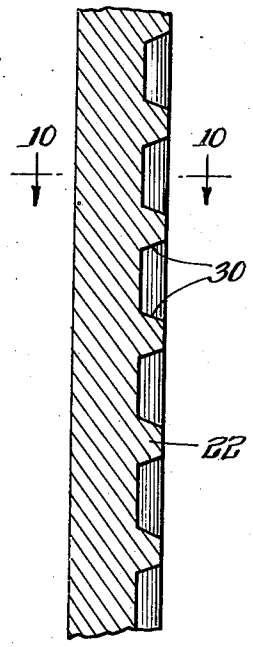


FIG. 10.

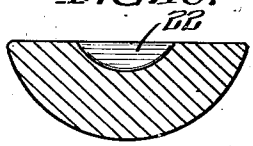


FIG. 12.

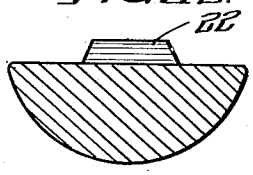


FIG. 13.

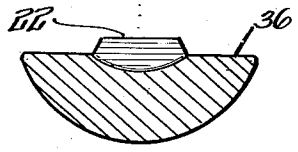


FIG. 16.

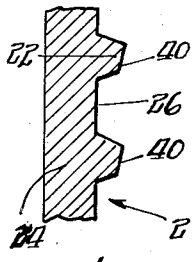


FIG. 17.

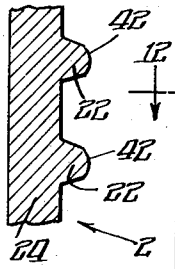


FIG. 11.

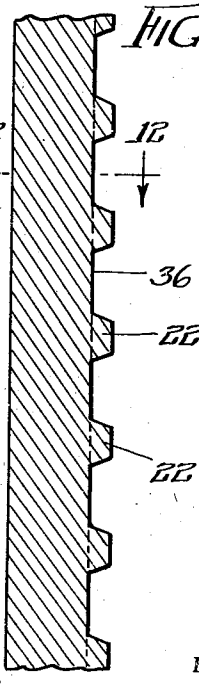


FIG. 14.

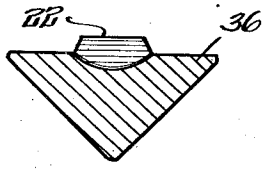


FIG. 18.

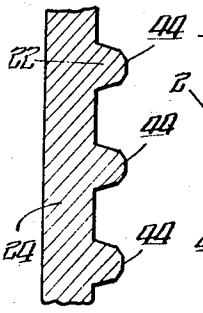


FIG. 19.

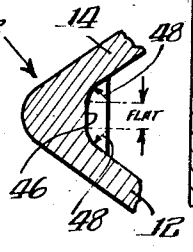
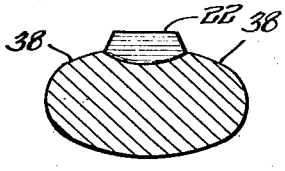


FIG. 15.



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Patented Apr. 9, 1946

2,397,965

UNITED STATES PATENT OFFICE

2,397,965

ROLLED TOOTH BAR

Alphonse W. Hunz, East Chicago, Ind.

Original application January 8, 1940, Serial No. 312,950. Divided and this application December 15, 1941, Serial No. 423,078

12 Claims. (Cl. 74—460)

This invention relates to elongated, toothed bars or rods of variant cross-section rolled from high carbon steel in such a manner that they may be inexpensively made, and at the same time are comparatively light in cross-section and weight, yet strong and rugged.

This invention contains subject matter common to but not claimed in my prior invention, Serial No. 312, 950, filed January 8, 1940, the claims of which relate to pushing and pulling devices, particularly lifting jacks.

Among the objects of the present invention are to provide an economically manufactured strong and rugged toothed bar or angle iron rolled from preferably high carbon steel stock and having the teeth uniformly formed thereon; to provide a corresponding process for producing such article; to provide a toothed bar or angle iron rolled from preferably high carbon steel stock in a manner such that the teeth thereof are shaped so that when cooperating with a ratchet, a pawl or other cooperator such teeth will be self-cleaning in that they will not become readily clogged with dirt, scale, rust particles or other foreign matter which would otherwise tend to prevent proper operation of the tooth member and its actuator; to provide these and other objects of invention as will be apparent from a perusal of the following specification and the drawings.

Referring to the drawings in detail:

Figure 1 is a perspective view of the preferred form of the invention.

Figure 2 is a face view of the completed toothed bar forming a rack or ratchet bar.

Figure 3 is a section on line 3—3 of Figure 2.

Figure 4 is a view on line 4—4 of Figure 2.

Figure 5 shows the approved method of rolling the rack or bar.

Figures 6 and 7 show the shapes formed during certain of the last passes of the bar through the mill.

Figure 8 is a perspective view of a modified form showing an integral rib pressed into the face of the bar.

Figure 9 is a longitudinal sectional view taken through the longitudinal center of the bar shown in Figure 8.

Figure 10 is a section taken on line 10—10 of Figure 9.

Figure 11 is a longitudinal sectional view of the type of bar shown in Figure 12.

Figure 12 is a section taken on line 12—12 of Figure 11.

Figures 13, 14 and 15 are still further modifications of the invention.

Figure 16 is a fragmentary sectional view longitudinally of the bar, showing teeth having beveled top surfaces.

Figure 17 is a similar view showing teeth having curved or rounded top surfaces.

Figure 18 is a similar view showing teeth having hexagonal top surfaces; and

Figure 19 is a fragmentary sectional view showing a modified cross-sectional view taken through the angle bar.

The present invention comprises an elongated toothed rack or ratchet bar 2 formed of suitable steel, preferably high carbon steel, and preferably hot-rolled to the required shape to produce a toothed bar which may be relatively light or small in cross-section so that the weight of the bar is materially reduced while at the same time strength and ruggedness are not sacrificed. The teeth are uniformly spaced.

The bars, rods or shapes may be formed of any desired type of stock including cut-up railroad rails. I have shown in Figures 1 to 7 a bar formed of angle iron. This is the preferred embodiment of the invention. In this angle bar the flanges 4 and 6 are disposed angularly with respect to each other not less than 72 degrees apart, but possibly more. The flanges 4 and 6 may be further spaced apart with respect to each other from 72 degrees up to 90 degrees more or less. They should not be closer together than the 72 degree angle.

In hot-rolling the toothed bar the spaced-apart flanges 8 of the upper roll 10 support the outside faces 12 and 14 and outside apexal wall 15 of the angular bar (see Figure 4) while at the same time the lower roll 16 of the rolling mill supports the inside faces 18 and 20 of the angular flanges of the angular bar. The lower roll 16 in conjunction with the upper roll 10 forms the teeth 22 by causing the metal of the bar at the apex 24 to flow laterally longitudinally of the bar to form a series of uniformly and longitudinally spaced teeth integral of the bar and extending transversely thereof, projecting upwardly and outwardly of the interdental spaces 26 and forming the basal inside apexal portion 24 of the bar at the junction of the two flanges 12 and 14.

In practice the midpoints of adjacent teeth are preferably formed from ¼ to ¾ of an inch apart. The teeth are in height not greater than ⅜ of an inch. The top of each tooth may be formed flat as at 28 and the dimension of this flat portion is preferably ⅛ of an inch longitudinally of the bar and at least ⅜ of an inch, or possibly more, transversely of the bar. Each

tooth tapers downwardly from the flat face **28** to the bottom interdental space **24** as shown at **30**, i. e., each tooth is provided with a sloping face as shown at **30** and these teeth are preferably oppositely sloped so that the bar may be reversely used. The interdental space **26** between the adjacent reversably sloped faces **30** of the adjacent teeth is formed parallel with the plane of the front and rear planes of the bar. By forming the teeth with oppositely formed faces **30** a ratchet is capable of being in position and operation so that the opposite face may be automatically used if desired. The opposite beveled faces **30** intersect the valley portion **24** (see Figures 2 and 4) and form curved intersections **32** as shown. By thus forming the teeth with the beveled faces **30** spaced apart a considerable distance in the manner shown, when a holding pawl or ratchet member moves along in the face of the bar from one tooth to the next it will automatically clean out the dirt or other foreign matter which has lodged in the valleys of the interdental spaces **24** and therefore maintain the toothed bar in effective operating condition. This self-cleaning feature is due to the fact that the plane of the bottom portion of the valley **24** lying in a direction longitudinally of the long axis of the bar is parallel to the plane of the rear or front faces of the bar and joins with the opposed beveled face **30** in such a manner that as the pawl moves down at face **30** it will slide into the adjacent valley and wedge or scrape the dirt therefrom and force it out of such valley.

The cross-sectional area of the spacing between the teeth of the bar is at least 15 to 20 per cent greater than the cross-sectional area of a tooth, whereby to facilitate the hot rolling of the toothed bar, as it is found that in hot rolling, tremendous heat on a small tooth will fire-crack the small piece. The spacing between the teeth has to be at least $\frac{7}{16}$ of an inch, whereby to provide spacing between the teeth sufficiently large so that the pawl mechanism which operates between the teeth, in conjunction with the beveled surfaces on the teeth, will kick out the dirt where the dirt has room to be cleared out.

In Figure 8 I have shown a bar with a rounded or acutely formed rear face and wherein the valleys between the teeth and the opposed beveled face **30** are formed by countersinking the metal of the bar which is shown in section in Figure 9 also.

In Figures 11 to 15 the variant cross-sectional shapes of the bar are shown in conjunction with raised teeth, the teeth and the reversably beveled faces **30** thereof extending upwardly from the plane of the bar itself as shown at **36**.

In Figure 15 the bar, as shown at **38**, curves downwardly away from the basal portion of the teeth **22**. In each one of these figures the dimensions of the teeth and the manner in which the interdental spaces are formed are similar, only the cross-sectional dimensions of the body of the stock being changed.

In Figure 16 there are shown modified teeth which may be rolled on the bar and whereon the top surfaces of the teeth are formed with a bevel, as shown at **40**.

In Figure 17 the top surfaces of the teeth are shown rounded as at **42**, and in Figure 18 the top surfaces are shown hexagonal as at **44**. All of these different types of top surfaces may be formed during the rolling of the bar.

In Figure 19 there is shown a modified type of tooth having a slight flat portion **46** at the intersection of the base of the tooth with the interdental space between the teeth of the bar. There are also arcuate portions **48** emerging from the lowest point of the interdental space and connecting the flat portion **46** with the side flanges of the bar **2**. The arcuate portions emanating from the lowest point of the space must extend at least $\frac{1}{32}$ of an inch upwardly or outwardly from the lowest point. This construction is more practical in rolling, as well as being preferable for jack purposes. However, an arcuate wall portion must emerge on each side of the flat face, as sharp corners at these points could not be rolled even if a roll was made having sharp edges, since sharp corners in the bottom of the groove would very soon wear into an arcuate or curved wall.

Obviously the invention is not limited to the specific forms disclosed herein but is capable of other modifications and changes without departing from the spirit and scope of the claims appended hereto.

The invention is hereby claimed as follows:

1. A toothed bar of steel having a longitudinal recess extending lengthwise of the bar, the extent of said recess in a direction transversely of the length of the bar being at least 10 per cent greater at the top than at the bottom of the recess, teeth uniformly spaced longitudinally of the bar and located at the bottom of the recess, the interdental spaces being formed on a continuous curve transversely of the bar, said curved surfaces intersecting the longitudinal surfaces of the sides of the bar.

2. A toothed bar of steel having teeth uniformly spaced longitudinally of the bar and located within the confines thereof, the extent of said teeth being substantially greater at the top than at the bottom of a tooth in cross section transversely of the length of the bar.

3. A rack or ratchet bar of solid metal having angularly disposed sides providing therebetween a longitudinal recess extending lengthwise of the bar, teeth located at the bottom of said recess, said teeth in cross section transversely of the length of the bar being substantially wider at the top than at the bottom, the opposing side walls of the bar forming said recess including arcuate portions adjoining the bottoms of the interdental spaces, which arcuate portions extend in a direction transversely of the length of the bar, said arcuate portions extending upwardly and outwardly away from the bottoms of said interdental recesses.

4. A tooth bar having integral teeth in spaced relation longitudinally of the bar and integrally formed therewith, said teeth being substantially wider at the top than at the bottom in cross section transversely of the length of the bar the spacing between the adjacent teeth being relatively greater than the size of the tooth in a direction longitudinally of the bar.

5. A toothed bar of angle cross-section having integral teeth disposed in spaced relation longitudinally of the axis of the bar and integrally formed therewith within the angle of the bar.

6. A rack or ratchet bar of relatively high carbon steel having opposed angularly disposed flanges angularly spaced apart between 65 and 75 degrees, said bar between the opposed flanges being provided with spaced apart teeth formed integrally with the flanges.

7. A rack or ratchet bar comprising an elongated bar of solid metal having angularly disposed intersecting sides providing an apexal por-

tion extending longitudinally of the bar, spaced teeth formed integrally of the metal of the bar and disposed in the apexal portion formed by the intersection of said angularly disposed sides, the bottoms of said interdental spaces all lying in a common plane longitudinally of the bar, and the inner walls of each of said angularly disposed sides in a direction transversely of the longitudinal axis of the bar including arcuate portions adjacent the bottoms of said interdental spaces, said arcuate portions being formed on a radius one end of which is disposed at a lowermost point of the interdental space, and said radius extending at least one thirty-second of an inch upwardly or outwardly from said lowermost point.

8. A toothed bar having integral teeth in spaced relation longitudinally of the bar, the interdental recesses in cross section transversely of the length of the bar being curved at their bottoms, the opposing interdental walls forming said recesses spreading outwardly in directions away from said bottoms.

9. A rack or ratchet bar comprising an elongated bar of solid metal having opposed angularly disposed sides, said sides constituting flanges forming therebetween a recess extending longitudinally of the bar, a plurality of teeth located at the bottom of said recess, said teeth intersecting the side walls of said flanges, and the interdental spaces in a direction transversely of the longitudinal axis of the bar being greater in extent at the top than at the bottom.

10. A rack or ratchet bar comprising an elongated bar of solid metal having angularly disposed sides forming therebetween a body portion having a longitudinal recess extending lengthwise of the bar, teeth formed in said body portion and spaced longitudinally of the bar and located at the bottom of said recess and intersecting the side walls of said recess, said teeth in a direction transversely of the longitudinal axis of the bar being wider at the top than at the bottom.

11. A rack or ratchet bar comprising an elongated bar of solid metal having a recess extending longitudinally of the bar, spaced teeth formed in said recess, the distance between the centers of adjacent teeth in a direction longitudinally of the bar being more than two times as great as the height of a tooth, the bottoms of the interdental spaces all lying substantially in a common plane longitudinally of the bar and said interdental spaces in cross section transversely of the bar being wider at the top than at the bottom.

12. A rack or ratchet bar comprising an elongated bar of solid metal having angularly disposed intersecting sides, providing an intermediate apexal portion extending longitudinally of the bar, spaced teeth formed integrally of the metal of the bar and disposed in the apexal portion formed by the intersection of said angularly disposed sides, the distance between centers of adjacent teeth in a direction longitudinally of the bar being substantially two times as great as the height of a tooth, the bottoms of the interdental spaces all lying substantially in a common plane longitudinally of the bar, the interdental spaces in cross section transversely of the bar being wider at the top than at the bottom and the cross sectional area of the spacing between the teeth being at least fifteen to twenty per cent greater than the cross sectional area of a tooth.

ALPHONSE W. HUNZ.