F. HORNBY.

CURVED RACK.

APPLICATION FILED AUG. 31, 1921.

1,412,116.

Patented Apr. 11, 1922.

2 SHEETS—SHEET 1.

Fig. 1.

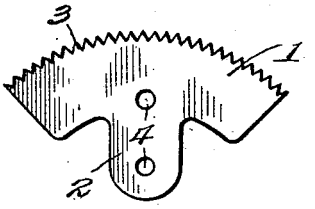


Fig. 2.

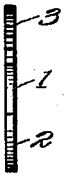


Fig. 3.

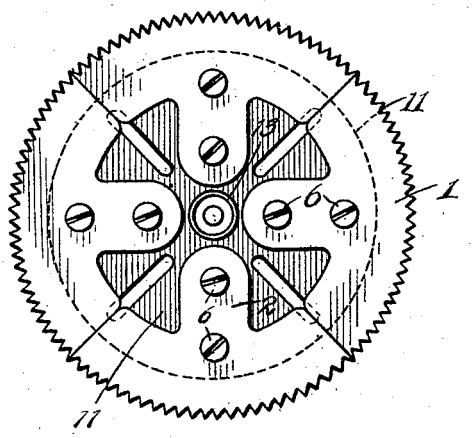
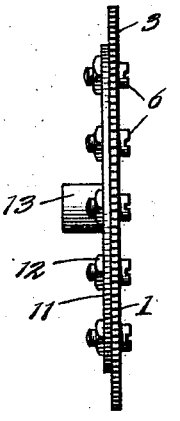


Fig. 4.



INVENTOR

Frank Hornby

BY

Dunn, Goodlett, Massie & Scott.

ATTORNEYS

F. HORNBY.

CURVED RACK.

APPLICATION FILED AUG. 31, 1921.

1,412,116.

Patented Apr. 11, 1922.

2 SHEETS—SHEET 2.

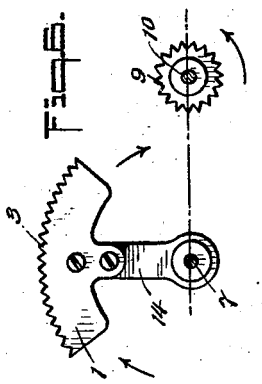


Fig.5.

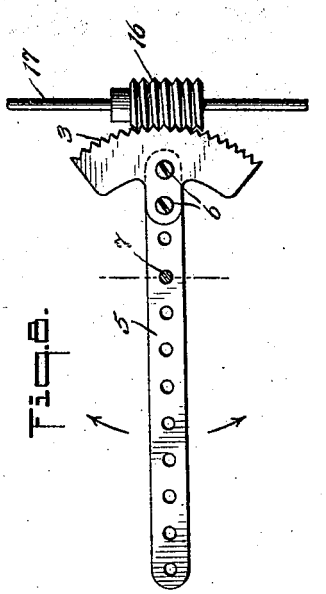


Fig.6.

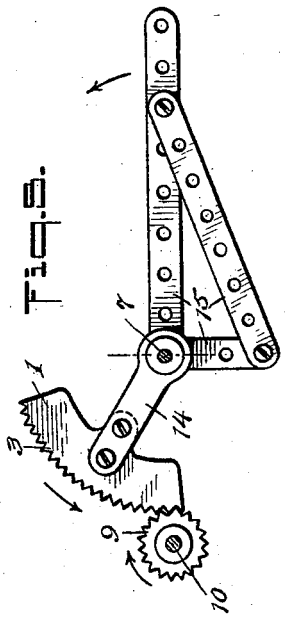


Fig.3.

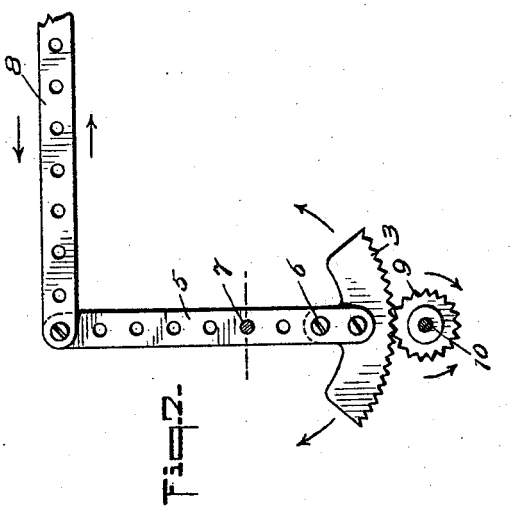


Fig.2.

INVENTOR

Frank Hornby

BY

Dunn, Goodlett, Massie & Scott

ATTORNEYS

UNITED STATES PATENT OFFICE.

FRANK HORNBY, OF LIVERPOOL, ENGLAND, ASSIGNOR TO MECCANO LIMITED, OF LIVERPOOL, ENGLAND, A BRITISH CORPORATION.

CURVED RACK.

1,412,116. Specification of Letters Patent. Patented Apr. 11, 1922.

Application filed August 31, 1921. Serial No. 497,238.

To all whom it may concern:

Be it known that I, FRANK HORNBY, a subject of the King of Great Britain, residing at Liverpool, England, have invented a new and useful Improvement in Curved Racks, of which the following is a specification.

This invention relates to an improved curved rack element for use in the building of constructional toys made up of interchangeable parts, the various parts after being utilized for building up a toy or model being capable of being taken apart and built up into other models. In such constructional toys it is desirable that each part should be interchangeable and fulfill several functions so as to reduce the total number of parts required in an outfit for building many models. The present invention relates to such a part.

According to this invention, the element consists of a curved rack or toothed segment of a circle such that while it may be secured at the end of a uniformly perforated metal strip or bar and engaged by a pinion or worm to give a to and fro angular movement, a series of such parts may also be assembled together on a disc or plate to form a complete gear wheel. One form of the invention is illustrated in the accompanying drawings, in which:

Fig. 1 shows an elevation of the curved rack or toothed segment;

Fig. 2 is an end view of the rack;

Fig. 3 is an elevation showing a series of the toothed segments assembled together to form a complete gear wheel;

Fig. 4 is an end view of such a complete gear wheel;

Fig. 5 is an elevation of a curved rack employed to rock a cantilever;

Fig. 6 shows a curved rack employed to produce intermittent rotary motion of one shaft from continuous rotary motion of another shaft;

Fig. 7 is an elevation of a curved rack employed to translate rotary motion into longitudinal motion or vice versa; and

Fig. 8 shows a curved rack cooperating with a worm to oscillate a perforated strip.

The curved rack consists of a flat sheet-metal plate having a segmental portion 1 and a centrally extending radial arm 2. The periphery of the segment 1 is circular and provided with a uniform series of teeth 3. In the sheet-metal-plate there are provided two or more perforations 4. Such perforations are spaced apart in accordance with the standard pitch of the perforations of the other elements in an outfit for use in the building of constructional toys, and most desirably are cut on a radius of the toothed periphery 3, the outermost perforation being spaced from the periphery a distance equal to the standard pitch aforesaid. The curved rack may be attached (Fig. 7) to a strip 5 having standard pitch perforations which thus register with the perforations 4 in the curved rack, the strip and rack being held together as by bolts 6 threaded through said perforations.

As a result of the positioning of the perforations 4 in the manner described, a shaft 7, on which strip 5 is mounted, will be at the center of the toothed periphery 3 so that during oscillation of strip 5, as by reciprocation of a second strip 8 secured at its upper end, it will maintain the teeth 3 in constant cooperation with the teeth of a pinion 9 mounted on a suitably positioned shaft 10. Moreover, the distance between shafts 7 and 10 will be an integral number of standard spaces. In the case shown in Fig. 7 where the pinion has a radius equal to the standard pitch of perforations, the distance between shafts 7 and 10 is five times such standard pitch.

The radius of the toothed periphery 3 of the curved rack may equal any integral number times the standard pitch of the perforations, in the rack shown in Fig. 1 the radius being three times such pitch. Thus, no matter what cooperating part from the constructional outfit is secured to the curved rack there will always occur a perforation at the center of the toothed periphery, and the pitch may be defined as an aliquot part of the radius of such periphery.

While the rack segment may extend through any arc of a circle, it most desirably extends through an aliquot part of a circle, such as 60°, 90° (as shown) or 120°. When the rack is of such an extent a number of racks may conveniently be mounted, as shown in Fig. 3, upon a disk 11 having radially disposed standard pitch perforations. The racks are secured to disk 11 by the usual bolts 6 and nuts 12 passing through perforations 4 and the perforations in the plate with which they register. Thus a complete gear wheel may be speedily con-

structed, there being provided a hub 13 consisting of a tubular boss suitably secured to register with the central perforation of disk 11.

In Fig. 5 there is shown a rack 1 secured to a crank 14 rigidly mounted on a shaft 7 carried by suitable bearings (not shown). A cantilever comprising three perforated strips 15 is likewise rigidly mounted on shaft 7. A pinion 9 may be rigidly mounted on a shaft 10 to cooperate with the teeth 3 of segment 1 so that rotation of shaft 10 will move the rack to rock the cantilever in the direction indicated by the arrows, illustrating the principle of a lift bridge. As described in connection with Fig. 7, the dimensions of the various parts are such that shafts 7 and 10 may be mounted in perforations of the usual rectangular perforated plates (not shown), the distance between said shafts equaling five times the standard pitch.

Fig. 6 illustrates the translation of uniform circular motion of a shaft 7 into intermittent circular motion of a shaft 10. A crank 14 is rigidly secured on shaft 7 and carries at its outer end a segment 1. The teeth 3 will engage the teeth of a pinion 9 mounted for rotation with a shaft 10 during one-fourth of each revolution of shaft 7, thereby causing shaft 10 to rotate as indicated by the arrows. In this case also, shafts 7 and 10 may be mounted at a distance of five perforations in any of the standard pieces supplied with toy building outfits.

Fig. 8 illustrates the cooperation between a curved rack segment and a worm. The rack 1 is secured to a perforated strip 5 rotatably mounted on a suitably supported shaft 7. A worm 16, mounted on a transverse shaft 17, cooperates with teeth 3 to move the rack and oscillate the strip in response to rotation of shaft 17.

While one embodiment of the invention and a number of its applications have been described in detail, it is to be understood that the invention is not limited to such description but may be varied within the scope of the appended claims without in any case departing from its spirit. For example, the segment 1 may have additional perforations positioned other than radially to cooperate with perforations on standard parts other than those shown, in which case the radius of the toothed periphery 3 may be determined regardless of the pitch of the standard perforations. Moreover, the arc described by the rack segment may be any fraction of a circle and a number of segments, differing in extent, may be assembled to form a complete gear wheel rather than a number of identical segments, as described. Again, the segments may be assembled on a pair of crossed strips rather than upon a disk, or upon some other number of strips or some other standard part of a toy building outfit. Obviously, the teeth 3 need not be of the simple variety shown, but may be any variety of contrate, spur or bevelled teeth.

What I claim is:

1. A curved rack for use in the construction of working models, toys, or the like, comprising a sheet-metal blank having a circular arcuate toothed periphery extending through a fraction of a circle, a centrally-extending radial arm midway of and terminating short of the center of the periphery, and a plurality of radially disposed perforations in the radial arm whereby the rack may be rigidly secured to a radially-extending strip.

2. A curved rack for use in the construction of working models, toys or the like, comprising a sheet-metal plate having a circular arcuate toothed periphery and a centrally extending radial arm, said plate having perforations to register with standard perforations in other elements of a toy construction outfit.

3. A curved rack for use in the construction of working models, toys or the like, comprising a sheet-metal plate having a circular arcuate toothed periphery, a radial arm extending toward the center of said periphery, and a plurality of radially disposed perforations, the centers of said perforations being distant from each other an aliquot part of the radius of said periphery and distant from the periphery an integral number of said distances from each other.

4. A gear-wheel for use in the construction of working models, toys or the like, comprising a plurality of flat sheet-metal die-cut blanks having arcuate toothed peripheries of equal radii, and means comprising a die-cut flat sheet-metal disc for maintaining said plates in predetermined relative position forming a complete circle.

5. In a gear-wheel for use in the construction of working models, toys or the like, the combination of a plurality of flat die-cut sheet-metal segments of a circle, each segment having radial edges, a standard toothed periphery and radial perforations placed according to a predetermined standard, of a flat die-cut sheet-metal blank provided with standard perforations registering with the perforations in said segments, and means for securing said segments to said blank to form a gear-wheel.

6. A curved rack for use in the construction of working models, toys or the like, comprising a sheet-metal plate having a circular arcuate toothed periphery and a centrally extending radial arm, said plate having perforations to register with standard perforations in other elements of a toy construction outfit, and said toothed periphery

extending through an aliquot part of a circle whereby a number of identical racks may be assembled to form a gear-wheel.

7. A curved rack for use in the construction of working models, toys or the like, comprising a sheet-metal plate having a circular arcuate toothed periphery, a radial arm extending toward the center of said periphery, and a plurality of radially disposed perforations, the centers of said perforations being distant from each other an aliquot part of the radius of said periphery and distant from the periphery an integral number of said distances from each other, and said toothed periphery extending through an aliquot part of a circle whereby a number of identical racks may be assembled to form a gear-wheel.

FRANK HORNBY.