

April 7, 1942.

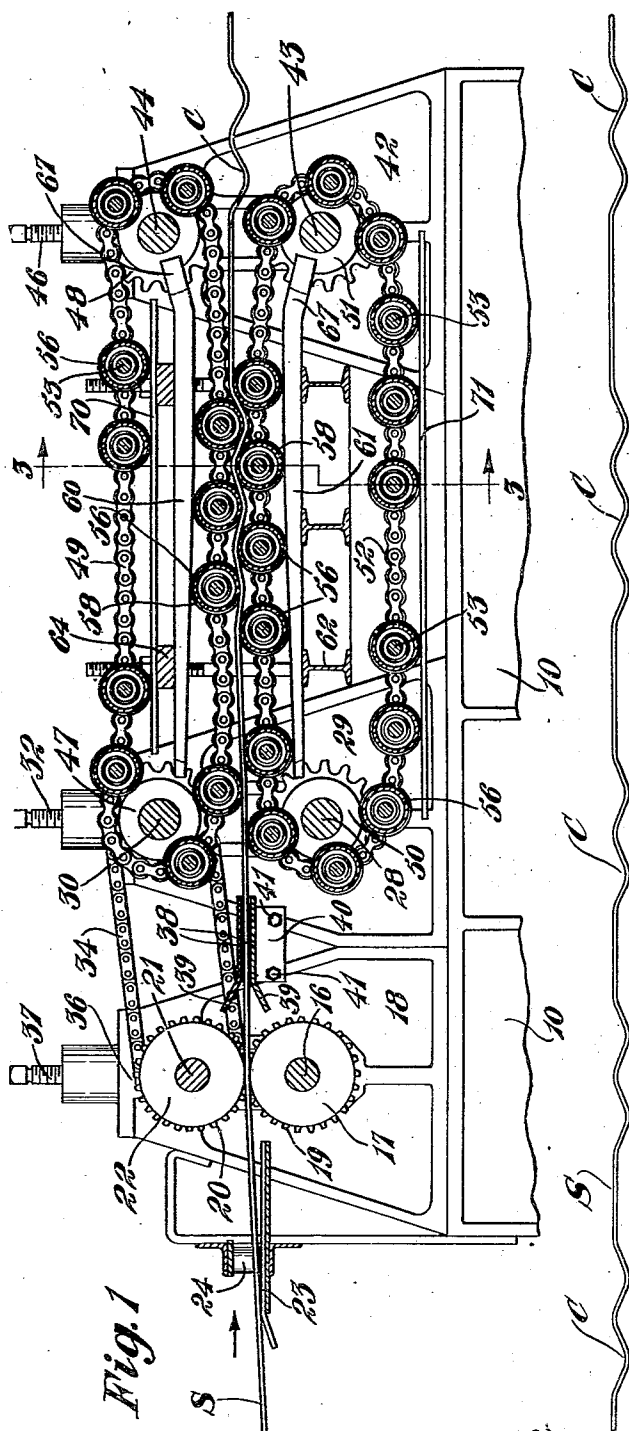
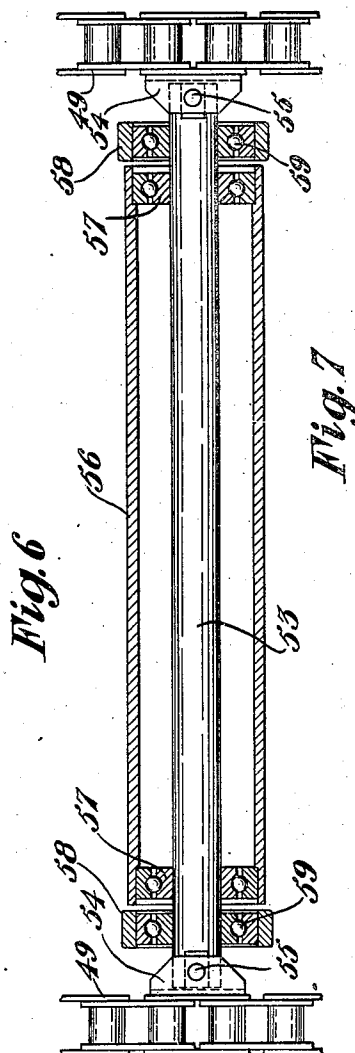
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2,278,477

CORRUGATING APPARATUS

Filed Sept. 28, 1940

3 Sheets-Sheet 1



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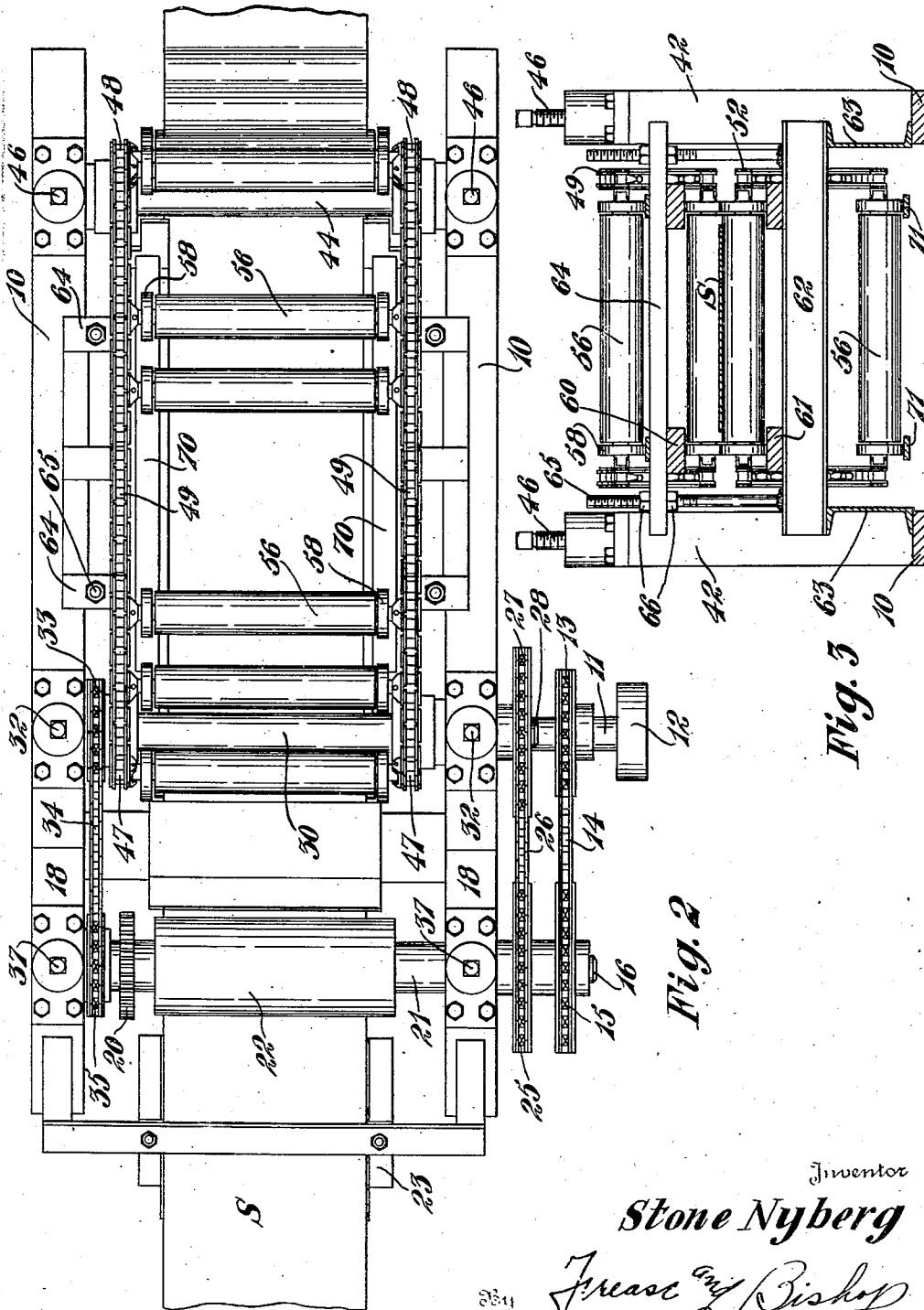
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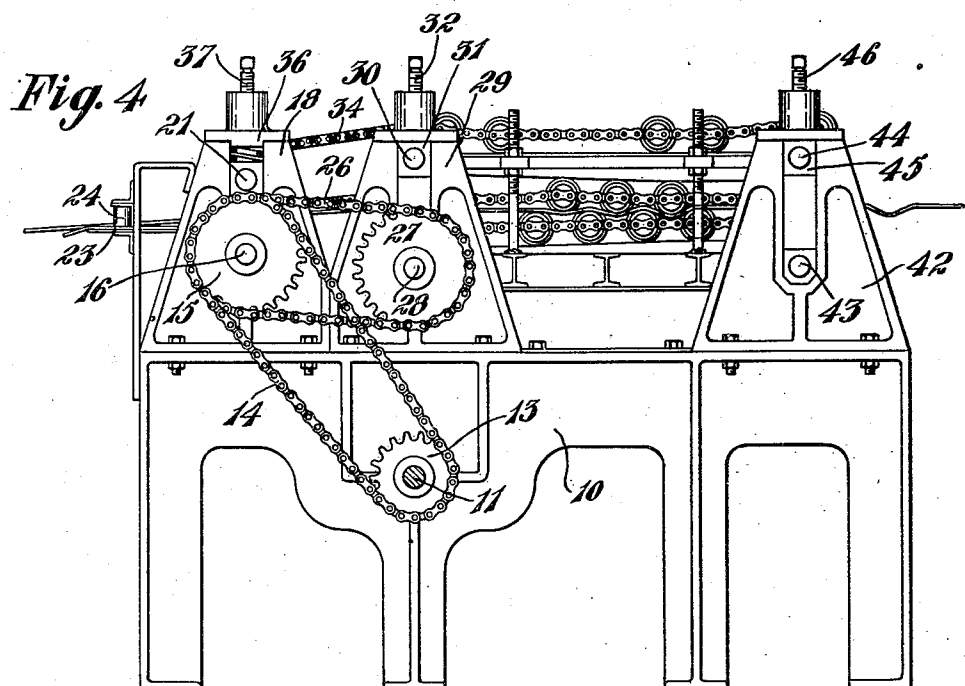
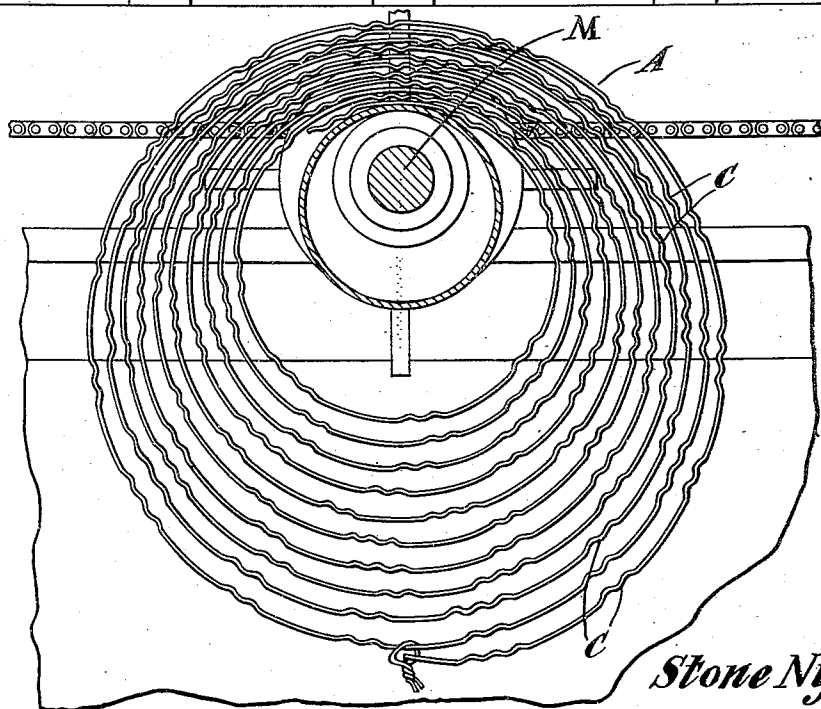


Fig. 5

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UNITED STATES PATENT OFFICE

2,278,477

CORRUGATING APPARATUS

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Application September 28, 1940, Serial No. 358,862

3 Claims. (Cl. 153—68)

The invention relates to the corrugating of sheet metal, and the particular machine disclosed in the present application is especially adapted for preparing coils of metal preparatory to pickling the coils in a pickling machine of the general type disclosed in Greer Patent No. 2,091,921, dated August 31, 1937; Shoemaker Patent No. 2,120,843, dated June 14, 1938; and Greer Patent No. 2,196,210, dated April 9, 1940.

The general type of pickling machines referred to provide for the pickling of coils of metal supported upon mandrels which are rotated as they are progressed through the pickling and washing tanks, whereby the coils are in turn rotated by the mandrels.

In machines of this type it is necessary that the convolutions of the coil be opened up, or separated from each other while immersed in the pickling solution so that none of the convolutions of the coil will remain in fixed contact with each other while in the pickling solution, thus preventing the pickled metal from being marred by black spots or marks where the acid has not had access to the surface of the metal. For this reason various means have been provided for opening up or separating the convolutions of the coil.

In the Shoemaker patent above referred to a back spinner was provided for rotating the coil of metal in reverse direction to partly unwind the same so as to open up the convolutions of the coil before it was charged into the pickling tank.

In Greer Patent No. 2,196,210, means are provided for further back spinning of the coils as they are passed through the solution, by rotating the mandrels, on which the coils are supported, in a reverse direction during at least a part of the time.

In such an apparatus the coil was formed in a conventional spiral, comprising a continuous curve from the center of the coil to the outside, and this frequently resulted in two adjacent convolutions of a coil contacting with each other for some distance while the coil was in the pickling solution, thus, preventing the acid from having access to the opposed surfaces of these convolutions of the coil and resulting in an imperfectly pickled coil having black spots or streaks upon the portions of the surface which were not properly exposed to the action of the acid.

Greer Patent No. 2,191,463 overcame this difficulty by forming a coil in which each convolution had a plurality of angular bends or corrugations therein so as to separate all convolutions of the coil from each other thus permitting the

pickling acid as well as the washing solution to have access to all portions of the surface of the metal.

The formation of the angular bends or corrugations in the Greer coil forming apparatus was accomplished by coiling the metal upon a drum having spaced ribs thereon and then back spinning the coil to separate or open up the convolutions so that the angular bends of adjacent convolutions would not register with each other.

In actual practice, coils formed in this manner have been pickled with very satisfactory results in pickling machines of the general type of the Greer and Shoemaker patents above mentioned. However, it has been found that in extremely large coils, some of which comprise strips of metal 1400 feet long, the angular bends or corrugations formed in the outer convolutions of such coils are so slight as to not properly space these outer convolutions from each other.

For this reason attempts were made to first corrugate the metal and then form it into a coil so as to provide corrugations of uniform depth throughout all convolutions of the coil.

However, it was found that present practice of corrugating methods were much too slow for practical use in forming a coil for pickling in machines of the type referred to.

In order to obtain the maximum advantage of such pickling machines it is desirable that a new coil be entered for pickling every two minutes and it was found that under present corrugating practice it is only possible to corrugate slightly more than 100 feet of metal in a minute.

Therefore, the capacity of the pickling machine would be reduced to only one-fourth to one-third of the desired maximum if the corrugating were carried out under present practice.

The object of the present improvement is to provide a novel means for corrugating metal by which the corrugating may be accomplished in a fraction of the time required under present practice.

Another object of the invention is the provision of corrugating apparatus comprising endless chains having cooperating corrugating rolls thereon, through which the sheet metal is passed.

A further object of the invention is the provision of corrugating apparatus of this character in which the cooperating working portions of the endless chains converge toward the exit end of the apparatus whereby the depth of the corrugations in the sheet metal is increased as the metal passes through the apparatus.

A still further object is the provision of such

a machine in which each of the corrugating rolls is journaled upon a shaft at each end of which is independently journaled a roller of greater diameter than the corrugating roll and adapted to ride upon tracks by means of which the rolls may be adjusted to form corrugations of any desired depth.

The above objects together with others which will be apparent from the drawings and following description may be attained by constructing the improved corrugating apparatus in the manner illustrated in the accompanying drawings in which

Figure 1 is a longitudinal sectional view through a corrugating apparatus embodying the invention;

Fig. 2, a top plan view of the corrugating apparatus shown in Fig. 1;

Fig. 3, a transverse sectional view taken as on the line 3—3, Fig. 1;

Fig. 4, a side elevation of the improved corrugating machine, on a smaller scale;

Fig. 5, a sectional elevation showing a coil of metal corrugated by the improved machine;

Fig. 6, a portion of a strip of sheet metal showing the manner in which it is corrugated by the improved machine; and

Fig. 7, an enlarged sectional view of one of the corrugating rolls.

Similar numerals refer to similar parts throughout the several views of the drawings.

The improved corrugating apparatus to which the invention pertains includes spaced side frames 10, through which is journaled a drive shaft 11 which may have a pulley 12 or the like fixed thereon for connecting the same to a motor, line shaft or other source of power.

A sprocket 13 is fixed upon the drive shaft 11 and connected as by the chain 14 to a sprocket wheel 15 upon the shaft 16 of the lower feed roll 17, said shaft being journaled in the spaced housings 18 mounted upon the side frames 10.

A gear wheel 19 is fixed upon the shaft 16 of the lower feed roll and meshes with a similar gear 20 fixed upon the shaft 21 of the upper feed roll 22, said shaft 21 being also journaled in the housings 18.

A guide table 23 is mounted between the housings 18 at the entrance end of the apparatus and vertical edge rolls 24 may be located near each side of the table for guiding a strip of metal into the machine.

A sprocket wheel 25 is fixed upon the shaft 16 and connected as by a chain 26 with the sprocket wheel 27 fixed upon a shaft 28 journaled in the housings 29 which are supported upon the side frames 10 adjacent to the housings 18.

A similar shaft 30 is journaled in blocks 31 adjustable toward and from the shaft 28 as by screws 32 and has fixed thereon a sprocket wheel 33 connected as by the chain 34 with a sprocket wheel 35 fixed upon the upper feed roll shaft 21.

It should be noted that this upper feed roll shaft 21 is journaled in blocks 36 vertically adjustable in the housings 18 as by the adjusting screws 37.

With this construction, feed rolls 17 and 22 may be adjusted toward or from each other to accommodate metal of varying thickness.

A pair of spaced guide plates 38 having forwardly flared ends 39 is located between the feed rolls 17 and 22 and the shafts 28 and 30 and may be connected to the housings 18 and 29 as by the angular flanges 40 and bolts 41.

A pair of housings 42 is mounted upon the side

frames 10 at the discharge end of the machine and the lower and upper sprocket shafts 43 and 44, respectively, are journaled in said housings, the upper shaft 44 being preferably journaled in bearing blocks 45 vertically adjustable in the housings as by the adjusting screws 46.

Spaced sprocket wheels 47 are fixed upon the shaft 30 and corresponding sprocket wheels 48 are fixed upon the shaft 44.

A chain 49 connects each sprocket wheel 47 and 48. Similar sprocket wheels 50 and 51 are fixed in spaced pairs upon the shafts 28 and 43, respectively, and are connected by similar sprocket chains 52.

The corrugating is accomplished by a plurality of similar rolls carried by the chains 49 and 52. Each of these rolls is of the same construction and one roll is illustrated in detail in Fig. 7.

Each roll is mounted upon a shaft 53 connected at opposite ends to the chains 49 or 52 as by the channel shaped brackets 54 and pins 55.

The rolls 53 may be tubular and are journaled upon the shafts 53 as by the ball bearings 57 at each end.

Independently journaled upon each shaft 53, beyond the ends of the roll 56 is a pair of rollers or wheels 58 preferably of slightly greater diameter than the roll 56, these rollers 58 may be journaled upon the shaft 53 by means of the ball bearings 59.

The rollers 58 on the shafts of the rolls of the upper and lower chains are adapted to ride upon tracks 60 and 61, respectively, located between the spaced pairs of sprocket shafts which carry said chains.

The lower tracks 61 may be mounted upon the transversely disposed eye-beams 62 supported upon the side frames 10 as by means of the channel irons 63 and the upper tracks 60 may be carried by the cross bars 64 mounted for vertical adjustment upon the threaded rods 65 and held in adjusted position thereon as by nuts 66.

The ends of the tracks 60 and 61 may diverge at the discharge end of the machine as indicated at 67.

The tracks may be so adjusted that their entrance ends are spaced further apart than their discharge ends whereby only a slight corrugation is formed by cooperating rolls 56 as the rolls pass into the entrance end of the tracks, the corrugations being increased in depth as the rolls pass along the tracks.

For the purpose of irregularly spacing the corrugations so that there will be no tendency for the corrugations of adjacent convolutions of the coil to register with each other, the rolls 56 are preferably located in irregularly spaced groups of varying numbers of rolls as shown in the drawings.

For the purpose of taking the weight of the endless conveyors on the return trip, upper and lower rails 70 and 71, respectively, may be provided for supporting the upper strand of the upper conveyor and the lower strand of the lower conveyor so as to take up any slack in the same.

In the operation of the improved corrugating apparatus above described the strip metal to be corrugated, indicated at S, is fed into the machine from the left hand side as viewed in Fig. 1, passing over the table 23 and between the edge rolls 24 and then between the feed rolls 17 and 22 and through the guide plates 38 to the corrugating rolls upon the sprocket chains.

As above described these chains carrying the rolls are preferably adjusted by means of the

tracks so as to only slightly corrugate the metal at the entrance end of the chains, the corrugations being increased in depth as the metal passes between the chains, the strip emerging from the machine with irregularly spaced groups of corrugations as indicated at C.

As the corrugated strip emerges from the machine it may be coiled upon any suitable drum such as indicated in Greer application Serial No. 230,304, filed September 16, 1938.

The coil may then be back spun to open up or separate the convolutions, in the manner disclosed in Greer Patent No. 2,191,463 and the coil thus formed, as indicated at A in Fig. 5, may be placed upon a mandrel indicated generally at M and passed through a pickling machine of the type above referred to, the corrugations C at all times keeping adjacent convolutions of the coil separated so as to permit access of the pickling and washing solutions to all portions of the surfaces of the metal.

Although the improved corrugating machine has been described as especially adapted for corrugating metal coils preparatory to pickling the same, it should be understood that by uniformly spacing the corrugating rolls the machine may be used for forming corrugated sheets and the like without in any way changing the invention or departing from the scope of the appended claims.

In actual practice the improved corrugating machine has been operated at a speed of over 800 feet a minute, thus making the same commercially practical for corrugating metal coils for pickling in the types of pickling machines disclosed in the above mentioned patents.

According to the provisions of the patent statutes I have explained the principle of my invention and described one embodiment thereof, but I desire to have it understood that within the scope of the appended claims the invention may be practiced otherwise than as specifically illustrated and described, the invention residing in the corrugating rolls carried by endless chains and moving with the sheet metal as the same is corrugated.

I claim:

1. Corrugating apparatus comprising two cooperating pairs of endless chains, shafts connecting each pair of chains at irregularly spaced points, rolls journaled upon the shafts and cooperating with each other, rollers journaled upon each shaft independently of the rolls, tracks upon which the rollers ride, said tracks converging toward the discharge end of the apparatus, means for adjusting the tracks relative to each other, and means for driving the chains in unison to convey a sheet of metal between the chains and simultaneously corrugate the sheet by contact with the rolls.

2. Corrugating apparatus comprising two cooperating pairs of endless chains, shafts connecting each pair of chains at irregularly spaced points, rolls journaled upon the shafts and cooperating with each other, rollers journaled upon each shaft independently of the rolls, tracks upon which the rollers ride, said tracks converging toward the discharge end of the apparatus, and means for driving the chains in unison to convey a sheet of metal between the chains and simultaneously corrugate the sheet by contact with the rolls to successively increase the depth of corrugations in the sheet from the entrance end toward the discharge end of the chains.

3. Corrugating apparatus for corrugating a flat metal strip, said apparatus comprising two cooperating endless conveyors, cooperating rolls journaled upon the conveyors and located so as to contact opposite surfaces of the metal strip at longitudinally spaced points, rollers journaled upon the conveyors independently of the rolls, tracks upon which the rollers ride, said tracks having straight portions converging toward the discharge end of the apparatus, and means for driving the conveyors in unison to convey a sheet of metal between the conveyors and simultaneously corrugate the sheet by contact with the rolls to successively increase the depth of corrugations in the sheet from the entrance end toward the discharge end of the apparatus.

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