May 24, 1955 H. H. CRAFTON 2,708,958

METHOD OF AND APPARATUS FOR MAKING A STEEL FLOOR

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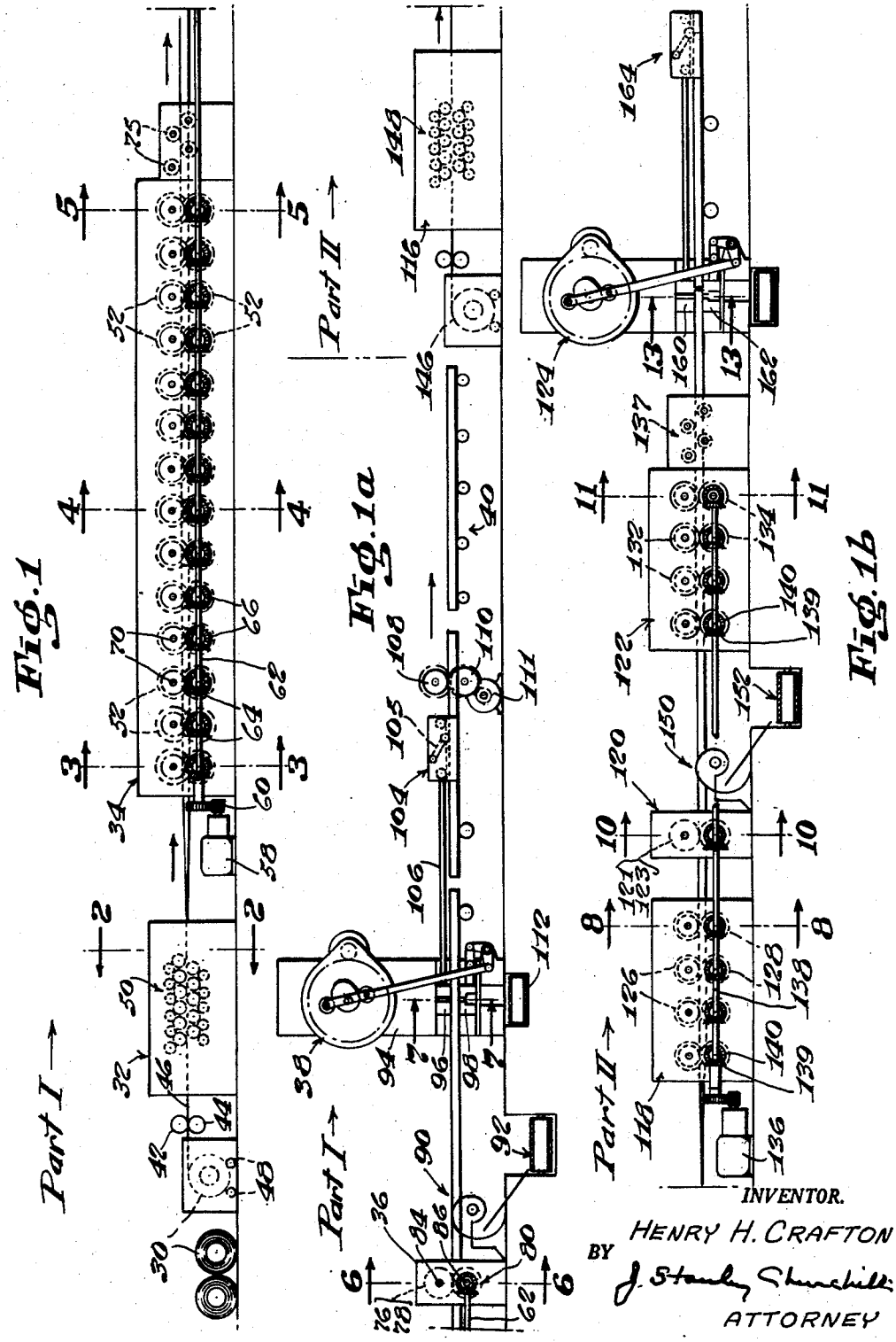


Fig. 1

Fig. 1a

Fig. 1b

May 24, 1955 H. H. CRAFTON 2,708,958

METHOD OF AND APPARATUS FOR MAKING A STEEL FLOOR

Filed Nov. 15, 1949 6 Sheets-Sheet 2

Fig. 2

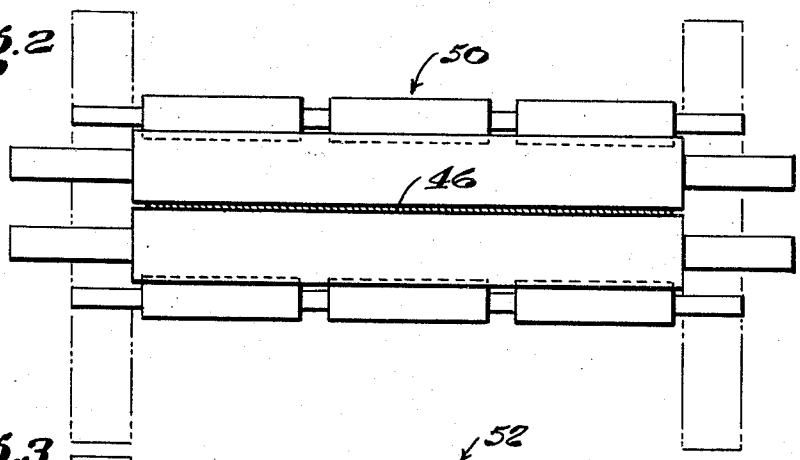


Fig. 3

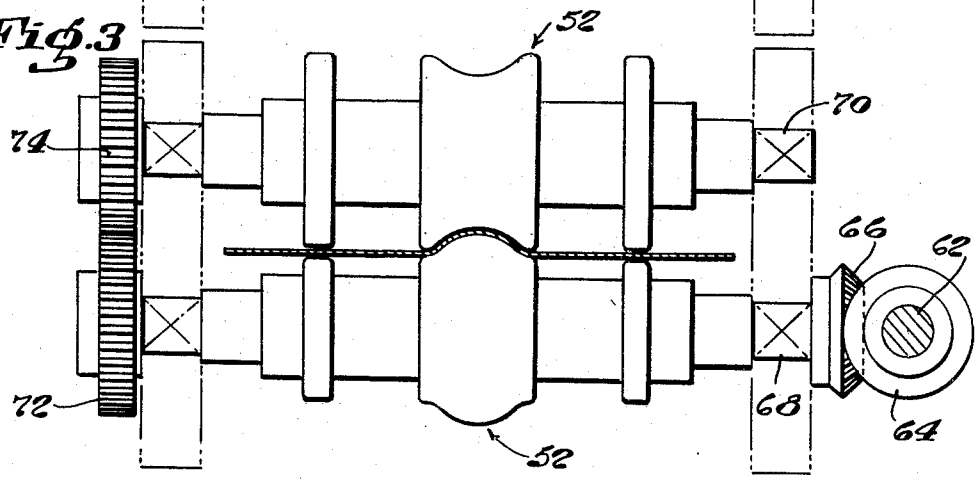
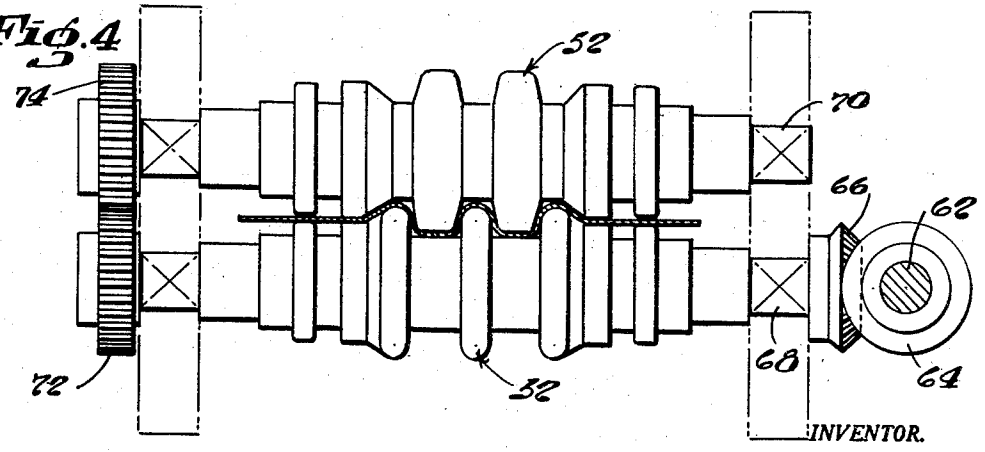


Fig. 4



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May 24, 1955 H. H. CRAFTON 2,708,958

METHOD OF AND APPARATUS FOR MAKING A STEEL FLOOR

Filed Nov. 15, 1949 6 Sheets-Sheet 3

Fig. 5

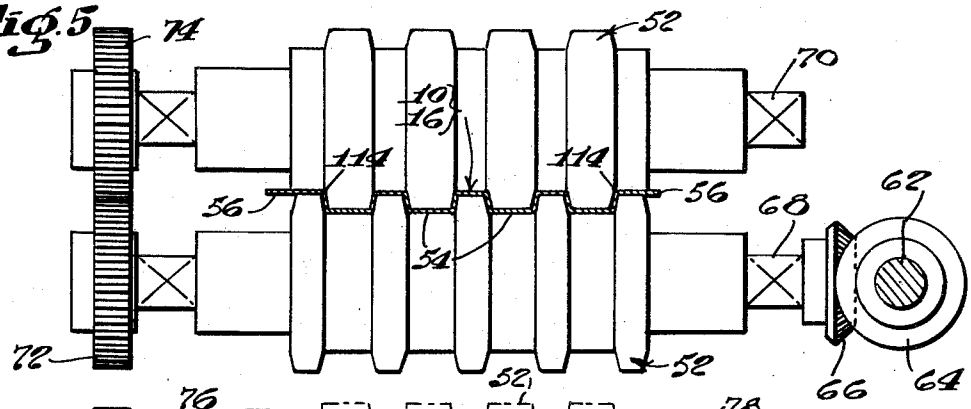


Fig. 6

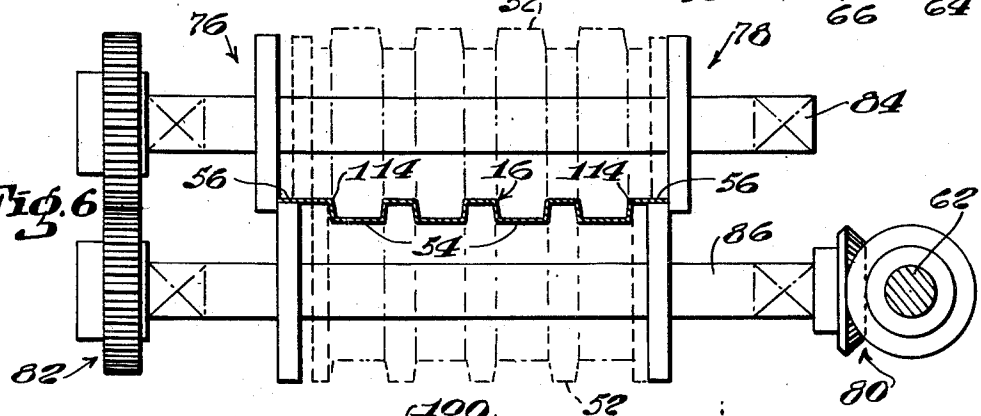
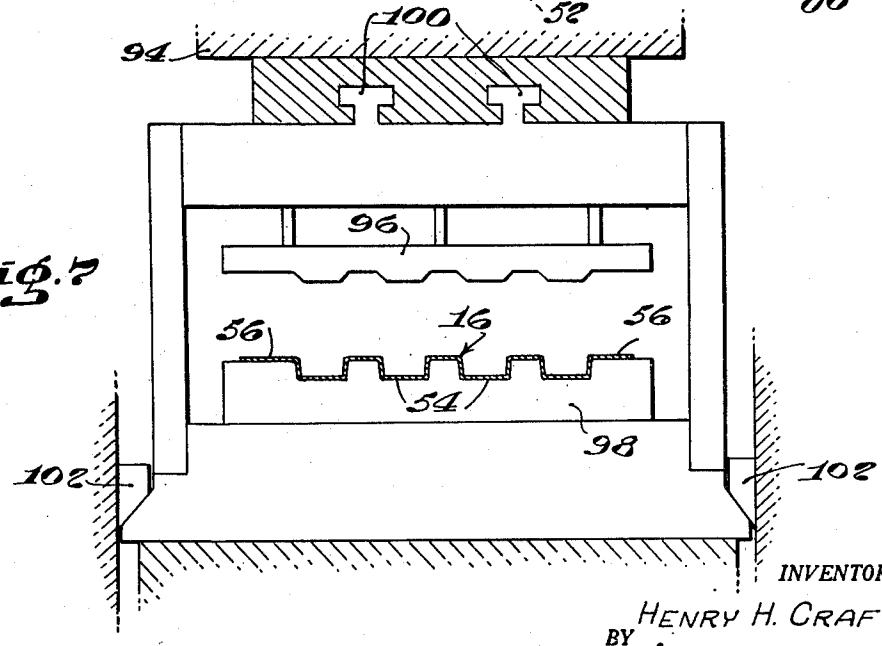


Fig. 7



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May 24, 1955 H. H. CRAFTON 2,708,958

METHOD OF AND APPARATUS FOR MAKING A STEEL FLOOR

Filed Nov. 15, 1949 6 Sheets-Sheet 4

Fig. 8

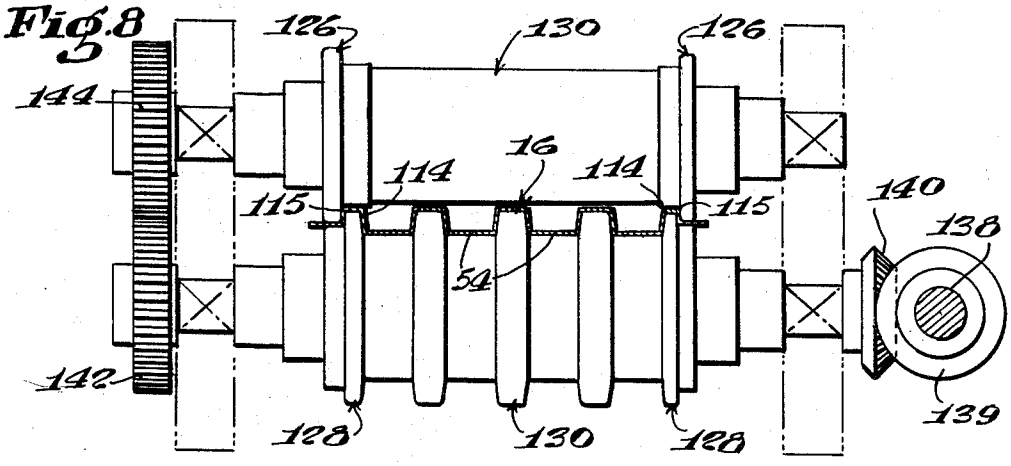


Fig. 9

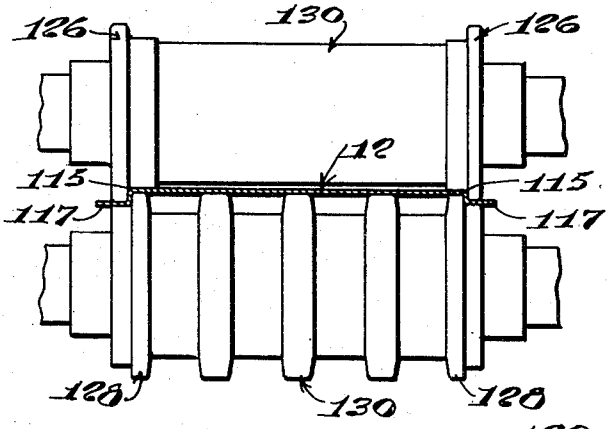
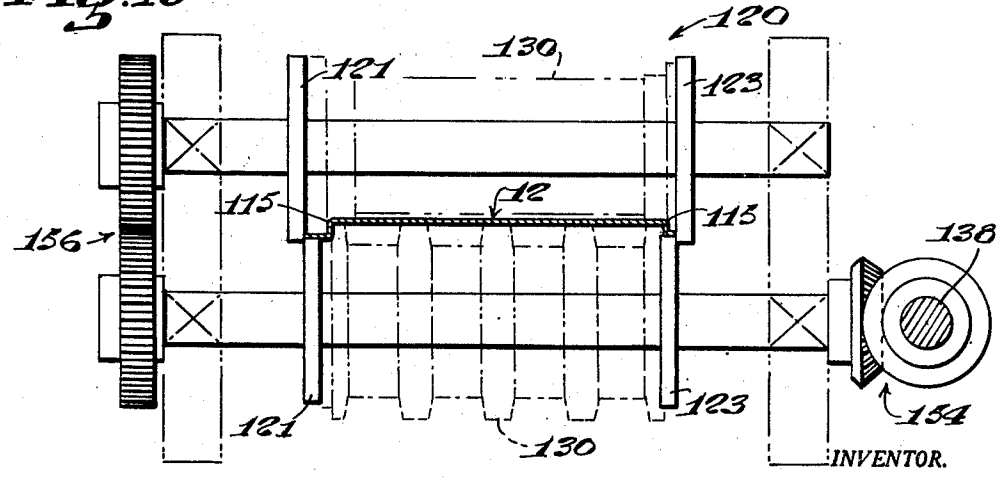


Fig. 10



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May 24, 1955 H. H. CRAFTON 2,708,958

METHOD OF AND APPARATUS FOR MAKING A STEEL FLOOR

Filed Nov. 15, 1949 6 Sheets-Sheet 5

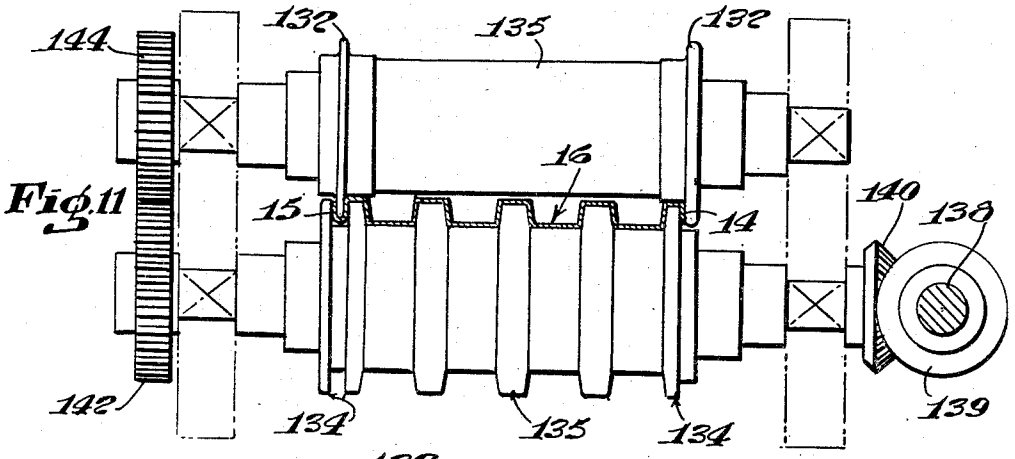


Fig. 11

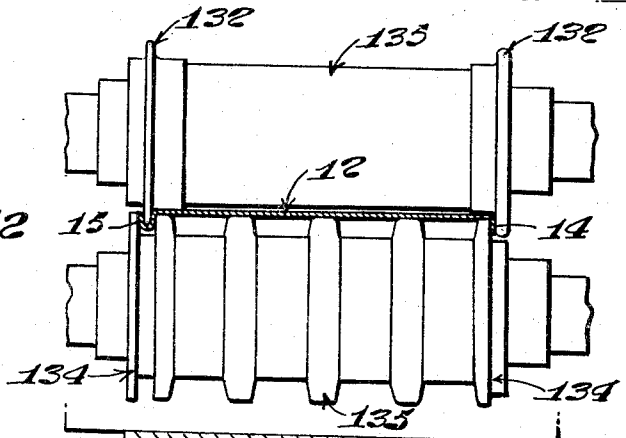


Fig. 12

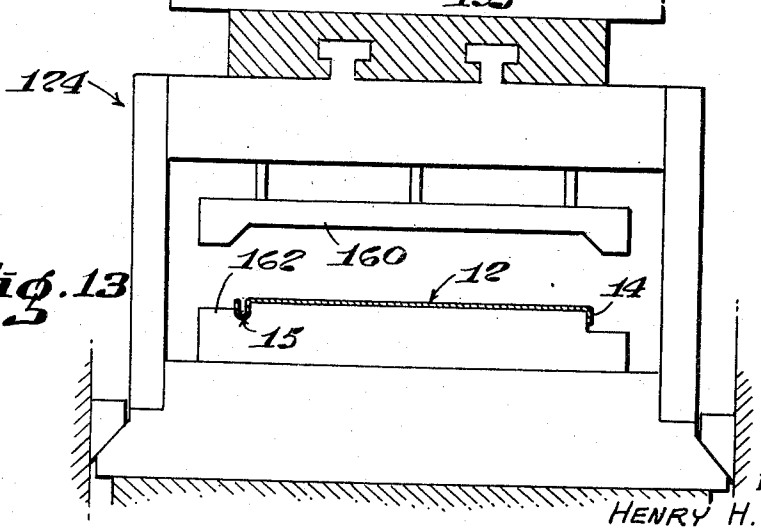


Fig. 13

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May 24, 1955 H. H. CRAFTON 2,708,958

METHOD OF AND APPARATUS FOR MAKING A STEEL FLOOR

Filed Nov. 15, 1949 6 Sheets-Sheet 6

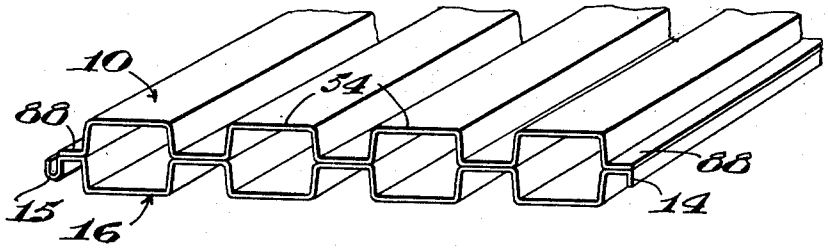


Fig. 14

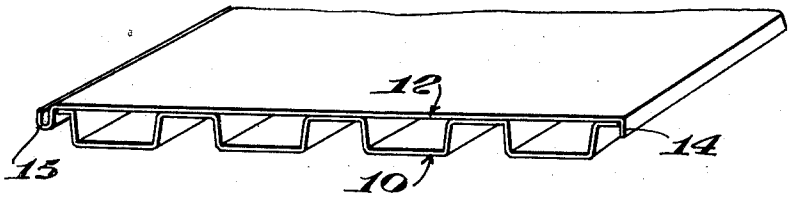


Fig. 15

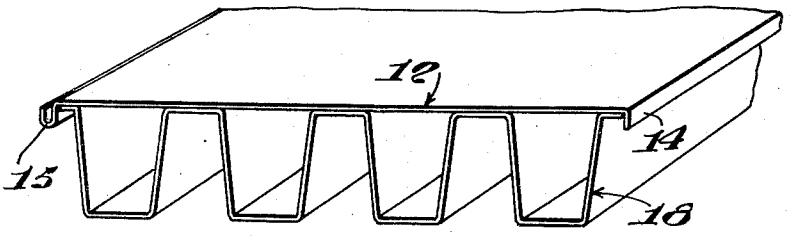


Fig. 16

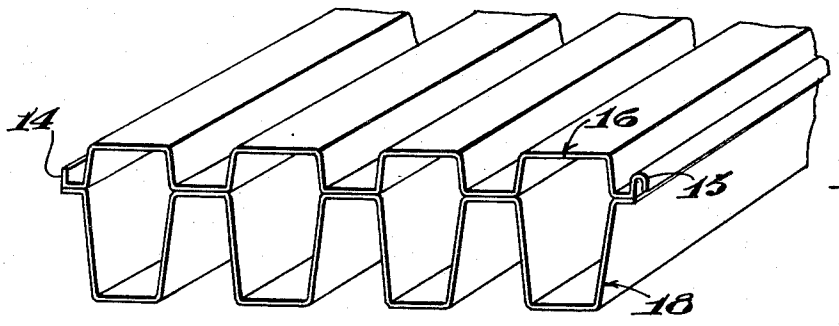


Fig. 17

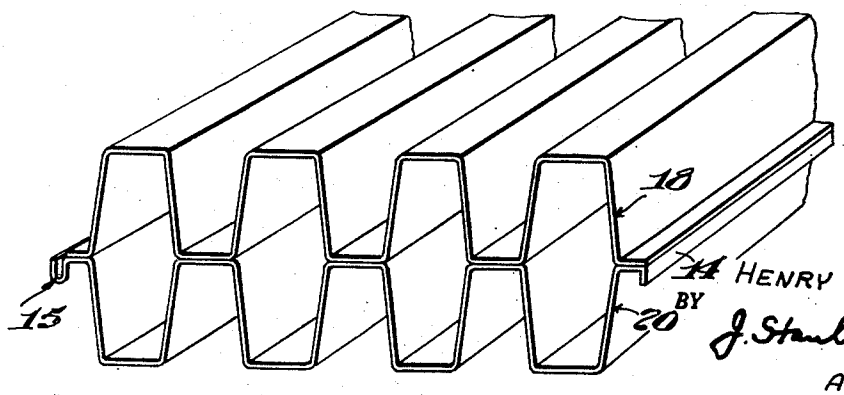


Fig. 18

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United States Patent Office

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METHOD OF AND APPARATUS FOR MAKING A STEEL FLOOR

Henry H. Crafton, Baden, Pa., assignor to H. H. Robertson Company, Pittsburgh, Pa., a corporation of Pennsylvania

Application November 15, 1949, Serial No. 127,365

10 Claims. (Cl. 153—2)

This invention relates to a method of and to apparatus for producing a plurality of different rolled shaped steel sheets for use in the production of a cellular floor.

One object of the invention is to produce novel apparatus of the character specified which may be successfully used to produce a plurality of rolled shaped steel sheets for use in the production of a steel floor unit from coiled strip steel and which enables the production of sheets to be accomplished to provide lip forming portions of the sheets in uniform widths irrespective of the camber of the rolled strip from which the sheets are made.

A further object of the invention is to provide a novel method for producing several rolled shaped steel sheets from coiled strip steel in such a manner as to enable the sheets to be provided with lip forming portions of uniform width.

A further object of the invention is to provide a novel method of and novel apparatus for producing from coiled strip steel a corrugated steel sheet of predetermined width provided with marginal lips of predetermined depth irrespective of varying amounts of camber in the coiled strip steel from which the sheets are produced.

With these general objects in view and such others as may hereinafter appear, the invention consists in the novel methods of and apparatus for producing the steel sheets hereinafter described and particularly defined in the claims at the end of this specification.

In the drawings illustrating the preferred embodiment of the invention, Figs. 1, 1*a* and 1*b* form a continuous side elevation of apparatus embodying the present invention for producing steel sheets in accordance with the present method for use in the production of a cellular floor; Fig. 2 is a cross section taken on the line **2—2** of Fig. 1 and illustrating a flat steel sheet after passing through the levelling rollers; Figs. 3, 4 and 5 are cross sectional views taken on the lines **3—3**, **4—4** and **5—5** respectively of Fig. 1 showing the steel sheet at different stages in passing through a rolling machine for forming a corrugated sheet having laterally extended untrimmed lip forming portions; Fig. 6 is a cross section taken on the line **6—6** of Fig. 1*a* showing the trimmer for shearing the longitudinal edges of the lip forming portions after passing through the rolling machine; Fig. 7 is a cross sectional view taken on the line **7—7** of Fig. 1*a* showing the transverse shearing mechanism adapted to cut the corrugated and edge trimmed sheet to length during the continuous movement of the sheet; Fig. 8 is a cross sectional view on the line **8—8** of Fig. 1*b* showing the corrugated sheet after passing through a second rolling machine for partially forming the lips in the laterally extended lip forming portions; Fig. 9 is a similar view showing the lips partially formed along the longitudinal edges of a flat untrimmed steel sheet in the formation of a different shaped sheet for producing a steel floor unit; Fig. 10 is a cross sectional view taken on the line **10—10** of Fig. 1*b* illustrating a trimmer for trimming the longitudinal edges of the partially formed lip portions of the sheet shown in Fig. 9; Fig. 11 is a cross section on the line **11—11** of

Fig. 1*b* showing the corrugated sheet after passing through a third rolling machine for completing the formation of the lip portions in the laterally extended lip forming portions; Fig. 12 is a similar view showing the partially formed and edge trimmed lip portions completed in the flat sheet; Fig. 13 is a cross sectional view of a transverse shear mechanism for cutting the flat lip bearing sheet to length during the continuous movement of the sheet; and Figs. 14, 15, 16, 17 and 18 illustrate a plurality of different steel flooring units adapted to be formed from the different rolled shapes produced in the present apparatus.

The present invention is particularly concerned with the production of rolled shaped steel sheets for use in the manufacture of the cellular steel floor forming the subject matter of the patents to Young, Nos. 1,855,082 and 1,867,433. As indicated in said patents and as illustrated in Figs. 14 to 18 of the drawings, the cellular steel floor is produced by welding together combinations of rolled sections to produce varying types and sizes of cellular steel flooring units. For example, in Fig. 15 the cellular steel floor unit is made by welding a corrugated sheet **10** to a flat sheet **12**, the latter being provided with male and female lip members **14, 15**. In Fig. 14, a corrugated steel member **10** devoid of lips is secured to or welded to a correspondingly shaped corrugated member **16** provided with male and female lips **14, 15**. In Fig. 16 a deep section corrugated member **18** is welded to a lip bearing flat sheet **12**. In Fig. 17 the lip bearing corrugated member **16** forming the lower sheet of the structure shown in Fig. 14 is welded to a corrugated deep section member **18** to produce a structure having exceptional strength. As shown in Fig. 18, two deep section corrugations **18, 20** are secured or welded together to form an exceptionally strong and deep-sectioned flooring unit, one of the sections, **20**, being provided with male and female lips **14, 15**.

At the present time many steel floors are being erected in commercial buildings utilizing the present flooring units having male and female lips and with the lips of one member interlocked with the lips of an adjacent member to form a continuous flooring surface over the entire floor of the building, as illustrated in the Young Patents above referred to. Prior to the present invention, the practice heretofore employed in producing the various shaped rolled sections illustrated in Figs. 14 to 18 from a coil of hot rolled strip steel having varying degrees of camber contemplated subjecting the coiled strip to a levelling operation as by passing the same through a known levelling apparatus and from which the flat strip was conveyed to side trimmers which trimmed the longitudinal marginal portions of the sheet to a standard width and then the strip was cut into individual lengths. The individual precut to length and side trimmed sheet was then passed through a rolling machine for forming the desired cross sectional shape and for forming the male and female lips **14, 15** in the laterally extended marginal lip forming portions or wings of the formed sheet. During the rolling operation, any camber existing in the sheet resulted in a variance in the width of the marginal wing portions relative to the cross sectional shape formed by the rolling machine and the lips formed along such marginal edges have varied considerably in depth resulting in a poor interlocking connection in the completed flooring unit. Furthermore, in practice, an individual sheet passing through the forming rollers inherently offers less resistance to deformation at the front and rear ends of the sheet causing the material to spread out a little wider at the ends than at the intermediate portions of the sheet also resulting in a variable width along the marginal edges of the precut sheet. The deformation of the sheet during the rolling operation also effects deformation of the precut ends of the sheet so that the

practice heretofore employed also required a resquaring operation effected by a transverse shear at each end of the formed sheet to produce a sheet of predetermined length.

In accordance with the present method of and apparatus for producing a steel sheet forming a component of a cellular steel flooring unit, a coil of strip steel is first passed through a leveler and is then passed directly into the rolling machine for forming the desired cross sectional shape prior to being trimmed along its marginal edges. During the rolling operation, the strip is permitted to spread out along its marginal edges or laterally extended wing portions along the lines of least resistance and to an irregular extent whereupon the continuous strip is passed through the trimmer for cutting the marginal edges or wing portions of the strip to a predetermined width. This may be accomplished by gauging the position of the trimming knives from the outer walls of the marginal corrugations of the rolled sheet. The continuous strip is then passed through a transverse shearing mechanism for cutting the strip into individual sheets of a predetermined length during the continuous advance of the strip. The sheet thus cut to length and trimmed to a uniform width along its marginal wing portions may then be passed directly into a rolling machine for forming the marginal lip portions, the uniform width of the wing portions resulting in lips of uniform depth and enabling accurate alignment and uniform interlocking engagement when the subsequently formed flooring units are laid side by side during the erection of the floor of the building.

In addition to enabling a sheet of uniform width and uniform lip portions to be produced by reason of performing the trimming operation after the strip has passed through the forming rolls, the herein described method of and apparatus for producing steel flooring sheets also results in elimination of rehandling the sheets between successive operations thereon and also renders the resquaring operation unnecessary.

The above procedure may also be followed in producing a rolled sheet of similar cross section formed without lips by merely removing the sheet from the line after being cut to length and prior to passage of the sheets into the lip forming rolling machine, the step of trimming the longitudinal edges after deformation of the strip to the desired cross sectional shape resulting in a sheet of uniform width for cooperation with a lip bearing sheet in assembling a cellular flooring unit. Thus, the same rolling unit is rendered capable of forming at least two types of flooring components without changing the rollers, one of the components being passed along to the lip forming section of the machine, as will be hereinafter more fully described. Although preferably illustrated and described herein as a continuous process for forming successive rolled sheets from a coil of strip steel it will be apparent that the present method may be used with advantage in forming a sheet of uniform width and lip formation from successive elongated strips of sheet steel. The lip forming section of the present apparatus is also capable of producing a flat sheet provided with male and female lips from a continuous coil of strip steel thus producing in the same apparatus a third type of sheet forming a component of a different flooring unit the lip forming portion of the apparatus serving to form lips on either the formed sheet or the flat sheet without the necessity of changing the lip forming rollers to accommodate the different shaped sheets. In the operation of the machine, the trimming of the marginal edges of the strip is effected directly after the passage of the foremost end of the strip through the forming rolls, the succeeding portion of the strip being still engaged between the forming rolls so that the strip is maintained in positively aligned relation to the trimmer during the advance of the strip whereby to provide lip forming portions of maximum uniformity in width relative to a longitudinal shoulder or other portion of the formed or shaped sheet thus enabling production of flooring units of uniform laying width.

Referring now to the drawings, and particularly to Figs. 1, 1*a* and 1*b*, the illustrated apparatus is designed for continuous operation in the production of different shaped rolled steel sheets from sheet steel and preferably from a coil of strip steel, and, in general comprises two sections, one section, indicated generally by part I, being adapted for forming a corrugated sheet, and, a second section, indicated generally by part II, being adapted for forming the lips **14**, **15** in the different shaped sheets. In operation, when a corrugated sheet without lips is to be produced, the strip is passed through part I only of the apparatus; when a corrugated lip bearing sheet is to be produced, the sheet is permitted to pass through both parts I and II with some of the elements of part II idle and inactive; and when a flat lip bearing sheet is to be produced, the strip is passed through all of the elements of part II of the apparatus. Parts I and II are also capable of simultaneous operation upon two types of sheets including a non-lip bearing corrugated sheet produced in part I, and a lip bearing flat sheet produced in part II.

Referring now particularly to Fig. 1, in general, in the production of a non-lip bearing corrugated sheet of the type indicated at **10** in Fig. 14, a coil of strip steel **30** is first passed through an uncoiling and levelling unit indicated generally at **32** adapted to uncoil and flatten the steel strip and then advance the flattened strip into a rolling machine indicated generally at **34** arranged to gradually and progressively deform the flat strip to shape it into a corrugated cross section. As the strip emerges from the discharge end of the rolling machine it is passed directly into a side edge trimmer, indicated generally at **36**, see Fig. 1*a*, whereupon the strip is subjected to a transverse shearing operation by shearing mechanism indicated generally at **38** adapted to effect the transverse shear during the continuous advance of the strip to form individual sheets of predetermined lengths. The cut to length sheet is then delivered to a transfer conveyer indicated generally at **40** from which the completed non-lip bearing corrugated sheet may be removed for assembly with other sheets in the formation of a cellular flooring unit or passed on into part II of the machine to have further operations performed thereon.

The decoiling and levelling unit **32** may comprise any of the commercial forms of apparatus now upon the market for this purpose and, as herein illustrated includes a pair of feed rolls **42**, **44** adapted to unwind a strip **46** of the material from the coil supported upon the rollers **48**, the feed rollers **42**, **44** operating to advance the uncoiled strip **46** between a series of driver rollers **50** comprising the levelling apparatus. The decoiling and levelling unit **32** may be driven through known means, not shown, and preferably in timed relation to the cooperating elements of part I, and inasmuch as the details of construction and mode of operation of such decoiling units are well known in the art, further description thereof is deemed unnecessary.

After leaving the levelling rollers, the strip **46** passes directly into the rolling machine **34** which, as herein illustrated, see Figs. 3, 4 and 5, is provided with a series of different shaped forming rollers indicated generally at **52**, arranged to gradually and progressively shape the flat sheet into a corrugated form having a plurality of longitudinally extended and transversely spaced corrugations **54** and provided with laterally extended wing portions **56**, as illustrated in Fig. 5. The rolling machine **34** may be driven in any usual or preferred manner such as by a motor **58** connected by gears **60** to a longitudinally extended shaft **62** which is provided with bevel gears **64** meshing with bevel gears **66** carried by the lower roll shafts **68**, the upper roll shafts **70** being driven through spur gears **72**, **74**, as shown in Figs. 3, 4 and 5.

It will be understood that the coiled steel strip as re-

ceived from the steel mills is not finished along the marginal edges so that the laterally extended wing portions **56** will be irregular and non-uniform in width. Any camber existing in the strip may effect further variance in width of the untrimmed edges during the rolling operation. In the operation of the apparatus, the corrugated strip emerging from the rolling machine **34** and being guided by rollers **75** is passed through the side edge trimmer **36** which, as herein shown, comprises two pairs of cooperating rotary shearing knives **76, 78** driven from the longitudinally extended shaft **62** through a gear train including bevel gears **80** and spur gears **82**, as shown in Figs. 1*a* and 6. The shearing knives **76, 78** may and preferably will be adjustably mounted on their supporting shafts **84, 86** so that the width of the trimmed wing portions **56** may be varied in order that the positions of the knives may be gauged from the outer walls of the corrugations. In the present instance, when forming a non-lip bearing sheet, the rotary shearing knives **76, 78** are adjusted to the dotted line position for trimming the wing portions **56** to a uniform width, such trimmed wing portions forming the laterally extended flanges **88** of the section **10**. The section **10** may be welded to a lip bearing section in the formation of a cellular flooring unit, such as is illustrated in Fig. 14. Cooperating with the side edge trimmer **36** is a scrap chopper of known construction diagrammatically indicated at **90** and arranged to chop the trimmed off material into short lengths and to deliver them to a continuously operated scrap conveyer **92** disposed below the floor line, as illustrated, for delivery of the chopped pieces to a scrap receptacle.

After passing through the side edge trimmer **36** the corrugated strip is continuously conveyed into operative relation to the transverse shearing mechanism **38** for automatically shearing the strip into uniform predetermined lengths during the continuous movement of the strip. Such automatic shearing mechanism may comprise any of the usual or preferred shearing mechanisms obtainable on the market but preferably the mechanism illustrated and described in my co-pending application, Serial No. 669,755, filed May 15, 1946, and which as herein shown, see Figs. 1*a* and 7, includes a vertically reciprocal power press **94** cooperating with upper and lower cutting dies **96, 98** slidingly mounted in guides **100, 102** respectively for horizontal reciprocation in timed relation to the advance of the corrugated strip therethrough, the cut being made during the forward stroke of the dies when the shearing unit is traveling at substantially the same rate of speed as the advance of the material. Provision is made in such shearing mechanism for controlling the operation thereof in accordance with the movement of the strip by control mechanism, indicated generally at **104** and including a switch arm **105** arranged to be actuated by the forward end of the strip to effect starting of the power shear through one cycle of operation and shearing of the strip at a predetermined time in the movement thereof, the control mechanism being arranged to move along with the strip during the shearing operation by a link connection **106** to the horizontally reciprocal shearing dies. After being sheared, the sheet is received between pinch rollers **108, 110** which may be driven by a motor **111** at a rate slightly faster than the rate of travel of the strip through the shearing mechanism thus providing a gap between the trailing end of the cut sheet and the forward end of the continuously advancing strip. In this manner, the trailing end of the cut sheet is permitted to pass beyond the control mechanism so that the forward end of the oncoming strip may again actuate the control mechanism to start another cycle of operation of the shearing mechanism. The pinch rollers operate to deliver the completed sheet **10** onto the conveyer **40**, comprising the final unit of part I of the apparatus and from which the sheet may be removed for assembly with a different or a similar sheet to form a cellular flooring unit. The scrap material formed by the portion sheared from the strip during the transverse shearing operation may fall onto an underfloor scrap conveyer **112** to be delivered to a scrap receptacle.

From the description thus far it will be observed that part I of the present apparatus is adapted to form a corrugated cut to length sheet **10** of uniform width and having side wing portions or flanges **88** of uniform width for assembly with a lip bearing sheet to form a cellular steel flooring unit, maximum uniformity in width being obtained by performing the side edge trimming operation after the corrugating operation. It will also be observed that positive alignment of the corrugated strip with the trimmer knives **76, 78** is obtained by feeding the strip directly into the trimmer while the succeeding portions of the strip are still operatively engaged and supported in the rolling machine, thus enabling a shoulder portion **114** of the outer corrugations to be used as a gauge and assuring maximum accuracy in the width of the flanges **88** and also in the overall laying width of the sheet, the edges of the flanges **88** of adjacent sheets being arranged in substantially abutting relation when the flooring is erected.

When a lip bearing corrugated sheet of the type indicated at **16** in Fig. 14 is to be produced, the steel strip is passed through the same elements of part I as above described for producing the non-lip bearing sheet **10** except that when the lips **14, 15** are to be formed in the sheet, the trimming knives **76, 78** are adjusted to their full line position illustrated in Fig. 6 in order to provide relatively wider laterally extended wings or lip forming portions **56** of uniform width relative to the shoulder portions **114** of the corrugated sheet. The male and female lips **14, 15** are subsequently formed in part II of the apparatus which is also adapted to independently form a flat lip bearing sheet of the type indicated at **12** in Fig. 15 from a coil of strip steel.

As illustrated in Figs. 1*a* and 1*b*, part II of the apparatus includes, in general, a decoiling and levelling unit indicated generally at **116**; a rolling machine, indicated generally at **118** for partially forming the lip portions **14, 15** in the strip; a side edge trimmer unit **120** for trimming the marginal edges of the partially formed lip portions; and a second rolling machine, indicated generally at **122**, adapted to complete the formation of the lips **14, 15**. Part II further includes a transverse shearing mechanism **124** adapted to sever the strip transversely during the continuous advance of the strip through the apparatus into uniform predetermined lengths.

However, when a corrugated sheet having the relatively wider laterally extended wing portions **56** is to be provided with lips in part II, only the lip forming elements **118, 122** are operative, the remaining elements of part II including the decoiling and levelling unit **116**, the side edge trimming unit **120** and the transverse shearing mechanism **124** are left open and idle to permit the corrugated sheet to pass directly from part I into the successive lip forming sections **118, 122** of part II. As herein illustrated the rolling machine unit **118** for partially forming the male and female lips **14, 15** includes a plurality of forming rollers **126, 128** adapted to gradually and progressively shape the marginal edges or trimmed wing portion **56** of the sheet into the form illustrated in Fig. 8 wherein an additional shoulder **115** is formed in the laterally extended and trimmed wing portions. It will be observed that the intermediate portions **130** of the rollers **126, 128** are shaped to accommodate either a corrugated sheet or a flat sheet and serve to positively guide and support the corrugated sheet in accurate alignment with the lip forming rollers **126, 128**. The sheet then by-passes the trimmer unit **120** and is fed directly into the second rolling machine **122** of part II which is similarly provided with different shaped forming rolls **132, 134** for gradually and progressively shaping the partially formed lips into their completed form as illustrated in Fig. 11, the rolling machine **122** forming in effect a continuation of the rolling

machine 118. The intermediate portions 135 of the rollers 132, 134 are similarly shaped to accommodate either the corrugated sheet or a flat sheet. The completely formed sheet 16 is guided out of the rolling machine 122 between rollers 137 and discharged onto a conveyer adjacent the idle shearing mechanism 124 to be removed from the machine.

As illustrated in Figs. 1b, 8 and 11 the lip forming units 118, 122 may be driven by a motor 136 geared to a longitudinally extended shaft 138 provided with bevel gears 139 arranged to mesh with bevel gears 140 carried by the lower roll shafts, the upper and lower roll shafts being connected together by spur gears 142, 144.

From the description thus far it will be further observed that a corrugated steel sheet 16 provided with lips of the type indicated at 14, 15 in Fig. 14, may be produced by passing a strip of steel through all of the elements of part I and through the lip forming elements 118, 122 only of part II, the laterally extended wings or lip forming portions 56 being accurately trimmed to a predetermined width when passing through part I, and the resulting sheet formed in part I being accurately guided and supported relative to the lip forming rollers 126, 128 in part II, by engagement of the shoulder portions 114 with the rollers 128 respectively whereby to provide lips of uniform depth for accurate alignment and cooperation when made up into a cellular steel flooring unit and laid side by side in the erection of the flooring. This result is obtained irrespective of the amount of camber in the strip.

Referring again to part II of the apparatus, in the production of a flat lip bearing sheet of the type indicated at 12 in Fig. 15, the steel strip is unwound from a coil 146 and passed through the levelling rolls 148 of the levelling unit 116 in a manner similar to the decoiling and levelling unit 32 above described and the flattened strip having untrimmed longitudinal edges is passed directly into the rolling machine 118 for partially forming the lips as illustrated in Fig. 9, wherein the strip is provided with the offset shoulder portions 115 and laterally extended wing portions 117. During the continued advance thereof, the strip then passes through the side edge trimmer unit 120 having rotary shearing knives 121, 123 for trimming the laterally extended wing portions 117 to a definite predetermined width for the completion of the lips, the strip being accurately and positively guided and supported by the rolling machine 118 during the trimming operation, the shoulder portions 115 forming gauge points whereby the rotary knives 121, 123 may be accurately adjusted relative to the forming rolls 126, 128 to obtain accuracy in the width of the lip forming portions, as illustrated in Fig. 10. It will thus be seen that in the production of a flat lip bearing sheet, any irregularity or non-uniformity in width of the lip forming portions due to camber of the strip or other causes is eliminated by subjecting the strip to a trimming operation after having passed through the rolling machine 118 and while still guided and supported therein which corresponds to the process followed in the production of a corrugated sheet in part I wherein the laterally extended wing portions 56 are trimmed after passing through the corrugating rollers.

The trimming unit 120 may be similar in structure and mode of operation to the trimming unit 36 previously described and is also provided with a scrap chopper 150 and scrap conveyer 152. The unit may be driven from the elongated shaft 138 by bevel gears 154 and spur gears 156, as shown in Fig. 10.

The flat strip having partially formed and trimmed lip portions is then passed through the second lip forming section 122 for completion of the lips, as illustrated in Fig. 12. The continuously advancing strip thus formed then passes into operative relation to the transverse shearing mechanism 124, which may and preferably will be of the construction and have the mode of operation attributed to the transverse shearing mechanism 38 previously described and which, as herein illustrated, may include upper and lower shearing dies 160, 162 mounted for horizontal reciprocation to effect the shearing operation during the continuous advance of the strip, and control mechanism 164 actuated by engagement of the forward end of the strip for starting the shearing unit 124 through one cycle of operation whereby to produce successive flat lip bearing sheets 12 of uniform predetermined length. Upon being severed, successive sheets may be advanced slightly faster than the travel of the strip by the provision of driven pinch rolls (not shown) similar to the rolls 108, 110 previously described and delivered onto an extended portion of the conveyer, not shown, from which they are removed from the apparatus.

Although the apparatus has been herein illustrated and described as adapted to form the sheets 10, 12 and 16 providing both components for use in the production of the flooring units illustrated in Figs. 14 and 15 embodying relatively shallow corrugated sheets, and also providing one component of each of the flooring units illustrated in Figs. 16 and 17 embodying a relatively deeper corrugated sheet, it will be apparent that the relatively deeper corrugated sheets 18, 20 shown in Figs. 16, 17 and 18 may be formed in the present apparatus in a similar manner and in accordance with the present method by merely changing the forming rolls to accommodate the deeper sections.

From the above description it will be observed that the present apparatus for producing different shaped rolled steel sheets for use in the production of steel flooring units is adapted to produce sheets of uniform length and width and having interlocking lip portions of uniform depth for accurate alignment when laid side by side in the erection of the flooring. It will also be observed that an important feature of the invention resides in the disposition of the side edge trimming unit following the rolling machine whereby to enable lip forming portions of uniform width to be produced irrespective of camber in the material from which the sheet is made.

While the preferred embodiment of the invention has been herein illustrated and described, it will be understood that the invention may be embodied in other forms within the scope of the following claims.

Having thus described the invention, what is claimed is:

1. The method of producing from a coil of strip steel a corrugated steel sheet for use as a component of a cellular steel floor having male and female lips upon the longitudinal marginal edges thereof which comprises the steps of subjecting the strip as it is uncoiled to a levelling operation to form a flat strip, rolling the strip to form a plurality of longitudinally extended and transversely spaced corrugations with the outer corrugations forming shoulders having laterally extended marginal wing portions, trimming the laterally extended wing portions to a uniform width with respect to said shoulders, shearing the strip transversely to form an individual sheet of predetermined length and width, and then rolling the lips in said wing portions whereby to produce lips of uniform depth irrespective of camber in the strip from which the sheet is produced.

2. The method of producing from a coil of strip steel, a flat steel sheet for use as a component of a cellular steel floor and having male and female lips upon the longitudinal marginal edges thereof which comprises the steps of subjecting the strip as it is uncoiled to a levelling operation to form a flat strip, rolling the marginal edges of the strip to provide shoulders constituting a part of the lips and having laterally extended wing portions, trimming the laterally extended wing portions to a uniform width with respect to said shoulders, rolling the wing portions to complete the formation of the lips, and then shearing the strip transversely to form an individual sheet of predetermined length and width whereby to produce lips of uniform depth irre-

spective of camber in the strip from which the sheet is produced.

3. In the method of producing corrugated steel sheets having male and female lips upon the marginal edges thereof from a continuous strip of sheet steel having untrimmed longitudinal edges, the steps which comprise continuously advancing the strip, rolling the continuously advancing strip to form a plurality of longitudinally extended and transversely spaced corrugations with the outer corrugations forming shoulders having laterally extended wing portions, trimming the marginal edges of the wings to a uniform width with respect to said shoulders during the advancing movement and while succeeding portions of the continuous strip are being subjected to the rolling operation to thereby produce lip forming portions of uniform width irrespective of camber in the steel strip, shearing the strip transversely to form successive individual sheets of predetermined length during the continuous advance of the strip, and then rolling the lips in the uniform width wing portions of successive sheets whereby to produce lips of uniform depth.

4. In the method of producing flat steel sheets having male and female lips upon the marginal longitudinal edges thereof from a continuous strip of sheet steel having untrimmed longitudinal edges, the steps which comprise continuously advancing the strip, rolling the continuously advancing strip to provide shoulders having laterally extended wing portions, trimming the marginal edges of the wings to a uniform width with respect to said shoulders during the advancing movement and while succeeding portions of the continuous strip are being subjected to the rolling operation to thereby produce lip forming portions of uniform width irrespective of camber in the steel strip, then rolling the lips in said trimmed wing portions to produce lips of uniform depth, and then shearing the strip transversely to form successive individual sheets of predetermined length during the continuous advance of the strip.

5. In apparatus of the character described, in combination, a rolling machine, means for advancing a flat strip of sheet steel having untrimmed longitudinal edges to and through said rolling machine, said rolling machine being constructed to form shoulders having laterally extended wing portions along the marginal edges of said strip, and adjustable side edge trimming means movable laterally toward or away from said shoulders for trimming the marginal edges of said wings to a uniform width gauged from said shoulders while succeeding portions of the strip are operatively supported in and guided by said rolling machine during the advance of the strip whereby to provide a sheet of uniform width having uniform wing portions irrespective of camber in the strip from which the sheet is produced, and means for forming marginal lips in said uniform width wing portions whereby to produce lips of uniform depth.

6. In apparatus of the character described, in combination, a rolling machine, means for continuously advancing a flat strip of sheet steel having untrimmed longitudinal edges to and through said rolling machine, said rolling machine having means for forming a plurality of longitudinally extended and transversely spaced corrugations with the outer corrugations forming shoulders having laterally extended wing portions along the marginal longitudinal edges of the strip, adjustable side edge trimming means for trimming the marginal edges of said wings to a uniform width with respect to said shoulders while succeeding portions of the strip are operatively supported in and guided by said rolling machine during the advance of the strip whereby to produce lip forming portions of uniform width irrespective of camber in the strip, means for shearing the strip transversely to form an individual sheet of predetermined length, and means for thereafter rolling the lips in said uniform width wing portions whereby to form lips of uniform depth.

7. In apparatus of the character described, in combination, a rolling machine, means for continuously advancing a flat strip of sheet steel having untrimmed longitudinal edges to and through said rolling machine, said rolling machine having means for forming a plurality of longitudinally extended and transversely spaced corrugations with the outer corrugations forming shoulders having laterally extended wing portions along the marginal longitudinal edges of the strip, adjustable side edge trimming means for trimming the marginal edges of said wings to a uniform width with respect to said shoulders while succeeding portions of the strip are operatively supported in and guided by said rolling machine during the advance of the strip whereby to produce lip forming portions of uniform width irrespective of camber in the strip, means for shearing the strip transversely to form an individual sheet of predetermined length, and means for thereafter rolling the lips in said uniform width wing portions whereby to form lips of uniform depth, said last named means including rolling means adapted to partially form the lips along the marginal edges of the sheet and forming additional shoulders in said laterally extended wing portions, and rolling means for completing the formation of the lips in said trimmed and partially formed wing portions while succeeding portions of the sheet are supported and guided in said partial lip forming rolling means.

8. In apparatus of the character described, in combination, a rolling means, means for continually advancing a flat strip of sheet steel to and through said rolling means, said rolling means being provided with means for partially forming lips along the marginal longitudinal edges of the strip and forming shoulders having laterally extended wing portions, adjustable side edge trimming means movable laterally toward or away from said shoulders for trimming the edges of said wings to a uniform width with respect to said shoulders while succeeding portions of the strip are operatively supported in and guided by said rolling means during the advance of the strip whereby to produce lip forming portions of uniform width irrespective of camber in the strip, a second rolling means for completing the formation of the lips after said wing portions have been trimmed, and means for shearing the strip transversely to form an individual sheet of predetermined length.

9. In apparatus of the character described, in combination, means for producing from coils of strip steel a plurality of different shaped rolled steel sheets for use in the production of cellular steel floor units including one group of elements arranged to form a corrugated sheet and comprising means for advancing the strip to and through rolling means adapted to form longitudinally extended and transversely spaced corrugations in the advancing strip with the outer corrugations forming shoulders having laterally extended wing portions; adjustable side edge trimmer means for trimming the edges of said wings to a uniform width with respect to said shoulders while the sheet is guided by said rolling means; and a transverse shear for severing the strip transversely to form individual sheets of predetermined length during the continuous advance of the strip, and a second group of elements including a rolling means adapted to partially form marginal lips in said laterally extended wing portions and forming additional shoulders in the marginal edges thereof, and a rolling machine adapted to complete the formation of the lips in said wings while succeeding portions of the strip are supported and guided in said partial lip forming rolling means whereby to produce lips of uniform depth irrespective of camber in the strip.

10. In the method of forming a metal sheet having a downwardly and outwardly bent shoulder adjacent but spaced from a longitudinal marginal edge of the metal sheet providing a laterally extended wing portion of uniform width, the steps comprising continuously advancing

a flat strip of sheet steel having untrimmed longitudinal edges, then forming a downwardly and outwardly bent shoulder adjacent but spaced from one of the longitudinal marginal edges of the sheet as it is being advanced to form a laterally extended wing portion, then adjustably determining the line of longitudinal shear necessary to form a wing portion of uniform width by gauging the line from said shoulder portion, then trimming the wing portion along the longitudinal line of shear thus determined whereby to produce a marginal wing portion of uniform width with respect to said shoulder irrespective of camber in the steel strip, and then shearing the strip transversely to form an individual sheet of predetermined length.

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