

Jan. 2, 1923.

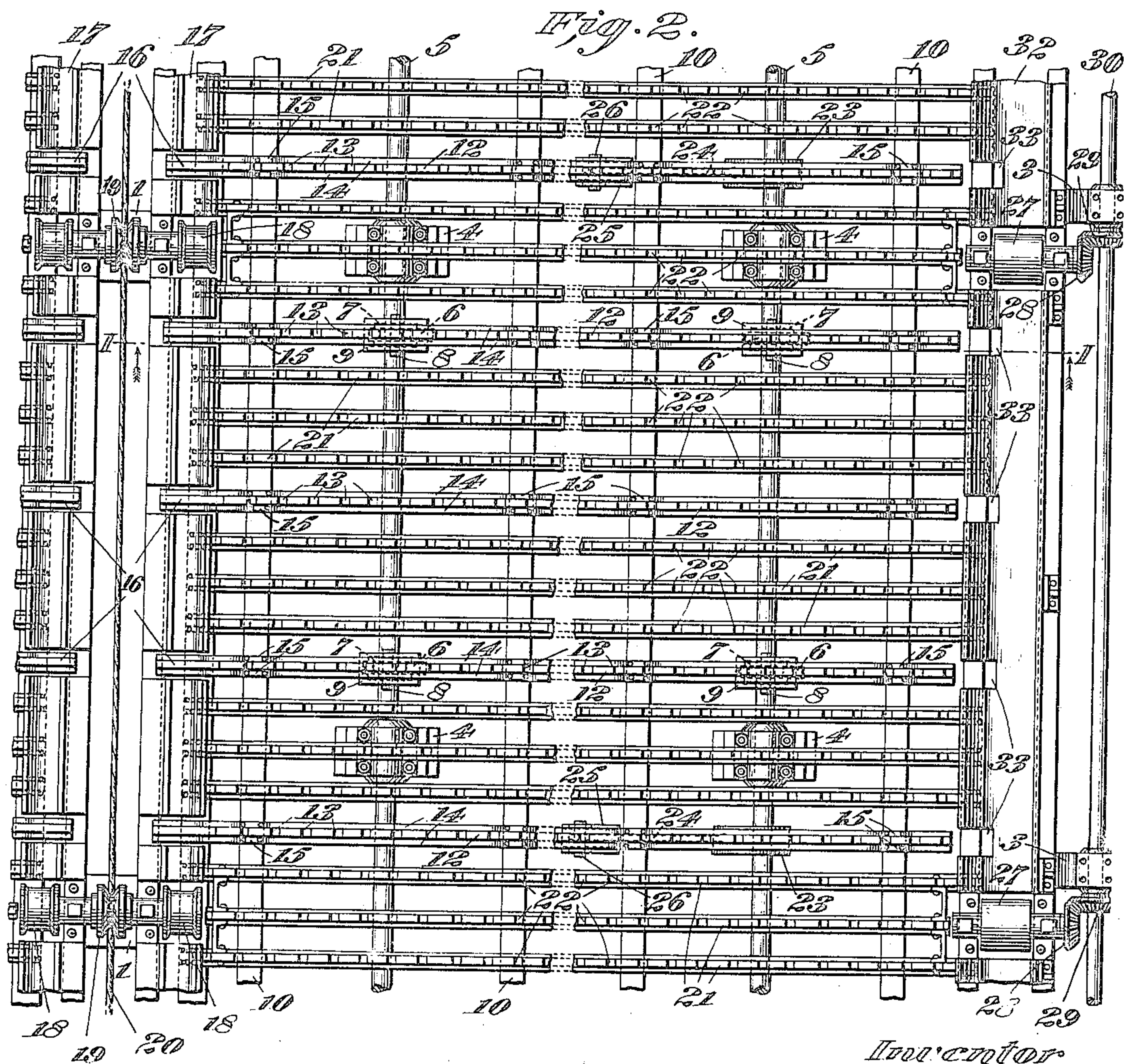
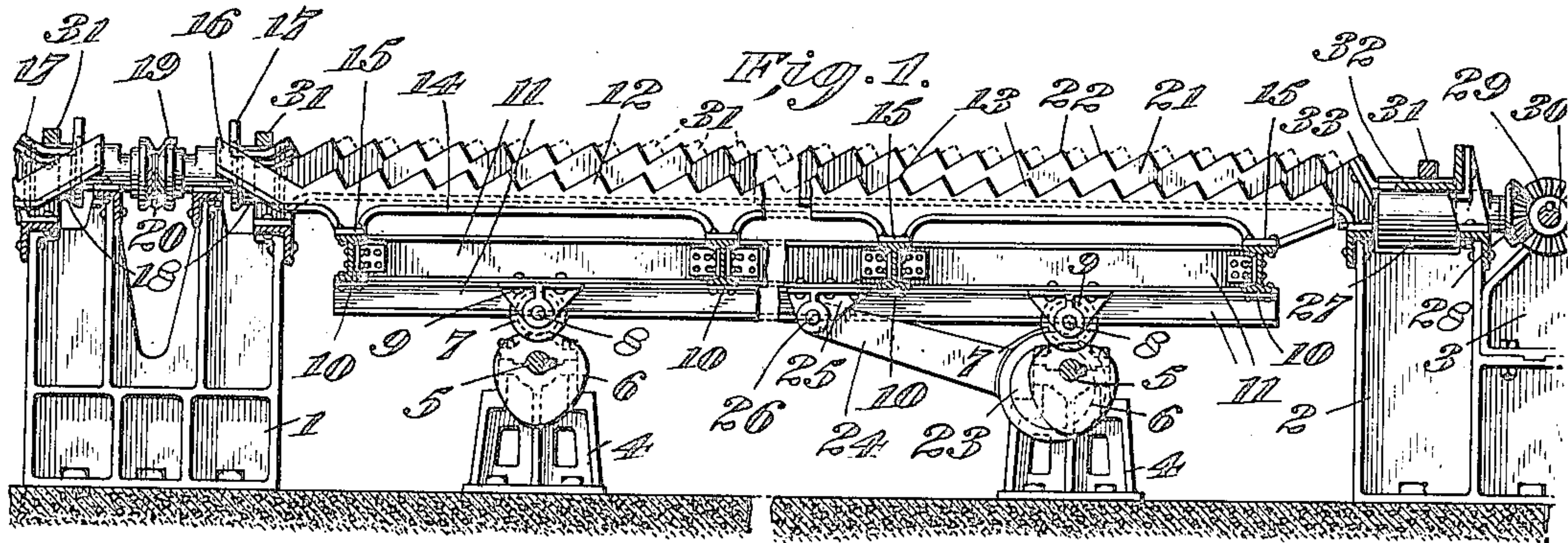
G. E. THACKRAY.

COOLING BED.

FILED APR. 29, 1921.

1,441,042.

2 SHEETS—SHEET 1.



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2 SHEETS—SHEET 2.

Fig. 3.

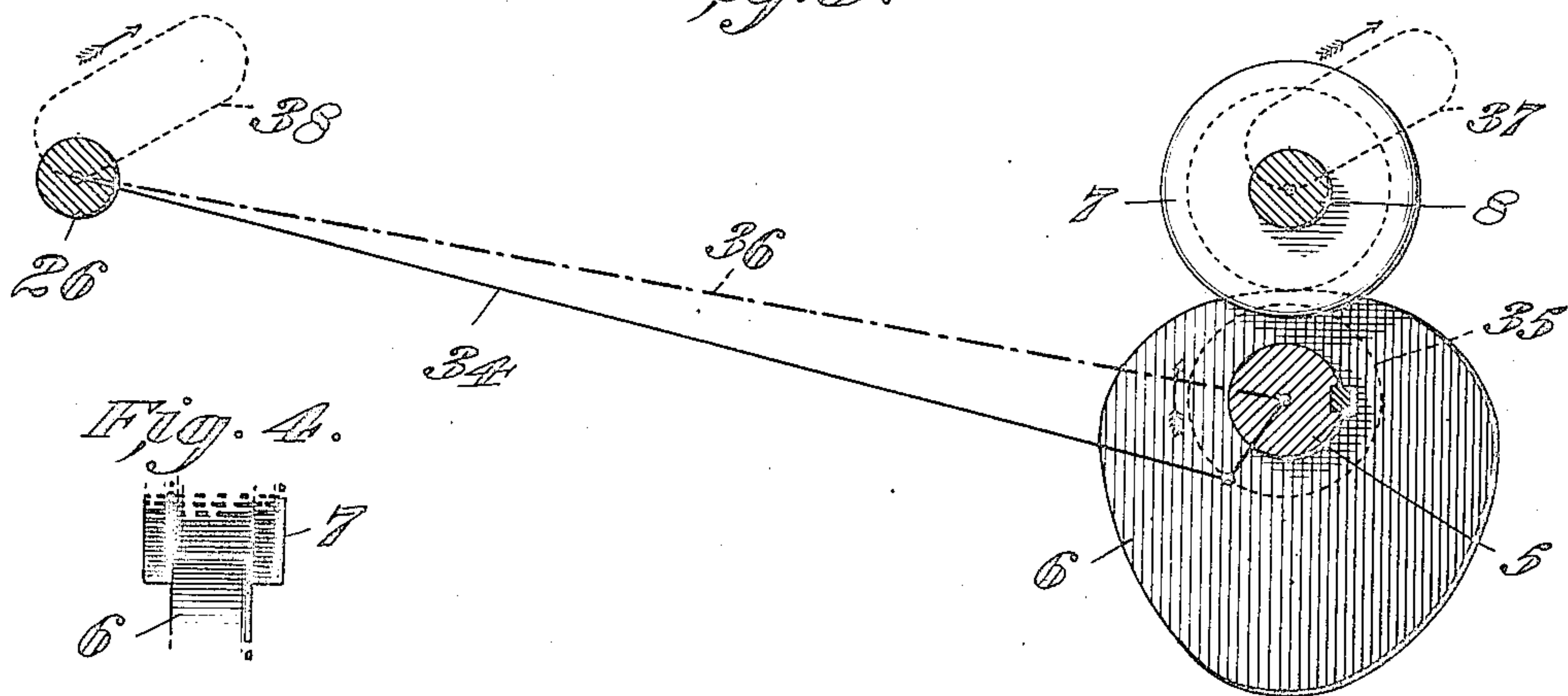


Fig. 4.

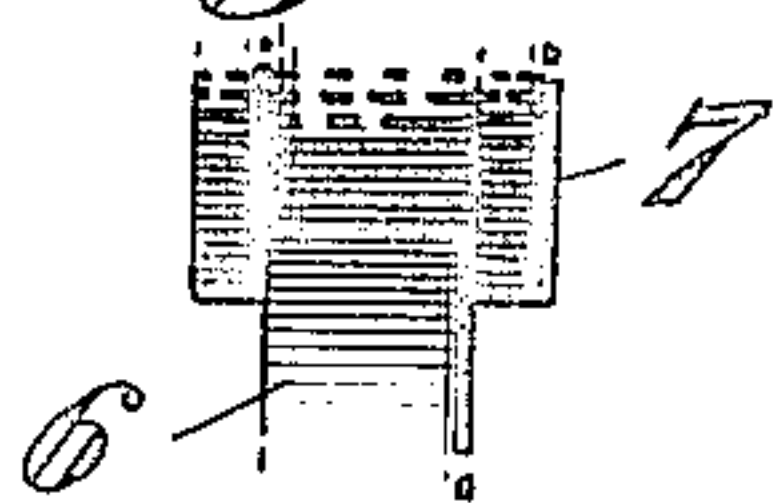


Fig. 5.

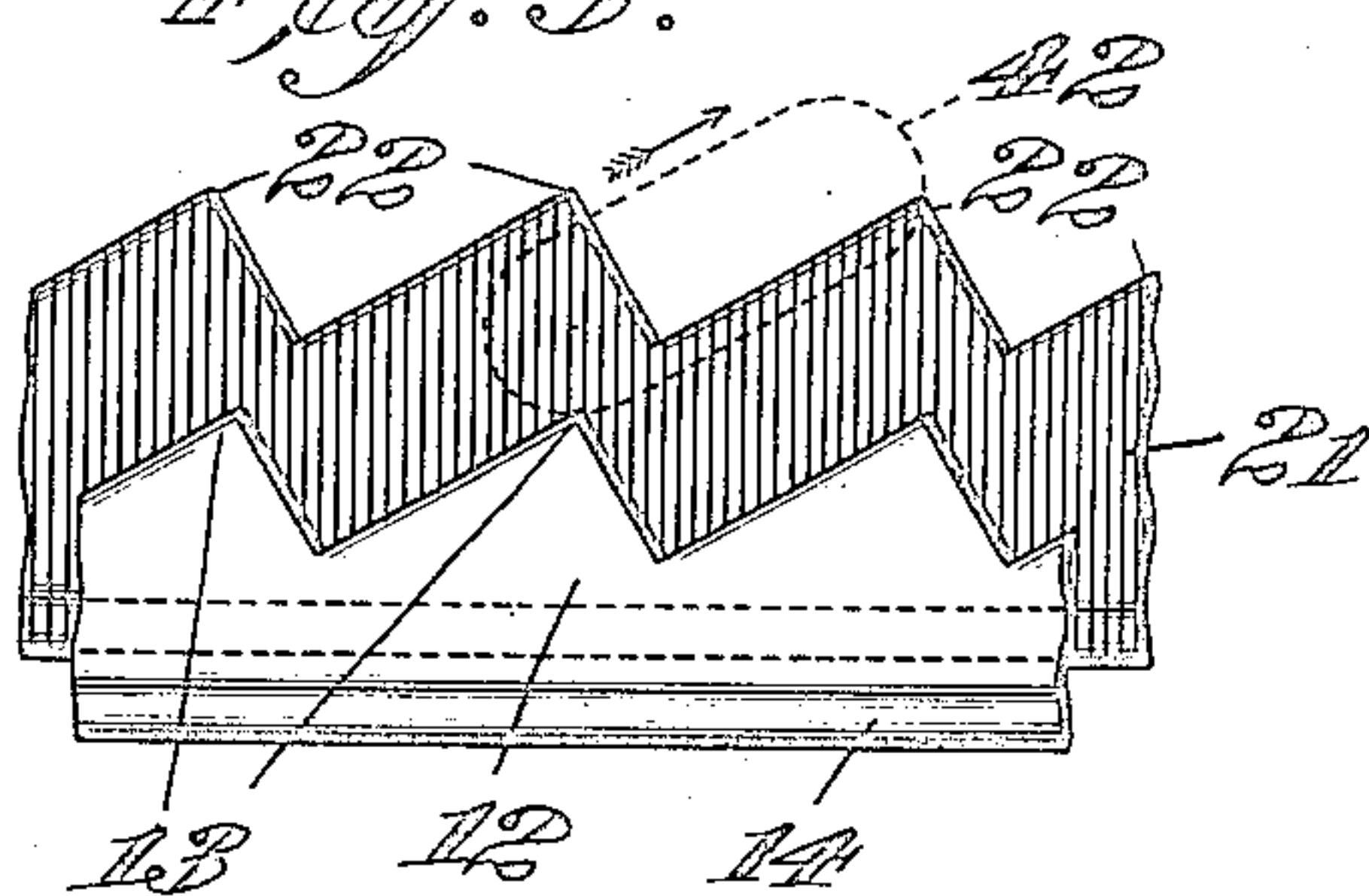


Fig. 6.

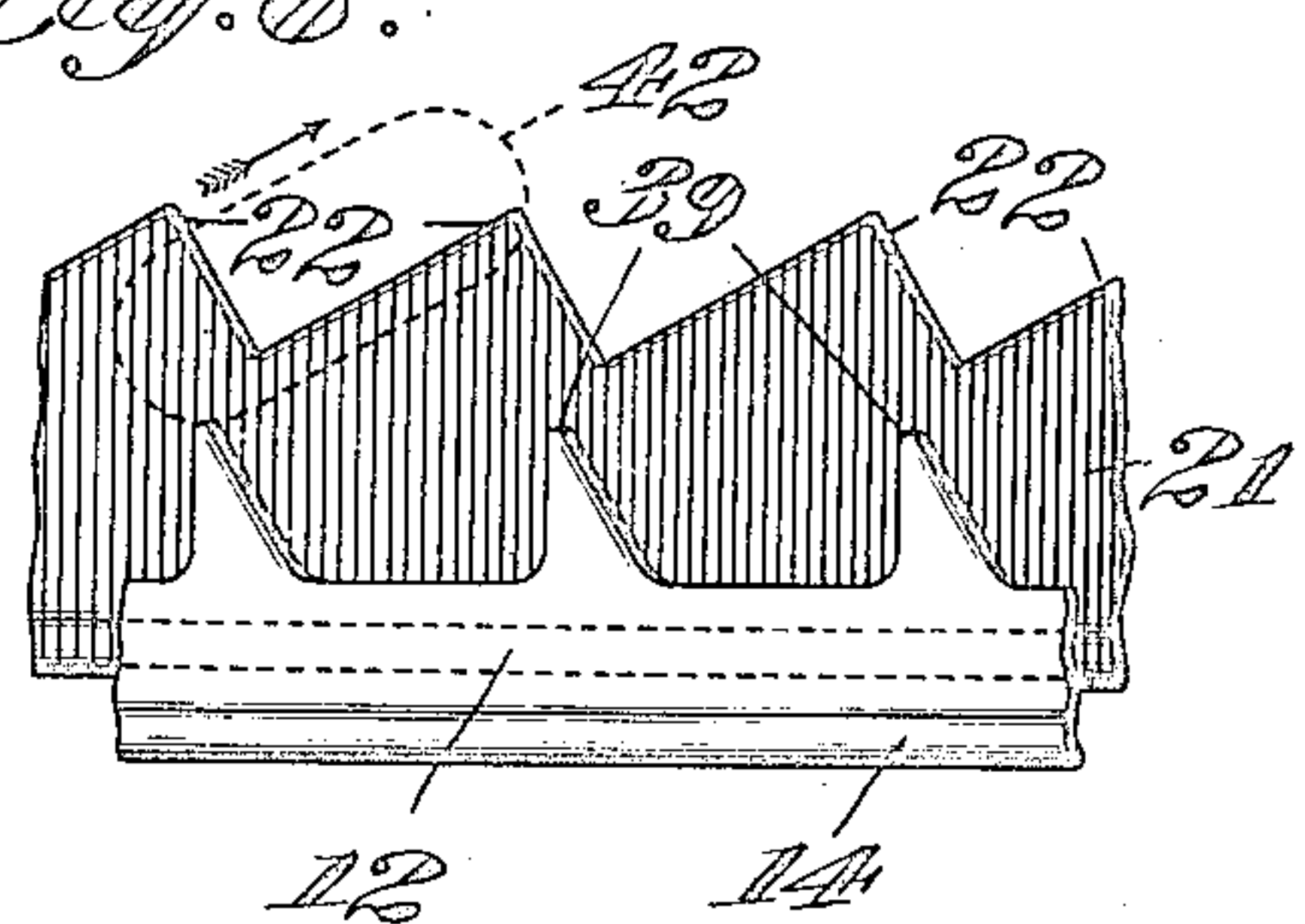


Fig. 7.

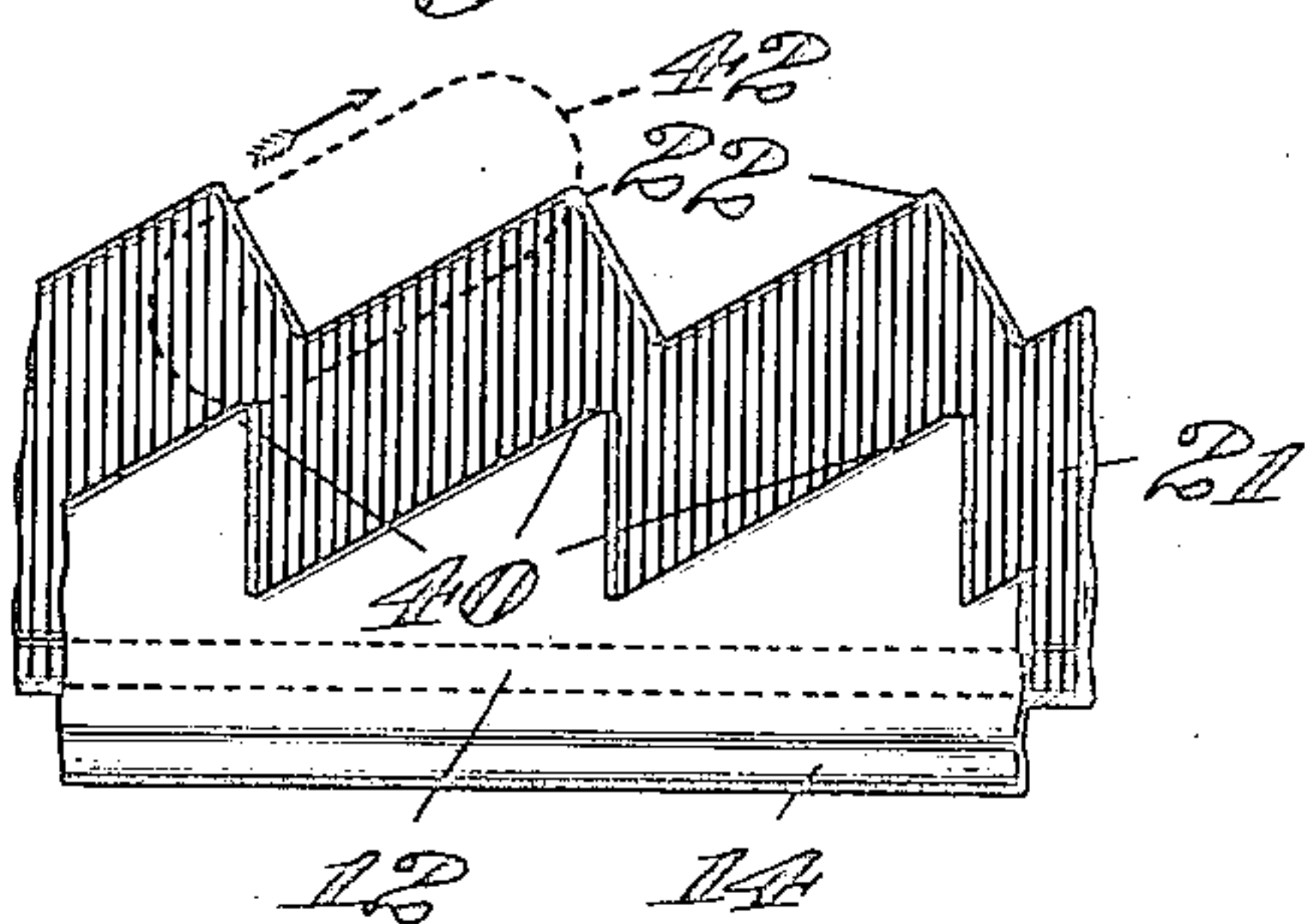
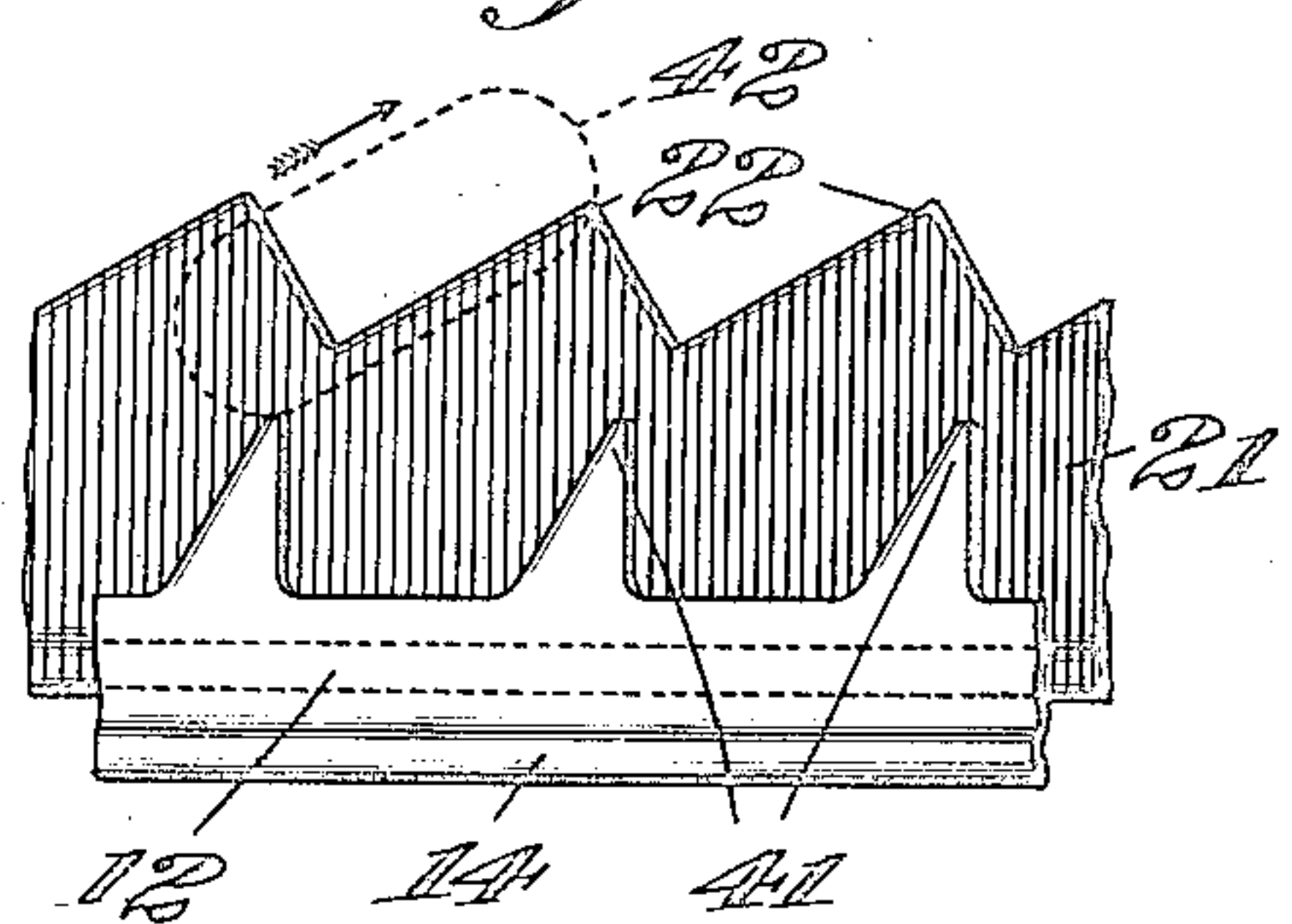


Fig. 8.



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UNITED STATES PATENT OFFICE.

GEORGE E. THACKRAY, OF WESTMONT BOROUGH, PENNSYLVANIA.

COOLING BED.

Application filed April 29, 1921. Serial No. 465,590.

To all whom it may concern:

Be it known that I, GEORGE E. THACKRAY, a citizen of the United States, residing in the borough of Westmont, county of Cambria, and State of Pennsylvania, have invented certain new and useful Improvements in Cooling Beds; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to new and improved constructions for transferring metal bars, which may be of various shapes, or similar materials, and which are particularly adapted to mechanically handle hot metal bars as they come from the rolling mill and transfer them both longitudinally and laterally and during said transfer to maintain the bars straight and allow them to cool by the circulation of air or otherwise.

One of the objects of my invention is to provide an apparatus that is simple and efficient in operation and of such construction as to readily withstand the wear due to the frictional contact with the hot bars and the bars or shocks to which said apparatus is, in a measure, necessarily subjected.

My cooling bed is especially adapted to receive metal bars of any shape such as billets, rounds, squares, flats, I-beams, channels, equal leg angles, unequal leg angles, rails and any other sections or forms of material, and by means of my apparatus these bars may be guided and transferred longitudinally and then moved laterally step by step, either singly or in groups, cooled during said transfer and maintained straight while in transit, after which they may be delivered either singly or in groups to the shears, cars, piles or warehouse for storing or may otherwise be disposed of as may be expedient or necessary.

Although my apparatus is adapted to the handling of various products I will, for convenience of reference, hereinafter refer to the material handled as bars.

My invention in general consists of a plurality of serrated bars the serrations of which are preferably in alignment so that they will maintain the bars straight, and the bars are capable of adjustment in order to maintain the alignment of the serrations if necessary. The serrations of the fixed bars preferably somewhat resemble saw teeth

but these and the serrations of the movable bars may be of various shapes as hereinafter described. One set of bars is fixed and stationary, and between these at intervals I arrange other bars which may or may not be serrated and are adapted to be moved upwardly and transversely of the bed in a path a portion of which may be substantially parallel to the supporting or lower sides of the serrations of the fixed bars. The motion of my moving bars is accomplished by cams of special design and eccentrics so arranged that the movement of my moving bars is substantially in the form of an oval or of a rectangle with rounded ends the sides of which are approximately parallel to the supporting sides of the fixed serrations. I do not, however, limit myself to this exact outline of movement, as this may be of varied forms as may be desired, either elliptical or more rectangular, but the rectangular form is not so desirable as it subjects both the bars and the apparatus to more sudden shocks due to the quicker changes of direction. I prefer not to lift the bars from one fixed serration to another, and my movement is preferably so accomplished as to slide them up the supporting sides of the serrations and allow them to be delivered into the next serration by gravity or partly by gravity and partly by the lowering of the movable bars. This reduces the power required and the strain on the mechanism, as the bars do not have to be lifted while they are being laterally transferred.

There are a number of fixed bars spaced at suitable distances apart, with saw-tooth notches, there being about three or four of these fixed bars grouped or secured together for each moving bar.

Between the groups of fixed bars are mounted the moving bars, which in turn are supported on structural steel framework, provided on its lower side with rollers and with two or more bearings adapted to be operated by eccentrics. These rollers are provided with side flanges to maintain them in position on the cams, and the movable framework may also have side guides to keep it in line and properly located during its motion.

These rollers are mounted on cams, one near each end of the framework, these cams being adapted to rotate by means of a shaft, which extends longitudinally of the bed, the

two shafts on either side being connected and moving together.

Upon the shafts are mounted two or more eccentrics, as illustrated, which, as the shafts 5 revolve, move the lifting frame and bars forward and backward to the extent of the eccentric throw. While the eccentric is moving the lifting bars backward and forward the cam also lifts them, the path of 10 movement being as shown by broken lines in various figures. The shape of the cams and the arrangement and throw of the eccentrics are such that the path of this movement is preferably designed so that the bars will 15 slide up the flatter slopes of the fixed teeth, and are not lifted or carried at any time. If desired, however, slight changes may be made in the cams so that the bars are carried, not slid, to prevent abrasion of the hot 20 bars by rubbing or sliding friction. The moving bars are also so arranged as to have ample clearance below the hot rolled bars as they lie in the serrations of the fixed bars, but this clearance may be modified as desired. 25 The clearance I prefer is about one inch more or less.

In order to insure that the moving bars will not contact with the hot rolled bars during their backward passage, ample clearance 30 is provided, and the path of the moving bars is also arranged so that the lateral motion of translation of the hot bars is substantially parallel to the supporting slope of the notches or serrations in the fixed bars, there- 35 by sliding the hot rolled bars uniformly without unnecessary friction and without lifting them clear of their supports.

Having thus given a general description of my invention, I will now, in order to 40 make the matter more clear, refer to the two annexed sheets of drawings which form a part of this specification and in which like characters of reference refer to like parts.

Figure 1 is a vertical transverse sectional elevation through the cooling bed taken on the line I—I of Figure 2. Figure 2 is a top 45 plan view of a portion of the apparatus. Figure 3 is a diagrammatic view on a larger scale illustrating the throw of the cams and the movement of the centers of the cam rollers. Figure 4 is a detail view of the meeting 50 edges of the cams and cam rollers, and Figures 5, 6, 7 and 8 are detail views on an enlarged scale showing different forms of serrations in the movable bars and illustrating 55 the movements or paths which the movable bars describe.

Referring now to the characters of reference on the drawings:—1 are the central 60 base frames, 2 the side base frames, 3 are brackets on the side base frames adapted to carry the driving shafts of the carrying rolls 27, 4 are the standards in which the cam and eccentric shafts are journaled, 5 are the cam 65 shafts extending longitudinally under the

apparatus as illustrated, and provided with the somewhat irregular and approximately heart-shaped cams 6, which cams, together with the eccentrics, are so designed as to cause any point on the moving bars to traverse the paths indicated by the dotted lines 70 in Figures 3, 5, 6, 7 and 8. 7 are grooved wheels adapted to rest upon the cams and to transmit the motion, and these wheels are mounted on axles 8 which are journaled in 75 the brackets 9 secured to the moving framework. 10 are I-beams extending longitudinally of the cooling bed on which the movable bars 12 are mounted, and 11 are other I-beams extending transversely of the cool- 80 ing bed to connect the I-beams 10 and to provide bracing and strength to the frame. The upper edges of the moving bars are serrated in one form as indicated at 13, these serrations being illustrated as angular but they 85 may be of any shape desired. The movable bars 12 are provided with the lower flanged edges 14, and the flanges 15 thereof are secured to the I-beams 10 of the moving frame. The movable bars 12 are provided at one end 90 with the inclined end portions 16 which, when the bars are moved, are adapted to lift a hot bar from the receiving trough 17, and 18 are the receiving rollers which deliver the bar from the mill and within the trough 17. 95 19 are rope sheaves adapted to operate the rollers 18 by means of the friction cable 20 which is generally endless and driven by any suitable source of power, not shown.

A plurality of stationary bars 21 are pro- 100 vided which have serrations 22 in their upper edges. While the cams 6 lift and lower the movable frame and the bars thereon, eccentrics 23 are provided on the same shaft, the crank radii of which are arranged at an 105 angle to the longer radii of the cams and connected by the eccentric rods 24 to the moving frame in such a way as to provide the motion of the moving bars previously mentioned. The ends of the eccentric rods 24 110 are journaled to the brackets 25 by means of the pivot pins 26. The rollers which deliver the bars from the cooling bed are 27 and these are driven by the beveled gears 28 which mesh with beveled gears 29 on the 115 driving shaft 30, which shaft is rotated by any suitable source of power, not shown.

31 indicates bars which are to be brought to the cooling bed by means of the delivery rollers 18 within the trough 17 and are then 120 lifted up and carried over the bed step by step from serration to serration of the fixed bars by means of the movement of the moving bars, during which time they are being cooled and are then delivered to the delivery 125 trough 32 and by the movement of the rollers 27 are transported thence for further operations, for shearing, handling, storage or otherwise as may be desired.

The delivery trough 32 is provided with 130

notches 33 through which the ends of the moving bars may pass in order to deliver the cooled bars 31 to the delivery trough 32 during the downward movement of the moving serrated bars. As illustrated in Figure 3 the dotted circle 35 indicates the movement of the center of the eccentric, or the throw of the same, the direction being in that of the arrow, while the dot-and-dash line 36 connects the center of the cam and eccentric shaft with the center of the outer pivoted end of the eccentric rod 24. 34 is the center line of the eccentric rod in its lower position. The dotted line 37 indicates the path of the center of the axle or journal of the cam roller and the dotted line 38 indicates the path of the center of the pivot pin 26 on which the outer end of the eccentric rod 24 is mounted. 39 illustrates a modified form of tooth for the serrated edges of the movable bars as shown in Figure 6, 40, is another modified form for the serrated edge of the movable bars as illustrated in Figure 7, 41 is still another modified form of tooth for the serrated edge of the movable bars as illustrated in Figure 8, and 42 are the paths described by the upper edges of the teeth of the serrated movable bars 14.

The teeth 22 of the moving bars shown in Figure 5 are of practically the same outline as those of the fixed bars, and when these bars move in their path the effect will be to slide the hot rolled bars up the flatter slopes of the fixed bars, and they then drop slightly on to the flatter slopes of the moving bars and as the moving bars continue their downward path, the hot rolled bars are lowered into the next serrations of the fixed bars.

The serrations 39 of the moving bars may also be as shown in Figure 6, a clearance or space being provided in such a way that when the hot rolled bars approach the upper corners of the fixed bars, they will drop into the next serrations without any fear of their falling backward into the serrations from which they came. The steeper slopes of the teeth 22 and 39 are preferably made at right angles to the flatter slopes of the serrations of the fixed bars so that there will be no tendency to bend or lift the hot bars during their sliding motion. The teeth 40 of Figure 7 have their steep slopes substantially vertical, which tends to slightly crowd the hot rolled bars downwardly toward the surfaces upon which they are sliding, and this slope provides such clearance that the hot bars readily drop and are deposited in the next set of serrations of the fixed bars.

The teeth 41 of Figure 8 also have their working surfaces substantially vertical and with clearance provided so that there will be no danger of the hot rolled bars falling back into the serrations from which they have just been moved.

The amount of movement of the moving bars is sufficient to handle any rolled bar which may be delivered to the bed.

As regards the force required for the operation, owing to the fact that the hot rolled bars are not lifted and their weight not carried on the moving bars and they are not delivered or moved above the upper points of the fixed bars, the amount of power required will be less than when the bars are lifted more. Also, owing to the fact that the bars are slid and not lifted, the amount of force required to move them will be less in a given time, so that the shifting apparatus will not be strained so severely and may be lighter than an apparatus in which the entire weight of the bars is carried by the lifting apparatus.

Other forms of cams, different in design, which make a different or more rectangular path of the moving bar may be used, but such cams have abrupt changes of outline, which may cause unnecessary shocks in the operation, so that the combined straight and curved paths indicated on the drawings is believed to be better. Less total power will suffice to operate this apparatus, and the effort will be distributed over a longer time, so that the operating mechanism may be lighter. The path 42 illustrates one form of the movement of the movable bars in a circuit or closed lineal figure, the upper side of which, as indicated by an arrow, is substantially parallel with the sloping side of the tooth of the fixed bar, so that the movement of the rod or rolled bar from one serration to the next is accomplished by sliding on the fixed bar as it is pushed by the tooth of the moving bar. The direction of this movement is approximately parallel to the sloping side of the fixed tooth on which the rod or bar is moved and the bar supported at the same time. This, therefore, as before stated, requires no actual lifting of the rods or bars by the moving bar, thus conducing to ease and economy of operation. Although I have shown the circuit 42 in the form of parallel lines, the ends of which are joined by semi-circles, I wish it understood that this path may be flattened oval or a flattened ellipse or similar figure, but so arranged that the moving bar operates in a direction substantially parallel to the inclined supporting surface of the fixed tooth when it is moving the rod or bar from one serration to the next, the ends of the path being preferably rounded to produce easy movement. In order to simplify the description herein I have called this path a circuit, meaning a lineal closed figure.

The operation of my apparatus is as follows: A series of bars following each other are delivered on the rollers 18 and within the trough 17, whereupon the moving bars 14 pick them up one by one by means of

their inclined ends 16 and deliver them into the first serrations of the fixed bars. As another bar is delivered from the rollers 18 it is then picked up and delivered into the first notch, while at the same time the bar first mentioned is picked up by the serrations of the moving bars adjacent the inclined portion 16 and delivered into the next set of notches of the fixed bars, and this operation is continued until a constant succession of hot bars is being delivered at one side of the cooling bed and finally cooled bars are delivered from the last notch of the fixed bars to the delivery trough 32 and thence carried away as desired by means of the rollers 27.

The cooling bed may be of such width and operated at such speed that the bars are properly cooled during their passage over the bed, and by reason of the notches of the bars they are maintained straight and free from warping. When bars of certain shapes are transferred on the fixed bars and slid upwardly on the sloping portions of these serrations they may during said transfer turn a quarter or a half turn more or less on their axes so that the various sides of such bars will be exposed to the cooling draughts of air and the bars will remain straighter than if cooled only from one side and will thereby maintain themselves in the notches and will also be delivered in a straighter condition.

Although I have described and illustrated my invention in considerable detail, I do not wish to be limited to the exact and specific details thereof, as shown and described, but may use such modifications in, substitutions for, or equivalents thereof, as are embraced within the scope of my invention, or as pointed out in the claims.

Having thus described my invention, what I claim and desire to secure by Letters Patent is:—

1. A cooling bed comprising a plurality of fixed bars provided with a series of aligned serrations, a plurality of moving bars there-between and means for lifting and lowering said moving bars and for moving them in a circuit, part of which is substantially parallel to the supporting surfaces of the serrations of the fixed bars.

2. A cooling bed comprising a plurality of fixed bars having a series of aligned notches therein, a plurality of moving bars there-between having a corresponding series of aligned notches, means for lifting and lowering the moving bars and for moving them in a circuit, part of which is substantially parallel to the supporting surfaces of the serrations of the fixed bars.

3. A cooling bed comprising a plurality of fixed bars having a series of triangular saw-toothed serrations therein, a plurality of moving bars located there-between and

provided with a corresponding series of serrations, means for lifting and lowering said moving bars and for moving the same in a circuit, part of which is substantially parallel to one of the sides of the triangular serrations in the fixed bars.

4. A cooling bed comprising a plurality of fixed bars having a series of notches therein, a plurality of moving bars located there-between and provided with a series of similarly spaced notches, means for lifting and lowering said moving bars and for moving the same in a circuit, part of which is substantially parallel to one of the sides of the notches of the fixed bars.

5. A cooling bed comprising a plurality of fixed bars, a plurality of moving bars located there-between, said moving bars being provided with lifting cams and eccentrics adapted to move said bars in an inclined oval manner.

6. A cooling bed comprising a plurality of fixed bars, a plurality of moving bars located there-between, said moving bars being provided with lifting cams and eccentrics adapted to move said bars in substantially the path of a rectangle with rounded ends.

7. A cooling bed comprising a plurality of fixed bars, a plurality of moving bars located there-between, said moving bars being provided with lifting cams and eccentrics adapted to move said bars in substantially the path of an inclined rectangle with rounded ends.

8. A cooling bed comprising a plurality of fixed bars provided with a series of aligned angular notches, a plurality of moving bars there-between having a similar series of aligned angular notches and means for lifting and lowering said moving bars and for moving them above and below said fixed bars in a circuit, part of which is substantially parallel to the lower supporting surfaces of the notches of the fixed bars.

9. A cooling bed comprising a plurality of fixed bars having a series of aligned notches, a plurality of moving bars located there-between having similarly aligned projections extending therefrom, one side of each projection being substantially parallel to the upper sides of the notches of the fixed bars aforesaid, means for lifting and lowering said moving bars and for traversing them in a circuit, part of which is substantially parallel to the lower sides of the notches of the fixed bars.

10. In a cooling bed of the character described, a plurality of fixed bars having a series of substantially right angle triangle notches therein, the right angle being at the bases of the same, in combination with a plurality of movable bars having a plurality of similarly aligned triangular notches, one side of each of which is substan-

tially vertical, and means for moving said movable bars in a circuit extending upwardly, downwardly and in a direction substantially parallel to the lower sides of the fixed
5 notches.

11. A cooling bed comprising a plurality of fixed bars having a series of right angle notches therein, with the right angles at the bottom of said notches, a plurality of
10 movable bars located there-between each provided with a corresponding series of

projections extending upwardly there-from, said projections having their operating sides substantially upright and their other sides inclined and means for moving said movable
15 bars in the path of a rectangle with rounded ends the sides of which are substantially parallel to the lower sides of the notches of the fixed bars.

In witness whereof I hereunto affix my
20 signature.

GEORGE E. THACKRAY.