July 20, 1965 E. HEIN ETAL 3,195,739

MEANS FOR PILING BILLETS

Filed April 27, 1962 5 Sheets-Sheet 1

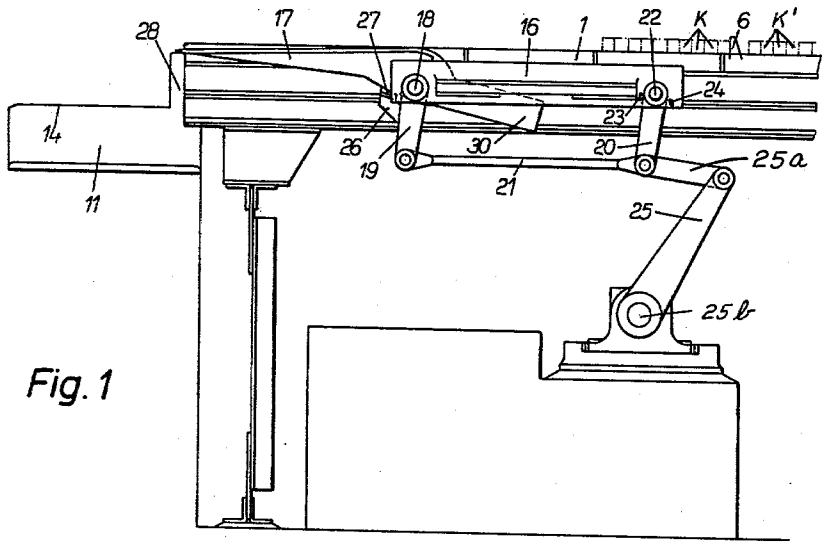

Fig. 1

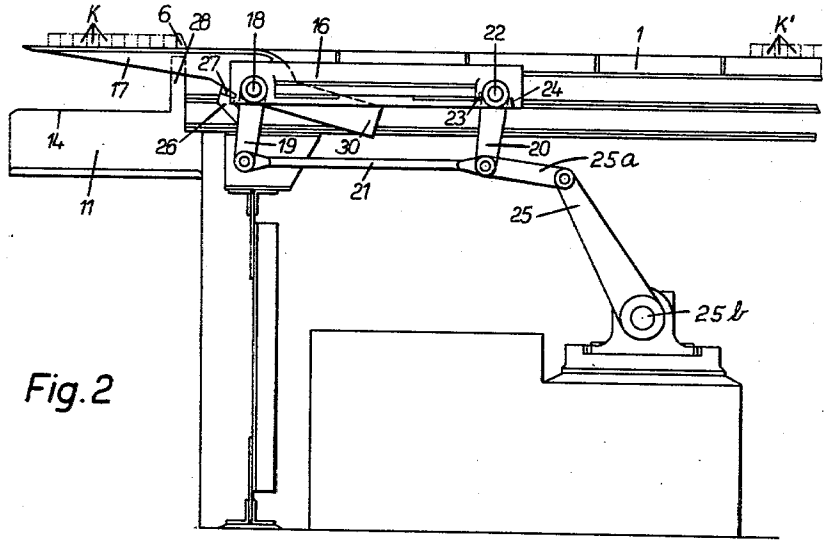

Fig. 2

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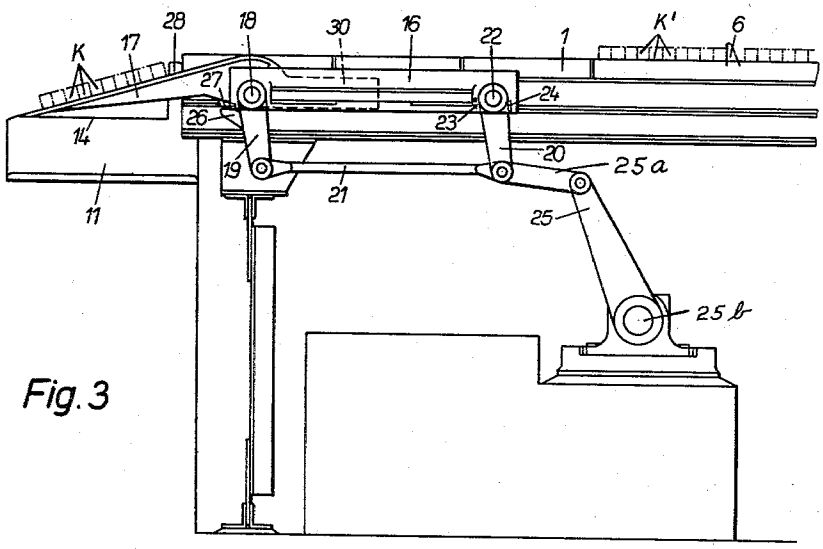

Fig. 3

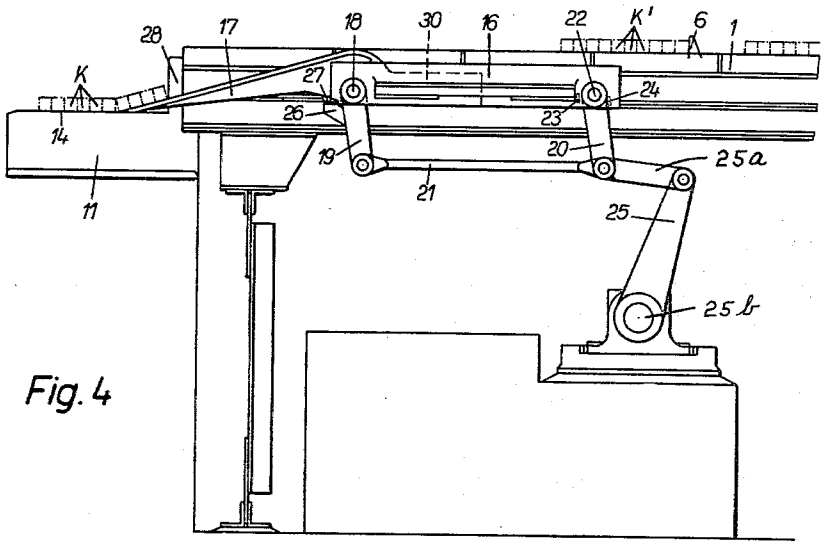

Fig. 4

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MEANS FOR PILING BILLETS

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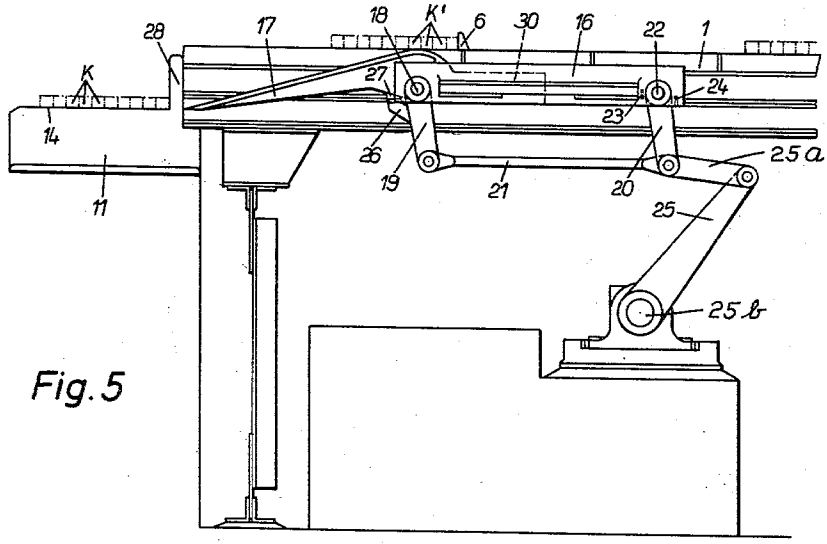

Fig. 5

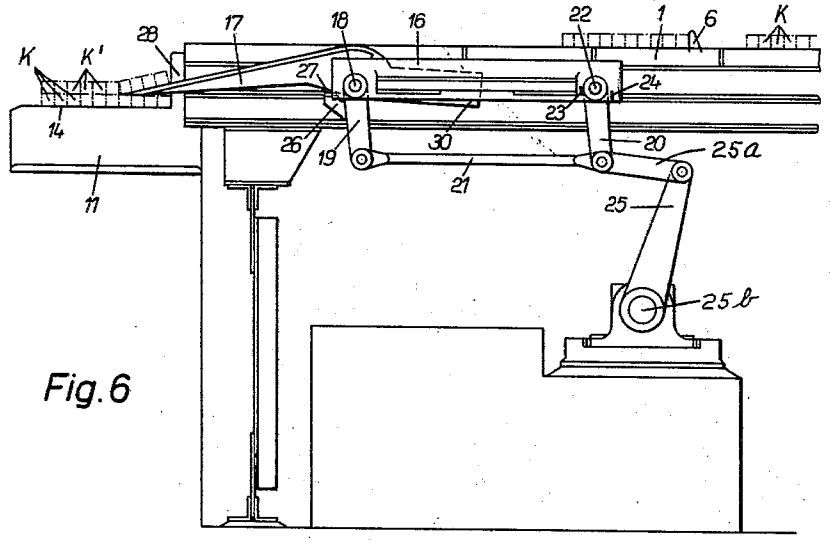

Fig. 6

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MEANS FOR PILING BILLETS

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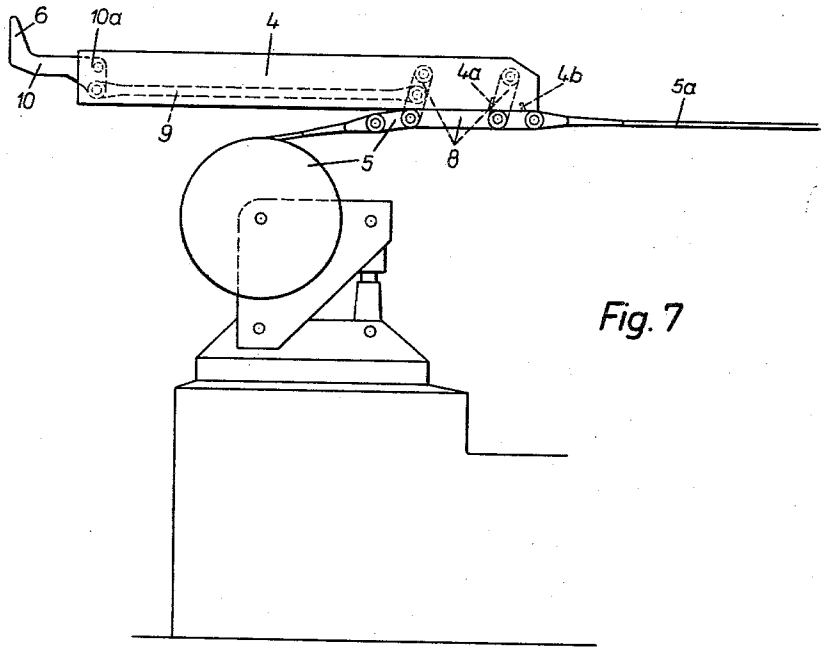

Fig. 7

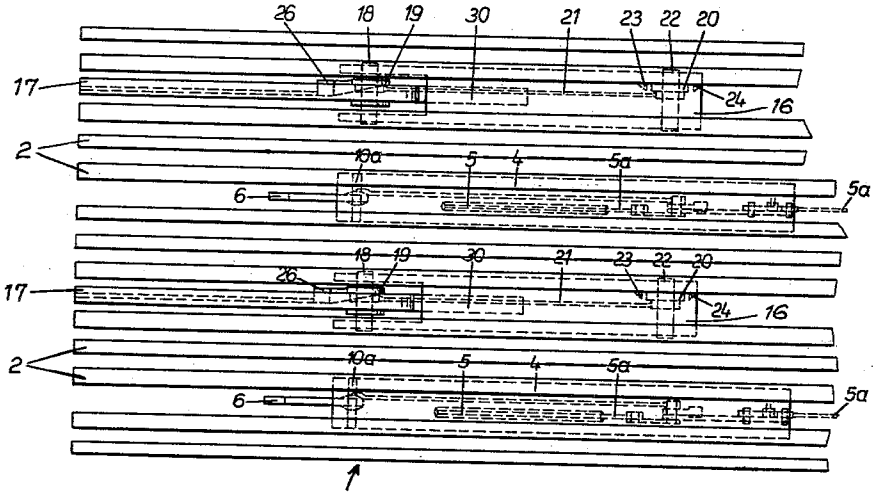

Fig. 8

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MEANS FOR PILING BILLETS

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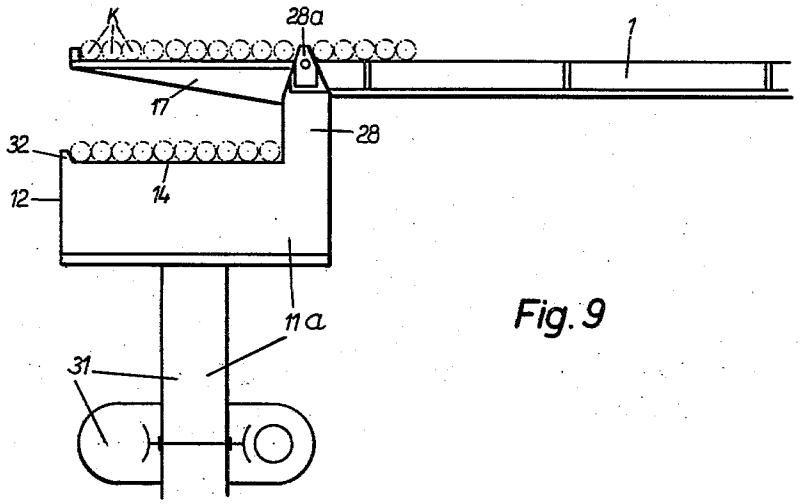

Fig. 9

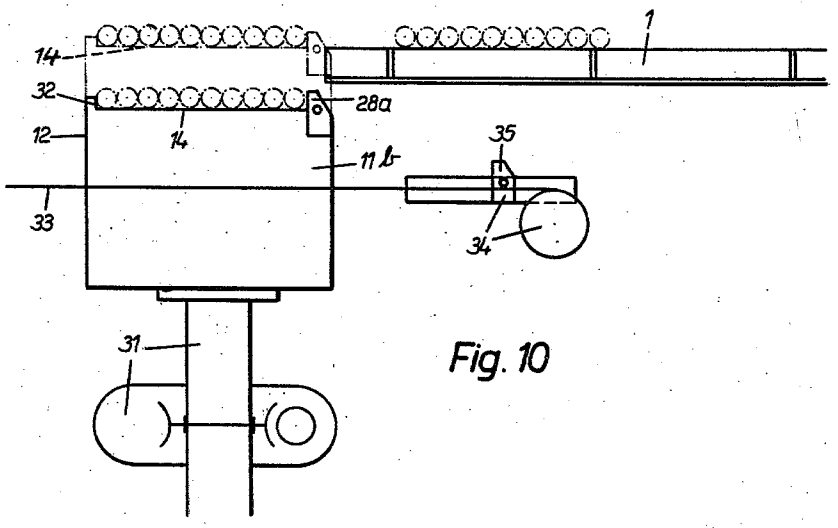

Fig. 10

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MEANS FOR PILING BILLETS

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3 Claims. (Cl. 214—6)

This invention concerns a piling device positioned to cooperate with a hot bed for rolled stock, particularly square billets, by which billets may be pushed laterally across a hot bed and transferred to a plurality of parallel pivoted arms which may move beyond the parallel bars of the hot bed to lower a group of billets to a grate or table. As the pivoted arms are retracted and drawn back to a position between the bars of the hot bed, the billets are stripped from the arms to be positioned in parallelism on the table. This operation is repeated so that successive groups of aligned square billets are laid neatly on top of the previous batch deposited on the table.

The rolled stock coming from a rolling mill is ordinarily sub-divided into predetermined lengths by means of shears. Such rolled stock cut to specific lengths is familiarly known as billets. These billets, which are ordinarily square, are directed to a hot bed, where they are positioned side by side and pushed laterally across the bed during the initial cooling. A hot bed is formed in the manner of a grate consisting of a plurality of parallel rods or supports which are at right angles to the longitudinal direction of the billets. The supports forming the hot bed are of such number as to adequately support the billets from end to end. The billets are moved across the hot bed by means of transfer skids. The transfer skids consist of drag cars that travel in guides between the grate rods of the hot bed. The drag cars are equipped with vertically extending fingers which can be set up in alignment adjacent a group of aligned billets to push the group of billets transversely of the hot bed. When the billets reach the side of the hot bed, it is desirable that they then be suitably piled on a table from which they may be picked up by a crane to be moved to a subsequent station.

It is particularly desirable that the billets on leaving the hot bed be maintained in neatly piled alignment to facilitate subsequent work sequences. Heretofore it has been proposed to lift the billets from the hot bed as they lie in aligned position by means of arms which rise between the bars of the hot bed and then move laterally away from the hot bed to lower the billets to a roller bed for further transportation. Such devices, however, are not capable of piling a succession of parallel layers of billets one on top of the other. Other arrangements have been used in which a group of parallel billets has been pushed from the hot bed onto a table at the same level. The table is then lowered a distance equal to the vertical dimension of the billets and another batch of billets is pushed from the hot bed onto the previous layer of removed billets, but piling by this method has proved difficult since it calls for an exact lowering of the table and results are not satisfactory.

The present invention operates without the necessity of having to adjust the height of the table on which the billets are piled. This is accomplished through the use of horizontal pivoted arms which may be moved laterally beyond the edge of the hot bed and onto which a group of parallel billets is pushed. The arms are then caused to swing downwardly until the outer ends of the arms engage the table on which the billets are to be deposited. The arms are then withdrawn, moving back into the hot bed, and the billets on the arms are progressively stripped therefrom to descend into perfect alignment on the table. This operation is repeated, with the next layer of billets being of the same number as the first layer and being deposited directly and accurately on the preceding layer. This operation is repeated again and again until the pile of billets has been built up to the desired height, after which the piled group may be carried away by a crane.

These and other objects of the invention will be more fully understood as the description proceeds with the aid of the accompanying drawings in which:

FIGS. 1 to 6 illustrate the piling device operating through two sequences to show how a first layer of billets is positioned on the table and a second layer of billets is thereafter placed on the first layer;

FIG. 7 is a side elevation of a transfer skid car, of which there are a plurality spaced along the hot bed and between the swinging arms that lower the billets to the table. The skid cars function to move the billets across the hot bed;

FIG. 8 is a plan view of a section of the hot bed showing the supporting arms in retracted position between the parallel supports of the hot bed and with the vertical fingers of the skid cars alternating with the support arms;

FIG. 9 is a side elevation of a modification in which the table to which the billets are to be transferred is vertically adjustable and mechanism is included to permit the handling of round billets;

FIG. 10 is another modification in which the table is vertically adjustable and a stroke adjusting device is included.

Referring to FIGS. 1 to 6, there is shown the grate 1 of a hot bed. Square billets K or similar rolled stock on leaving the rolling mill are pushed laterally one at a time onto the hot bed. As can also be seen in FIG. 8, the grate 1 of the hot bed is formed by a number of grate rods 2 which run parallel to each other and are at right angles to the billets. Beneath grate 1 and parallel to the grate rods 2 there are suitable rails along which a plurality of transfer skid cars 4 can be simultaneously moved back and forth over the entire length of the hot bed through customary mechanism, as shown in FIG. 7. For each car there is a shifting drive 5 in the form of a winch which will pull the transfer skid car 4 to the left. Each skid car 4 has an upwardly extending finger 6 which acts in conjunction with other aligned fingers 6 on the other skid cars to push a group of billets across the hot bed.

As can be easily understood from an examination of FIG. 7, when the winch 5 is actuated to pull the skid car 4 to the left, the parallel linkage arrangement 8 acts to move the coupling rod 9 to the left, causing lever 10 to swing clockwise about axis 10*a*. This, of course, raises finger 6 to operative position adjacent a billet. Movement of finger 6 is limited by engagement of the right-hand link 8 with stop 4*a*.

When the tension rod 5*a* is brought into operation to pull the skid car 4 to the right, the parallel linkage 8 shifts to the right until stop 4*b* is engaged. This, of course, causes lever 10 to swing counterclockwise, dropping finger 6 below the billets so that the fingers 6 can be shifted to a new position behind the next group of billets to be moved across the hot bed.

Directly at the discharge side of the hot bed is a table 11 on which the billets are to be piled. This table is advantageously formed by several parallel elements placed comb-wise adjacent each other with intervals therebetween. On this table 11 the square billets K, which are pushed by the fingers 6 of skid cars 4 to the discharge side of the hot bed, are to be laid in alignment with each other in a plurality of layers so that they can be further conveyed in this arranged situation by a crane, for example.

The piler device used to pile the square billets on the surface 14 of the table 11 will now be described. Referring to FIGS. 1 to 7, the piler device comprises a plu-

rality of cars or slides **16** which are alternated with the skid cars **4**. This is illustrated in FIG. 8. The slides **16** run on suitable rails so that as the slides move back and forth they will run parallel to the grate rods **2**. In each of the slides **16** is an arm **17** extending in the direction of the table **11**. Arm **17** is pivoted at **18**, with its axis horizontal, and extends crosswise of the grate rods **2**. Arm **17**, which is flat on its upper surface, has a strengthening web along the bottom which tapers upwardly to the left end of the arm. The arm may be swung up and down through the use of mechanism consisting of parallel links **19** and **20** and a connecting rod **21**. Link **19** is pivoted at **18** and link **20** is pivoted at **22**. A crank **25** swinging about axis **25***b* is connected to link **20** and connecting rod **21** by link **25***a*.

FIG. 1 shows the slide **16** in retracted position with crank **25** at the right. As crank **25** is moved to the left, as shown in FIG. 2, link **20** will engage stop **23**, in which position the related linkage will cause the upper surface of arm **17** to be horizontal. On the left side of link **19** is an abutment **26**, of which the upper surface is adapted to engage the under side of a corresponding abutment **27** affixed to the under side of arm **17** to the left of axis **18**. So long as links **19** and **20** are in the position shown in FIG. 2 with link **20** against stop **23** (and regardless of the position of slide **16**), the upper surface of arm **17** will be horizontal.

When slide **16** has reached the limit of its travel to the left, as shown in FIG. 2, the fingers **6** on the skid cars **4** come into operation. These fingers force themselves upwardly between the billets then residing on the hot bed, and as the cars **4** are moved simultaneously to the left, as viewed in FIGS. 1 to 7, the fingers **6** push a group of billets K to the left to position them on the upper surfaces of the aligned arms **17**. In FIG. 2, it will be seen that ten billets have been so shifted from the hot bed to the arms **17**.

The skid cars **4** are then moved to the right and at the same time crank **25** is swung to the right. As this movement occurs, arms **17** are lowered, as shown in FIG. 3, until the outboard ends of the arms engage the upper surface of the table **11**. With the arms in this position, the last of the billets K will be on the outside of stripper element **28**. Also link **20** will come into engagement with stop **24**, and abutment **26** will no longer support abutment **27**. Further movement of shaft **25***b* to the right is then instituted, and this causes all slides **16** and their associated arms **17** to move to the right, as shown in FIG. 4, causing the billets K to be stripped from the arms **17** by the stripper **28** to be deposited in aligned orderly fashion on the upper surface of table **11**.

As soon as crank **25** has carried slides **16** to the right far enough so that the lefthand ends of arms **17** are clear of the now deposited billets K, as shown in FIG. 5, reverse movement of crank **25** is instituted, causing abutments **26** and **27** to engage to swing arms **17** upwardly again to the position shown in FIG. 1. To minimize the force required to swing arms **17** up to horizontal position, there is provided on each arm a counterweight **30**.

The previously described operations are now repeated. A second group of billets K′ is moved to the left by fingers **6**, as shown in FIG. 5, to be positioned on arms **17** when the arms have reached the extended horizontal position shown in FIG. 2 Crank **25** is then swung to the right, causing all of the arms **17** to be lowered in the manner shown in FIG. 3, but in this case the first layer of billets will be therebelow. Further righthand movement of crank **25** is then instituted, causing the arms **17** to be withdrawn and the second layer of billets K′ to be stripped from the arms by stripper **28** to be deposited neatly and accurately on top of the first layer of billets. This procedure is repeated until the desired number of layers of billets has been piled up in aligned condition on table **11**.

A modification is shown in FIG. 9. Here the rigid table

11 of FIGS. 1 to 6 is replaced by a table **11***a* adjustable in height by means of a hydraulic or mechanical stroke device **31**. This is useful in connection with the swinging arms **17** for the formation of higher stock piles. The arrangement according to FIG. 9 is particularly suitable for the piling of billets having a circular cross-section. To prevent the circular billets from rolling from table **11***a*, a series of aligned upwardly extending projections **32** are located at the end of the table away from the grate **1** of the hot bed. The end of the table **11***a* adjacent grate **1** has a group of aligned strippers **28** having on their upper ends a series of aligned catches **28***a*. These catches can swing to the left, permitting the round billets to pass thereby but acting to prevent return of the billets to the hot bed. When the arms **17** are lowered, the arms will descend initially between the comb-like elements of table **11***a* to permit the round billets to roll therefrom to lie on the horizontal top surface of the vertically adjustable table in the manner shown in FIG. 9.

A further modification is shown in FIG. 10, in which a table **11***b* is located at the side of the hot bed and is vertically adjustable by means of a stroke device **31** of such character that the surface **14** on which the billets are deposited can be brought to the height of the surface of the hot bed, as illustrated in dot-dash line. The surface **14** is formed by a plurality of spaced parallel walls, on the upper edges of which the billets are deposited. When the surface **14** is in the upper position, then either square or round billets can be pushed from the grate **1** to the surface **14**. Then table **11***b* is lowered by means of a stroke device **31** until the surface **14** comes to the same height as another grate **33** of spaced parallel bars with which a towing transport device **34** its coordinated. By means of the towing straps or fingers **35**, the square or round billets K then at the level of grate **33** can be shifted to the left from the surface **14**. The tiltable strippers **28***a* serve to prevent movement of the billets to the right after they have been positioned on surface **14**. Similarly, the projections **32** prevent the billets from running off the table at the left until the table has been lowered to deposit the billets on grate **33**.

It is our intention to cover all changes and modifications of the examples of the invention herein chosen for purposes of the disclosure which do not constitute departures from the spirit and scope of the invention.

We claim:

1. Means for transferring a plurality of aligned billets on a hod bed to a table adjacent said hot bed, said means comprising a plurality of aligned slides movable transversely of said billets, an arm on each slide pivoted thereto, the extent of movement of said slides being such that when said slides have reached the limit of their movement across said hot bed the said arms will extend therebeyond, means for temporarily maintaining said arms in horizontal position when in extended position beyond said hot bed, means for pushing a group of aligned billets transversely of said hot bed until they are positioned on said arms in horizontal position above said table, means permitting said arms thereafter to swing downwardly under the weight of said billets until the outer ends of said arms are at substantially the level of the table on which said billets are to be deposited, means for withdrawing said slides and arms away from said table, means for stripping the billets from said sloping arms as the arms leave said table to cause said billets to be successively deposited on the said table in parallel aligned relationship.

2. An apparatus for transferring a plurality of aligned billets on a hot bed to a table adjacent said hot bed comprising: a plurality of aligned slides movable transversely of said billets across said hot bed, said slides being constrained to move in a horizontal direction; an arm on each slide pivotally secured thereto; reversible drive means for alternately moving said slides and arms across said hot bed toward said table and then withdrawing said slides and arms away from said table, the extent of movement

of said slides being such that when said slides have reached the limit of their movement toward said table said arms will extend beyond said hot bed; means for temporarily maintaining said arms in a horizontal position when in extended position beyond said hot bed; means for pushing a group of aligned billets transversely of said hot bed until they are positioned on said arms in horizontal position above said table; means operable by said drive means for permitting said arms thereafter to swing downwardly under the weight of said billets until the outer ends of said arms are at substantially the level of the table on which said billets are to be deposited; and means for stripping the billets from the sloping arms as said arms are withdrawn from said table to cause said billets to be successively deposited on said table in parallel aligned relationship.

3. An apparatus according to claim 2 wherein said reversible drive means comprises: first and second parallel

links pivotally secured to said slide; a connecting rod pivotally secured to said links, said connecting rod, links and slide forming a parallelogram; stop means secured to said slide for limiting the rotation of said links; and actuating means pivotally secured to said connecting rod and one of said parallel links at the pivotal junction thereof.

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