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Kazuba

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[54] **BILLET MANIPULATING UNIT**

[75] Inventor: **Robert J. Kazuba,** Chicago, Ill.

[73] Assignee: **Pettibone Corporation,** Chicago, Ill.

[22] Filed: **July 22, 1971**

[21] Appl. No.: **165,268**

[52] **U.S. Cl.** .....**214/1 QG**

[51] **Int. Cl.**.....**B65g 7/00**

[58] **Field of Search**.....214/1 Q, 1 QA, 1 QG, 130 R, 214/130 C

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Primary Examiner—Gerald M. Forlenza
Assistant Examiner—Frank E. Werner
Attorney—Norman H. Gerlach

[57] **ABSTRACT**

A billet manipulating unit adapted, in conjunction with similar units, to receive therein an elongated steel billet which is rectangular in transverse cross section, and the width of which is appreciably greater than its thickness and, by the manipulative action of two cooperating pivoted billet-engaging arms, to impart varying increments of unidirectional turning movement to the billet in order to present selected side surfaces of corner edges thereof to a grinding wheel for conditioning purposes.

7 Claims, 15 Drawing Figures

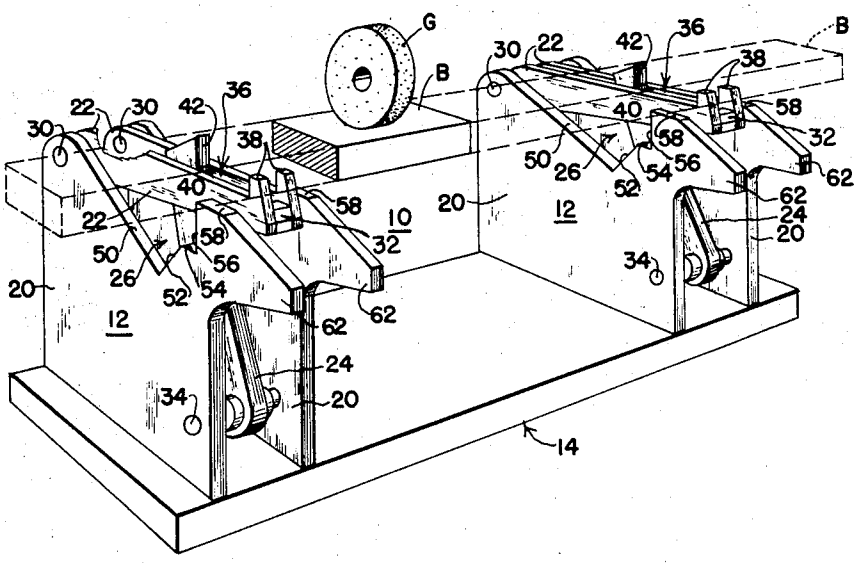


FIG. 1

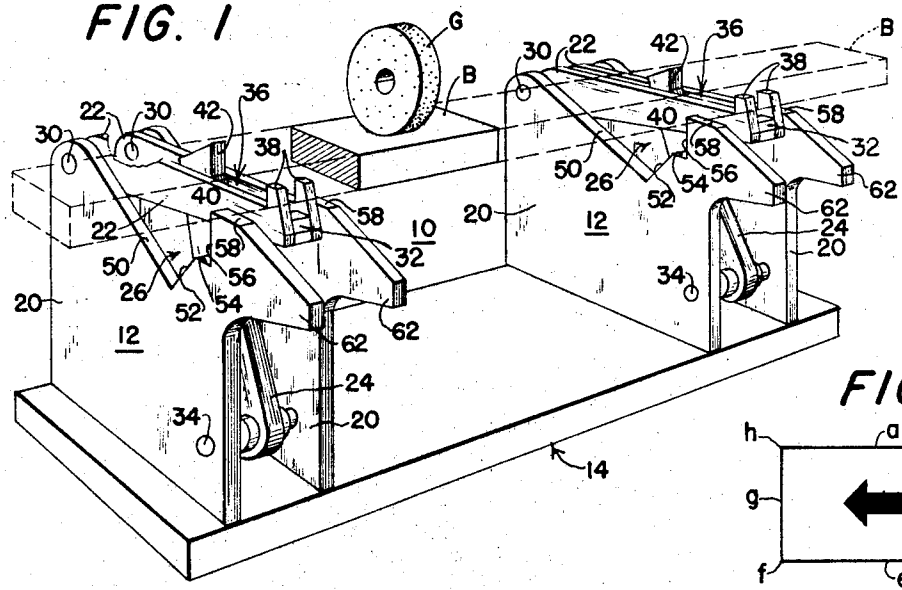


FIG. 1a

FIG. 2

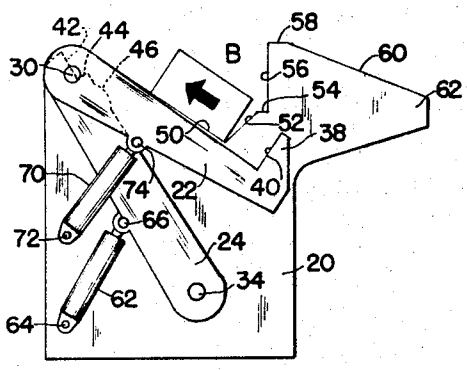


FIG. 3

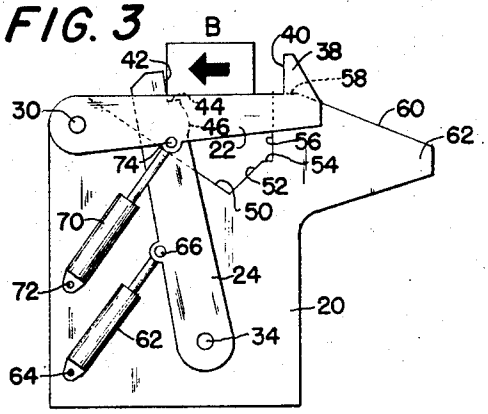


FIG. 4

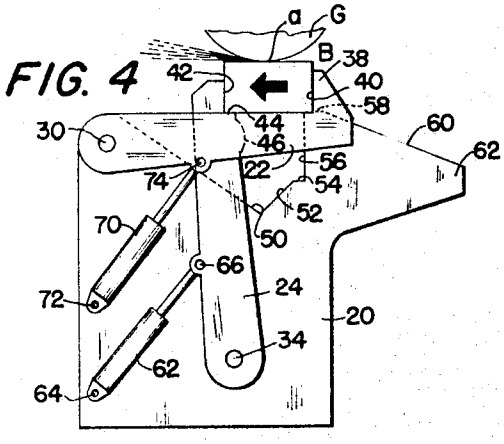
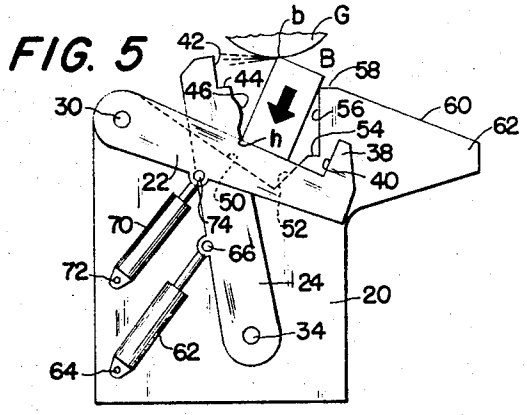


FIG. 5



INVENTOR.
ROBERT J. KASZUBA

BY Norman G. Wood

Atty.

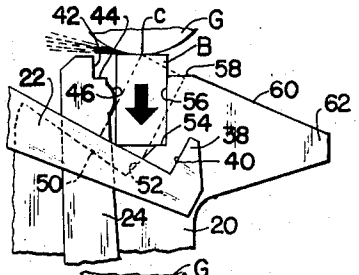


FIG. 6

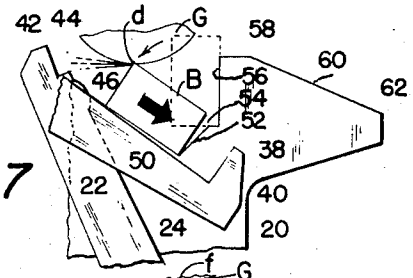


FIG. 7

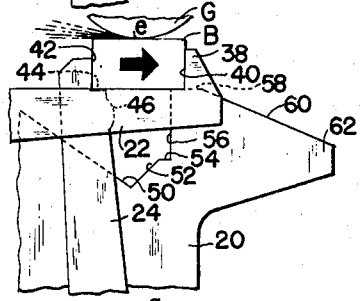


FIG. 8

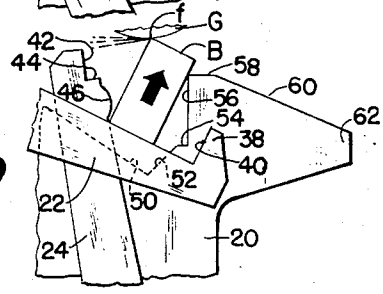


FIG. 9

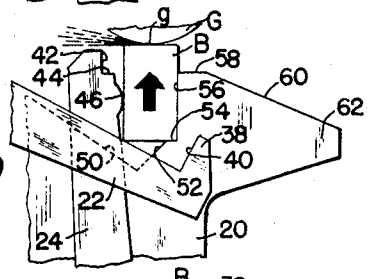


FIG. 10

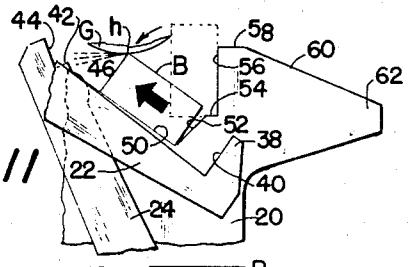


FIG. 11

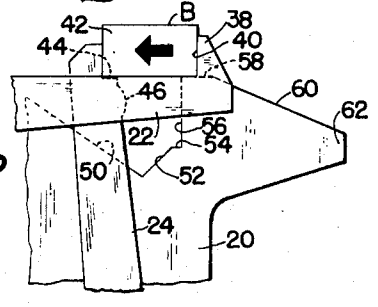


FIG. 12

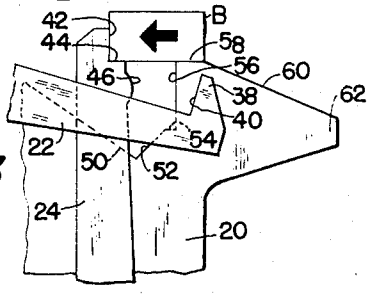


FIG. 13

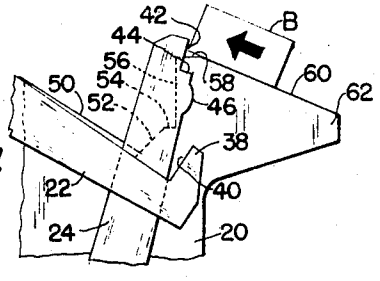


FIG. 14

INVENTOR.
ROBERT J. KASZUBA

BY Norman F. Oblon
Atty.

BILLET MANIPULATING UNIT

The present invention relates generally to billet handling or manipulating apparatus and has particular reference to a novel billet manipulating unit which, when used in conjunction with one or more similar units, serves to support an elongated steel billet of rectangular cross section in operative relationship with respect to a power-driven grinding wheel in order to obtain by way of the wheel selective conditioning of the four side surfaces or the four corner edges of the billet.

The billet manipulating unit of the present invention is similar in many respects to the particular billet manipulating unit which is shown and described in copending U.S. Pat. No. 3,601,263, granted on Aug. 24, 1971 and entitled "Billet Handling Apparatus." The present manipulating unit is, however, an improvement over the earlier unit in that it is capable of effectively manipulating steel billets which are of elongated rectangular cross section, which is to say that their width is appreciably greater than their thickness. Both the earlier manipulating unit and the present manipulating unit are predicated upon the use of a frame structure having in the upper region thereof an open upwardly presented billet-receiving trough which receives the billet therein, together with a pair of billet manipulating arms which are pivoted to the frame structure for swinging movements about respective horizontal axes. In both the earlier and the present manipulating unit, one of the two arms constitutes a billet supporting arm and the other constitutes a billet clamping arm. By various and selective manipulations of the two arms, either simultaneously or individually, a billet which rests in the trough may be lifted from the trough by the billet supporting arm, clamped between such arm and the billet clamping arm for grinding purposes, released by both arms, and finally allowed to fall back into the trough by a tumbling action wherein an increment of 90° turning movement is imparted to the billet so that its new trough-supported position is 90° removed from its original position in the trough. A reptition of the billet lifting and billet clamping operation by the two manipulating arms serves to present a fresh side surface to the grinding wheel for billet conditioning purposes. Two additional and identical quarter-cycles of billet manipulation serve to complete the conditioning of all four sides of the billet.

The present billet manipulating unit is designed as an improvement over the earlier billet manipulating unit of aforementioned U.S. Pat. No. 3,601,263 in that whereas the earlier unit is incapable of satisfactorily handling billets which are other than square in transverse cross section, the present unit is capable of handling billets in which the width thereof is appreciably greater than its thickness. Although the basic "tumbling" principle which is involved in effecting incremental turning movement of the billet to be conditioned by the associated grinding wheel remains substantially the same, the contour of the framework trough which initially receives the billet and the shape of the two billet manipulating arms are modified for proper cooperation with the trough so that a wide variety of rectangular cross sectional billet shapes may be accommodated. One of the more important improvements of the present billet manipulating unit over the earlier unit resides in the provision of cooperating clamping shoulders on the trough sides and on one of the manipulating arms so that, in certain positions of the billet, the latter is clamped against the framework, whereas in the earlier billet manipulating unit, all billet clamping operations take place only between the two manipulating arms themselves.

The provision of an improved billet manipulating unit such as has briefly been outlined above constitutes the principal object of the present invention. Other objects and advantages of the invention, not at this time enumerated, will become readily apparent as the nature of the invention is better understood from a consideration of the following detailed description.

The invention consists in the several novel features which are hereinafter set forth and are more particularly described by the claims at the conclusion hereof.

In the accompanying two sheets of drawings forming a part of this specification, one illustrative embodiment of the invention is shown.

In these drawings:

FIG. **1** is a front perspective view of a pair of cooperating billet manipulating units embodying the principles of the present invention, such view showing the two units in one of several billet clamping positions of which they are capable of assuming;

FIG. **1***a* is a diagrammatic reference view of a rectangular billet which is capable of manipulation by the present manipulating unit and to which certain lower case letter designations have been applied to designate the various side surfaces and corner edges of the billet;

FIG. **2** is a schematic view of one of the billet manipulating units of FIG. **1**, such view showing the unit in its initial billet-receiving position;

FIG. **3** is a schematic view similar to FIG. **2** but showing the billet raised preparatory to clamping thereof for grinding purposes;

FIG. **4** is a schematic view showing the billet in a first clamped position and undergoing grinding on one side thereof;

FIG. **5** is a schematic view showing the billet in a stable but unclamped position and while undergoing grinding on one corner edge thereof;

FIG. **6** is a schematic view showing the billet in a second clamped position and undergoing grinding on a second side thereof;

FIG. **7** is a schematic view showing the billet in a stable but unclamped position and undergoing grinding on a second corner edge thereof;

FIG. **8** is a schematic view similar to FIG. **4** but showing the billet in a clamped position and undergoing on a third side thereof;

FIG. **9** is a schematic view similar to FIG. **5** but showing the billet in a stable but unclamped position and undergoing grinding on a third corner edge thereof;

FIG. **10** is a schematic view similar to FIG. **6** but showing the billet in a clamped position and undergoing grinding on a fourth side thereof;

FIG. **11** is a schematic view similar to FIG. **7** but showing the billet in a stable but unclamped position and showing the same undergoing grinding on a fourth corner edge thereof;

FIG. **12** is a schematic view showing the billet in a raised and clamped position preparatory to ejection of the same from the manipulating unit;

FIG. 13 is a schematic view showing the billet in its raised and unclamped position immediately prior to ejection thereof from the unit; and

FIG. 14 is a schematic view illustrating the billet undergoing ejection from the unit.

Referring now to the drawings in detail and in particular to FIG. 1, a billet manipulating apparatus embodying two of the manipulating units of the present invention is designated in its entirety by the reference numeral **10**, the individual units **12** being mounted on a common base member **14**. The illustration of FIG. 1 is purely an exemplary one and the apparatus **10** may be used in a wide variety of environments. It is the purpose of the manipulating units **12** to support therebetween a billet such as the billet B, portions of which are shown in dotted lines in FIG. 1, and by a sequence of manipulations, progressively impart increments of counterclockwise rotation or turning to the billet so as to cause different sides and edges of the same to be presented upwardly for cooperation with a rotary, power-driven grinding wheel such as is shown in full lines in FIG. 1 and designated by the reference numeral G, the grinding wheel traversing the billet B in the usual manner of surface conditioning a steel billet at a grinding station. The environmental aspects of the apparatus **10** form no part of the present invention and the base member **14** may, if desired, be a fixed member which is disposed directly at a grinding station where there are successively conditioned billets which are capable of endwise movement, the grinding wheel G traversing the billet undergoing conditioning in a longitudinal direction and operating upon whatever side or edge of the billet is presented upwardly. Alternatively, the base member **14** may constitute the deck or platform of a manipulating car which travels on rails so that the billet B may be loaded onto the manipulating units **12** at a location remote from the grinding station and, thereafter, the manipulating car caused to travel on the rails so as to shift the billet endwise into the grinding station, after which back and forth endwise movement of the manipulating car at the grinding station will cause the billet to traverse the grinding wheel.

The billet B of FIG. 1 of the drawings is a relatively short billet and, therefore, it is capable of being handled by only two of the manipulating units **12**. Where a longer and, consequently, heavier billet is to undergo treatment or conditioning, a greater number of such units will be employed, the various units being suitably spaced apart on the base member **14**. The particular number of units which are employed is not so much a function of the length of the billet as it is of the weight of the billet, the output or lifting functions of each unit being of a limited nature inasmuch as each unit is hydraulically operable under the control of relatively small piston and cylinder devices in a manner that will be described in detail presently.

The manipulating units **12** in handling billets which are of non-uniform rectangular configuration in transverse cross section are capable of manipulating a billet having a width which is appreciably greater than its thickness. Accordingly, the particular billet B which is selected for illustration herein is of such a nature and, in order that the sequence of positions which this billet assumes during treatment thereof by the two units **12** may be adequately described in connection with the disclosures of FIGS. **2** to **14**, inclusive, the various side and corner regions of the billet have been given lower case designations *a*, *b*, *c*, *d*, *e*, *f*, *g* and *h* in FIG. 1*a*, the designations *a*, *c*, *e*, and *g* representing the four side surfaces of the billet B and the designations *b*, *d*, *f* and *h* representing the four corner edges of said billet. The arrow in FIG. 1*a* is provided in order to render a quick visualization of the particular position of the billet B as it progresses from an initial position of presentation at the time it is received by the manipulating units **12**.

Insofar as the loading of the billets, one at a time and successively, onto the manipulating units **12** is concerned, the billets may be placed thereon by means of a fork truck (not shown) or the like, or if desired, the billets may be received from the discharge end of a steel mill charge table, a suitable billet transfer arm of the type which is shown and described in the aforementioned copending patent application Ser. No. 868,998 being employed to effect successive transfer of the billets from the charge table to the units **12**. Irrespective, however, of the particular manner in which the billets are operatively loaded or positioned on the manipulating units **12** of the apparatus **10**, the mode of operation of such units remains substantially the same.

Inasmuch as the two illustrated manipulating units **12** are identical in construction, a description of one of them will suffice for them both. Each billet manipulating unit **12** involves in its general organization a framework or casing including a pair of side plates **20** which project upwardly from the base member **14** in spaced parallelism and between which there is provided a pair of billet manipulating arms **22** and **24**. The arm **22** functions largely as a billet lifting and supporting arm while the arm **24** functions largely as a billet clamping arm and, accordingly, these two arms will hereinafter be referred to, respectively, as the billet supporting arm and the billet clamping arm. As will be made clear subsequently, the billet clamping arm **24** also performs a billet-ejecting function at the end of one complete billet handling cycle of operation.

The two side plate **20** of the casing are substantially identical in construction, such plates being generally rectangular in outline and having their upper edge regions relieved with the two relief areas defining a composite billet-receiving trough **26**. The latter has regular and irregular side walls as will be described subsequently, and these cooperate with the manipulating arms **22** and **24** in a particular manner for billet supporting and tumbling purposes.

The billet supporting arm **22** is of a composite nature and is comprised of two parallel side pieces **28** (see FIG. 1) which have their proximate ends pivoted by means of respective horizontally extending pins **30** to the side plates **20**, the pins being disposed adjacent to the upper left-hand corners of these plates and substantially at the level of the upper open side of the trough **26**. The two side pieces **28** are secured together by means of a filler block **32** which extends across and between the distal ends thereof and may be welded in position. The clamping arm **24** is pivoted adjacent to its proximate end on a horizontally extending pin **34** which extends between the two side plates **20** and is disposed below the trough **26**.

The two side pieces **28** of the billet supporting arm **22** define therebetween, in effect, a longitudinal slot

36, and the distal end region of the billet clamping arm 24 projects into this slot and traverses the same during the various relative movements of which the two arms are capable. The outer or distal ends of the two side pieces 28 of the billet supporting arm 22 are provided with upwardly extending protuberances 38, the two protuberances, in combination with each other, defining a composite divided billet-clamping shoulder 40 which is designed for clamping cooperation with an opposed clamping shoulder 42, the latter being provided adjacent to the distal end of the clamping arm 24.

Immediately inwards of or below the clamping shoulder 42 on the clamping arm 24 there is provided a billet-supporting shoulder 44 and a slight distance inwards or below the latter shoulder there is provided a rounded, hump-like clamping protuberance 46(see FIG. 5) which is designed for cooperation with one of the walls of the billet-receiving trough 26 in clamping the billet B therebetween during certain portions of the billet-manipulating cycle as will be described presently.

Considering now the nature of the billet-receiving trough 26, it being recalled that this trough is of a composite nature and consists of identical relief areas in the upper edges of the two side plates 20, the trough is generally of V-shape configuration and includes a linearly straight, inwardly and downwardly inclined left-hand side wall 50 the slant angle of which with respect to a horizontal plane is on the order of 45°, and an irregularly shaped righthand side wall the lower portion 52 of which extends upwardly and outwardly from the bottom of the trough 26 at a slant angle on the order of 45° as best seen in FIGS. 1, 3 and 4. The upper end of the lower portion 52 of the right-hand side wall of the trough 26 meets with a horizontal billet-supporting ledge-like shoulder 54 which, in turn, meets with the lower end of a vertical portion 56, the latter being the upper portion of said right-hand side wall. As best seen in FIG. 2, the upper end of the vertical portion 56 meets with a horizontal ledge 58 and the latter meets with a downwardly slanting billet-discharge surface 60 having a slant angle on the order of 30°. This billet-discharge surface is provided along the upper edges of a pair of overhanging wing portions 62 which are associated with and form parts of the upper right-hand corners of the side plates 20.

It will be understood that the foregoing description of the shape of the trough 26 is based on a treatment of the trough as a composite unit which exists by reason of identical relief areas being formed in the upper edges or margins of the two side plates 20, the various trough portions 50, 52 and 56, as well as the ledge-like shoulder 54, the billet-supporting ledge 58 and the discharge surface 60, existing by reason of identical edge regions which are provided on the two side plates.

The billet supporting arm 22 is operable under the control of a cylinder and piston device 64, one end of which is pivotally mounted on a horizontally extending pin 66 which is carried by the side plates 20 of the casing and the other end of which is pivoted on a horizontally extending pin 68 which is carried by medial portions of the side pieces 28 of the composite billet supporting arm 22. The billet clamping arm 24 is similarly operable under the control of a cylinder and piston device 70 which is similarly secured to horizontally extending pins 72 and 74 on the side plates 20 and the arm 24, respectively. The two cylinder and piston devices 64 and 70 are disposed within the narrow space which exists between the two side plates 20, the device 64 being disposed above the device 70. Said cylinder and piston devices 64 and 70 preferably are hydraulically operated and are adapted to be selectively actuated under the control of a suitable arrangement of solenoid-actuated or other directional valves (not shown), such valves being included in the billet handling system (also not shown) with which the manipulating units 12 are associated.

In the operation of each manipulating unit prior to reception of the billet B within the trough 26 (see FIG. 2) the two manipulating arms 22 and 24 assume retracted positions wherein they lie substantially below the level of the trough with no portion thereof obstructing free entrance of a billet into said trough 26. Assuming now that the billet B has been deposited in the trough 26, either by the use of a suitable lift truck or by the use of a transfer arm in associated relation with a charge table, such billet will assume the completely seated position in which it is shown in FIG. 2 with the side *a* thereof facing upwards (see FIG. 1a) and the side *e* resting on the left-hand side wall 50 of the trough. It is to be noted at this point that because the schematic representation of the billet B in FIG. 1*a*, which, as previously stated, embodies lower case letter designations for the various sides and corner edges of the billet, is coupled with a directional arrow designation, the various sides and corner edges of the billet B in FIGS. 2 to 14, inclusive, are readily recognizeable simply by their positional relation to the arrow designation. Therefore, in these views, and in order to avoid needless letter-crowding in the drawings, lower case letter designations are applied only to such surfaces or corner edges of the billet as actually are undergoing grinding and, consequently, are in grinding contact with the grinding wheel G.

After the billet B has been deposited in the trough 26 as previously described in connection with FIG. 2, the cylinder and piston device 70 is actuated to swing the billet supporting arm 22 in a counterclockwise direction and thus raise the billet B to the position wherein it is shown in FIG. 3 with its side *a* presented upwardly and with its side *c* directly opposing the now vertical billet-clamping shoulder 40 which is formed on the protuberances 38. After this operation, the cylinder and piston device 62 is actuated to swing the billet clamping arm 24 in a clockwise direction and, in so moving, it pushes the billet B against the shoulder 40 as shown in FIG. 4 so that the billet is securely clamped between the clamping shoulders 40 and 42 of the arms 22 and 24 and in a fixed grinding position wherein the side *a* of the billet B is presented to the grinding wheel G.

After the side *a* of the billet B has been properly conditioned by the grinding wheel G, the billet supporting arm 22 and the billet clamping arm 24 are both swung toward their respective retracted positions in order to release the billet B which, because of the fact that the corner edge *d* at this time overhangs the ledge-like shoulder 54, then tumbles, so to speak, in a counterclockwise direction and falls to the stable position wherein it is shown in FIG. 5 with the corner edge *b* presented upwardly to the grinding wheel G for grind-

ing of such edge. Although the billet B at this time is supported on the narrow side *g* thereof, with this side moreover resting on an inclined surface of the billet supporting arm **22**, the stability of the billet B is appreciable since the side *e* of the billet rests against the wing portions **62**, while the corner edge *h* bears against the billet clamping arm **24** which assumes an intermediate position.

After the corner edge *b* has been conditioned by grinding thereof with the grinding wheel G, the billet clamping arm **24** is actuated so that it swings in a clockwise direction and causes the billet B to assume the position wherein it is shown in FIG. **6** with the sides *e* and *a* clamped against and between the upper vertical portion **56** of the right-hand side of the trough **26** and the hump-like protuberance **46** of the billet clamping arm **24**, and with the corner *f* of the billet seated on the ledge-like shoulder **54**. In this position, the billet B is securely clamped for surface grinding of the side *c*.

Progression of the billet B from the position in which it is shown in FIG. **6** to the unclamped but stable position in which it is shown in FIG. **7** for grinding of the corner edge *d* is effected by causing both arms **22** and **24** to be returned to their fully retracted positions in order to release the billet B, whereupon the billet will undergo a counterclockwise tumbling operation by reason of the fact that its corner edge *f*, at the time of billet release, rests on the ledge-like shoulder **54**, thereby rendering the billet unstable. The billet B will come to rest with its side *a* supported on the left-hand side wall **50** of the trough **26** and its corner edge *d* presented upwardly for grinding purposes. The necessary stability of the billet B for grinding of the corner edge *d* is attained by reason of the fact that the corner edge *h* of the billet is seated in the extreme bottom of the trough **26** between the juncture of the left-hand side **50** and the lower portion **52** of the right-hand trough side.

After the corner edge *d* has been conditioned by subjecting it to the action of the grinding wheel G, movement of the billet to the position shown in FIG. **8** for surface grinding of the side *e* is effected by causing the billet supporting arm **22** to be raised to a substantially horizontal position while at the same time causing the billet clamping arm **24** to be swing in a clockwise direction, thus raising the billet B and causing the sides *g* and *c* to be clamped between the vertical upper portion **56** of the right-hand side of the trough **26** and hump-like protuberance **46** of the billet clamping arm **24**, the corner *h* of the billet now overlying the ledge-like shoulder **54** of the trough **26** and the corner edge *b* overlying the billet-supporting shoulder **44** on the billet clamping arm **22**.

The billet manipulations which take place under the control of the manipulating arms **22** and **24** in shifting the billet B from the position shown in FIG. **8** to the position shown in FIG. **9** in order to present the corner edge *f* to the grinding wheel G are substantially the same as those previously described in connection with FIGS. **4** and **5**, the billet B tumbling from the ledge-like shoulder **54** in a counterclockwise direction as soon as the billet supporting arm **22** is lowered and the billet coming to rest with its sides *c* and *a* bearing against the supporting arm **22** and the inner upper corners overhanging wing portions **62**. This position of the billet B which is illustrated in FIG. **9** is sufficiently stable to enable the corner edge *f* to be operated upon or conditioned by the grinding wheel G.

The manipulations of the arms **22** and **24** necessary to bring the billet B from the position of FIG. **9** to the position of FIG. **10** for grinding of the side *g* are substantially the same as those described in connection with FIGS. **5** and **6**, the billet clamping arm **24** swinging in a clockwise direction and causing the sides *e* and *a* of the billet to be clamped between the hump-like protuberance **46** and the vertical portion **56** of the right-hand side of the trough **26** with the corner edge *b* of the billet overlying the ledge-like shoulder **54**.

Similarly, the manipulations which are required to shift the billet B from the position of FIG. **10** to the position of FIG. **11** for grinding of the corner edge *h* are the same as illustrated and described in connection with the disclosures of FIGS. **6** and **7**, retraction of the billet clamping arm **24** serving to cause the billet B to tumble in a counterclockwise direction from the ledge-like shoulder **54** to a position wherein the side *e* of the billet rests on the left-hand side **50** of the trough **26** and the corner edge *d* is seated at the extreme bottom of the trough **26** between the left-hand trough side **50** and the lower portion **52** of the right-hand trough side.

After the corner edge *h* has been conditioned by proper use of the grinding wheel G, the billet B is ready for ejection and, accordingly, the billet supporting arm **22** is raised by swinging the same in a counterclockwise direction until it assumes the position wherein it is shown in FIG. **12**. In such position of the arm **22**, the billet B is raised to a level slightly above that of the horizontal ledge **58**, after which the billet clamping arm **24** swings in a clockwise direction as indicated in both FIGS. **12** and **13**, thus sliding the billet B over and past the ledge **58** until it moves onto the inclined billet-discharge surface **60** of the wing portions **62** as shown in FIG. **14**, from whence it may be discharged by gravity onto a conveyor or the like.

It will be understood that although, in the foregoing description, the operation of the billet manipulating apparatus **10** and its associated manipulating units **12** has been set forth to illustrate the manipulating functions which take place in presenting all four sides and all four corners of the billet B to the grinding wheel G, it is not frequent that every position described will result in a grinding operation. Rarely does a billet require edge grinding and, more often than not, there will be no pause in the movement of the manipulating arms **22** and **24** as they pass through the positions shown in FIGS. **5, 7, 9** and **11**.

The invention is not to be limited to the exact arrangement of parts shown in the accompanying drawings or described in this specification as various changes in the details of construction may be resorted to without departing from the spirit or scope of the invention. Therefore, only insofar as the invention is particularly pointed out in the accompanying claims is the same to be limited.

Having thus described the invention what I claim as new and desire to secure by letters patent is:

1. A billet manipulating unit for supporting and imparting increments of rotational movement to an elongated steel billet or the like which is of elongated rectangular shape in transverse cross section, said unit

comprising a casing defining an upwardly presented generally Veshaped trough having downwardly and inwardly sloping sides, one of said sides being interrupted by a horizontal ledge-like shoulder and a vertical clamping portion immediately thereabove, a linearly straight billet supporting arm pivoted at its proximate end to said casing at a region adjacent to the upper region of said trough for swinging movement about a horizontal axis which is disposed adjacent to the uppermost level of the trough, a linearly straight billet clamping arm pivoted at its proximate end to said casing at a region below the lowermost level of said trough for swinging movement about a horizontal axis, said billet-supporting arm being provided with a longitudinally extending slot therein and said billet clamping arm normally projecting through said slot, said arms being individually movable between normally retracted positions wherein they underlie the trough and actuated advanced positions wherein they intersect the trough, said billet supporting arm being operable upon actuating thereof to engage and raise the billet in the trough to a level slightly above the level of said horizontal shoulder, said billet clamping arm being operable upon actuation thereof to engage the thus raised billet and clamp the same in a grinding position against said vertical clamping portion of said one side of the trough above said ledge-like shoulder, and means for selectively actuating said arms , said means comprising a cylinder and plunger device for each arm, each device having one end pivotally connected to its respective arm at a point medially of its ends, and having its other end pivoted to the casing at a point below the level of the said trough.

2. A billet manipulating unit for supporting and imparting increments of rotational movement to an elongated steel billet or the like which is of elongated rectangular shape in transverse cross section so as to present broad and narrow sides, said unit comprising a casing defining an upwardly presented generally V-shaped trough at its upper end for reception of the billet, said trough having downwardly and inwardly sloping sides, one of said sides being interrupted by a horizontal ledge-like shoulder and a vertical clamping portion immediately thereabove, a billet supporting arm pivoted to said casing for swinging movement about a horizontal axis which is disposed adjacent to the uppermost level of the trough, a clamping protuberance on the distal end of said supporting arm, a billet clamping arm pivoted to said casing for swinging movement about a horizontal axis which is disposed below the lowermost level of the trough, said arms being individually movable between normally retracted positions wherein they underlie the trough and fully actuated advanced positions wherein they intersect the trough, said billet supporting arm being operable upon a first full actuation to engage and raise a billet above the level of said trough, said clamping arm being operable upon a first actuation to engage the thus raised billet and slide the same on said supporting arm and against said protuberance in a first clamped broad side grinding position with a corner edge region of the billet overlying an edge of the trough, said arms being effective upon partial retraction thereof to cause the billet to fall by gravity from said trough edge into said trough and rest on said supporting arm and against the clamping arm in a second and corner edge grinding position, said clamping arm being operable upon a second actuation to engage the thus supported billet and project the same to a third clamped narrow side grinding position against said vertical clamping portion with a corner edge region of the billet overlying said horizontal ledge-like shoulder, said arms being effective upon full retraction thereof to cause the billet to fall by gravity from said ledge-like shoulder into the bottom region of the trough and against the other inwardly sloping trough side in a fourth grinding position.

3. A billet manipulating unit as set forth in claim 2 and wherein said clamping arm is provided at its distal end with a flat billet clamping shoulder which is engageable with the billet when the latter is in its first and broad side clamped grinding position, and a hump-like clamping protuberance immediately below said latter clamping shoulder which is engageable with a broad side of the billet when the latter is in its third and narrow side clamped grinding position.

4. A billet manipulating unit as set forth in claim 3 and wherein said clamping arm is provided with a ledge-like billet supporting shoulder immediately above said hump-like protuberance and immediately below said latter clamping shoulder.

5. A billet manipulating unit as set forth in claim 4 and wherein said casing includes a pair of vertically disposed side plates between which said arms are disposed, one of said arms is formed with a longitudinal slot therein, and the other arm projects through and is operable in said slot.

6. A billet manipulating unit as set forth in claim 5 and wherein said slot is provided in the billet supporting arm.

7. A billet manipulating unit as set forth in claim 6 and wherein when the billet is in its broad side clamping position and the billet supporting arm is thereafter retracted and the billet clamping arm is fully actuated, the flat billet clamping shoulder at the distal end thereof impels the billet by a sliding action completely over said edge of the trough to a region of discharge.

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