April 3, 1962 L. PÉRAS 3,028,021

PIECE-TURNING DEVICES

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Fig. 1

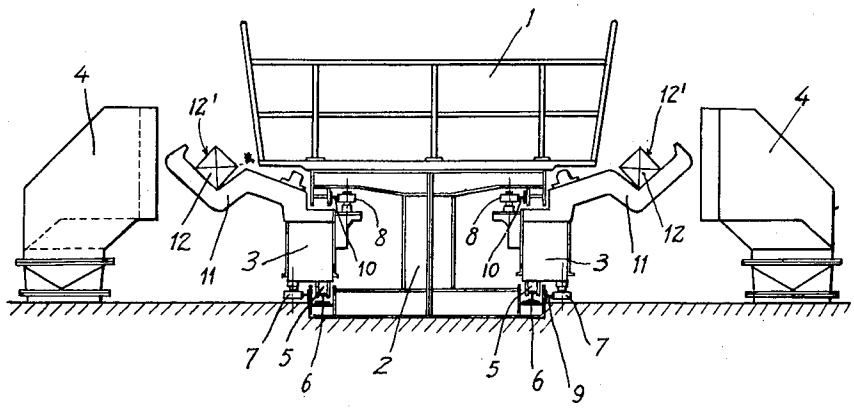
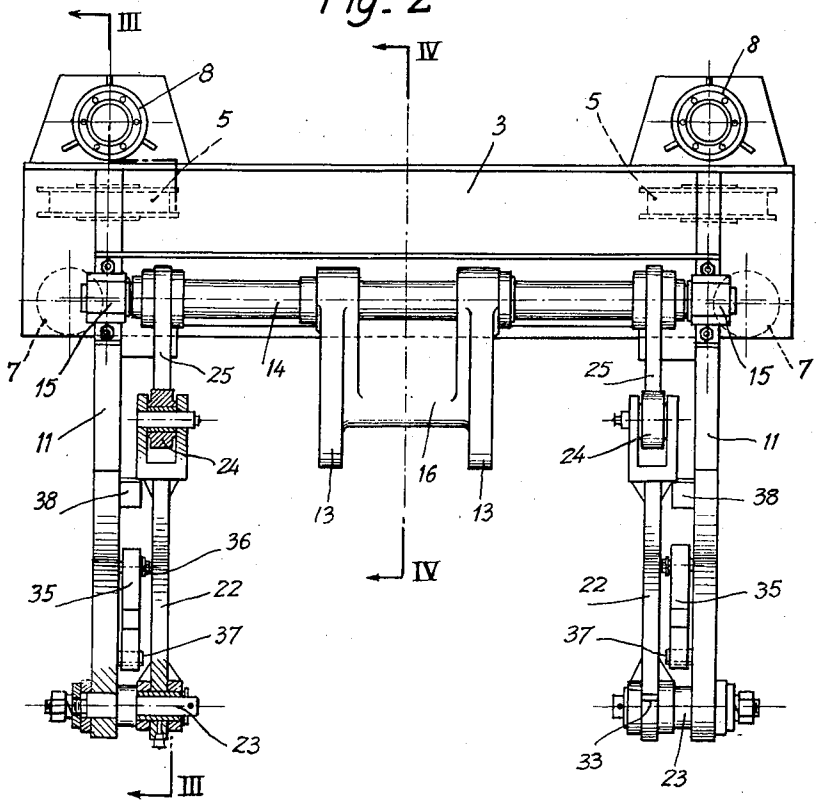


Fig. 2



INVENTOR
Lucien Péras
By Stevens, Davis, Miller & Mosher
ATTORNEYS

April 3, 1962 L. PÉRAS 3,028,021

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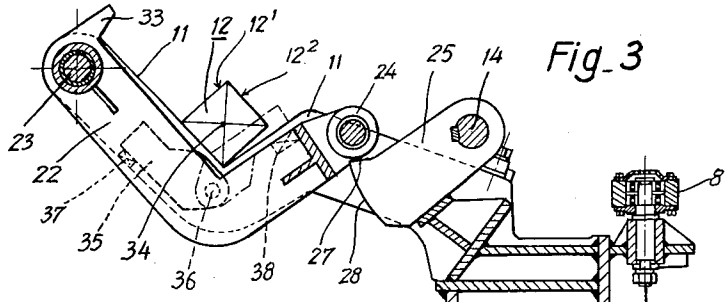


Fig. 3

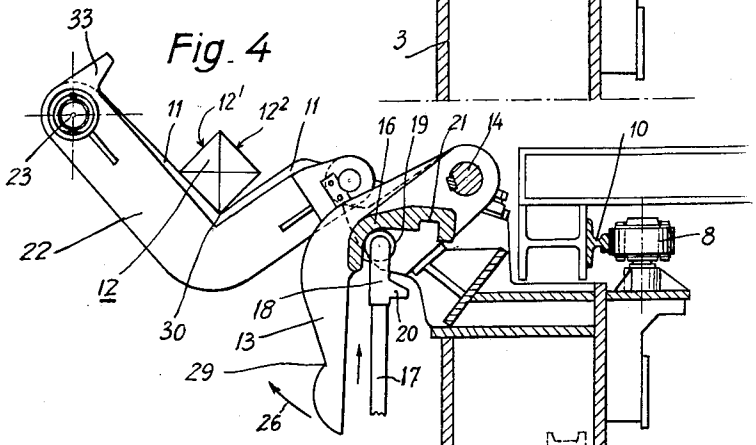


Fig. 4

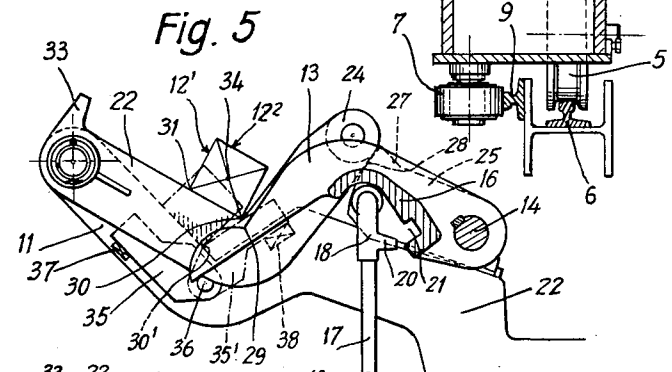


Fig. 5

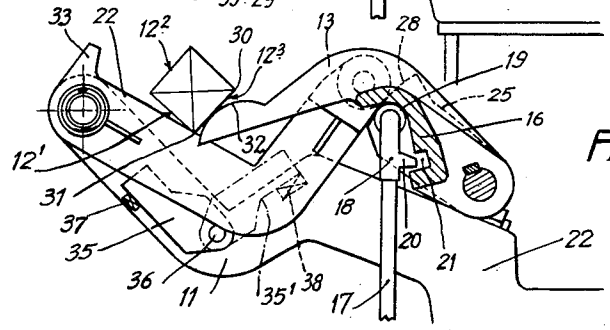


Fig. 6

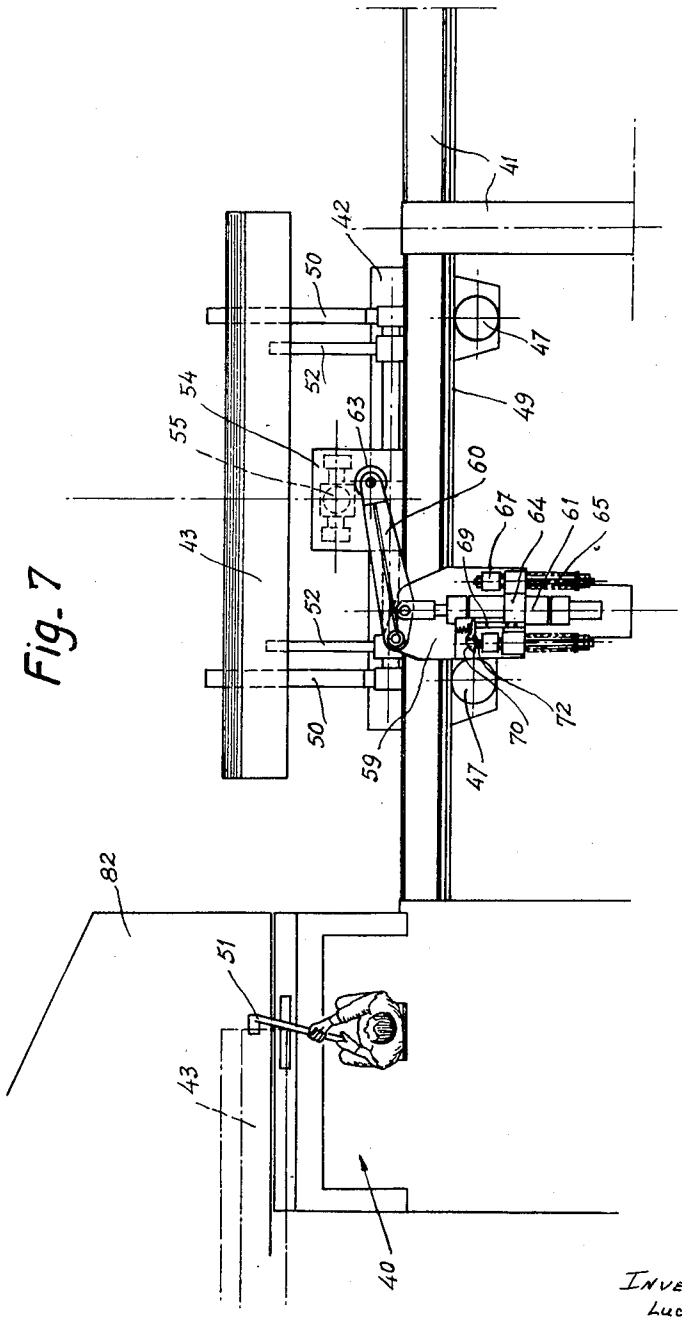
INVENTOR
Lucien Péras
By Steinmeyer, Davis, Hall & Mueller
ATTORNEYS

April 3, 1962 L. PÉRAS 3,028,021

PIECE-TURNING DEVICES

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Fig. 7



INVENTOR
Lucien Péras
By Adams, Davis, Muller & Janeway
ATTORNEYS

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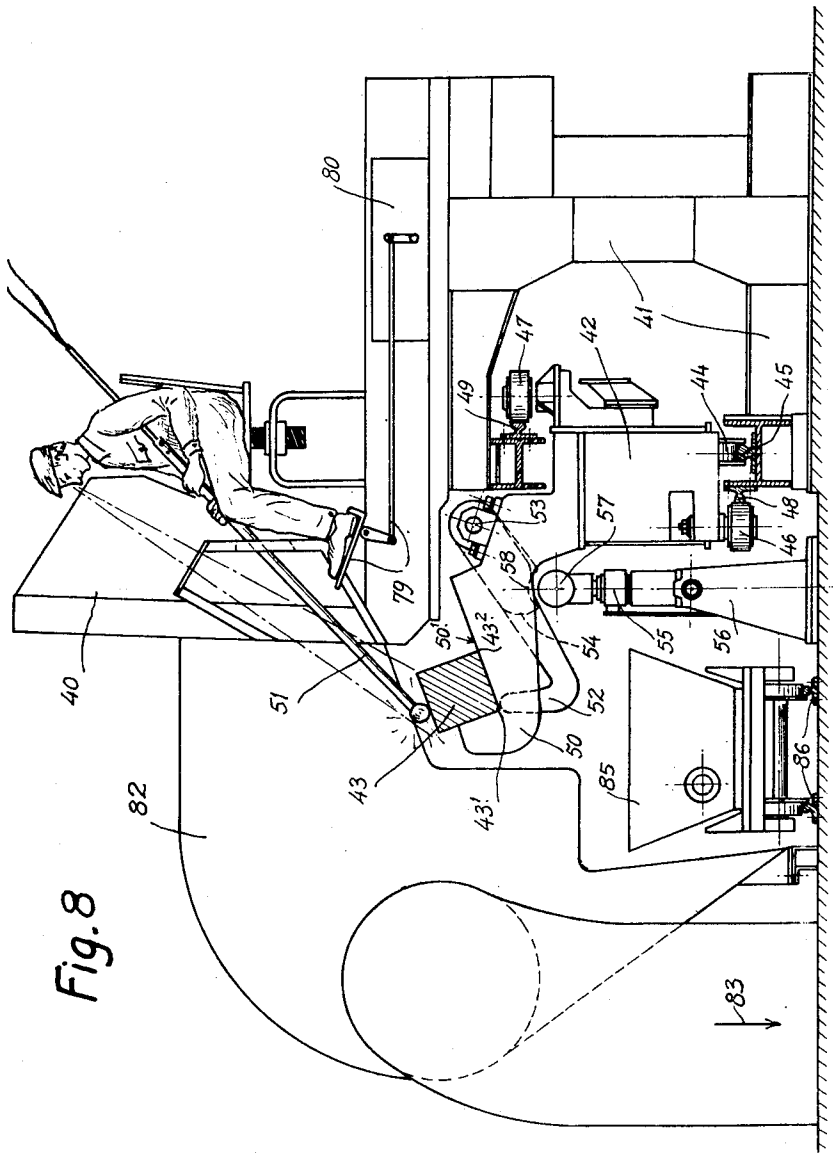


Fig. 8

INVENTOR
Lucien Péras
By Stevens, Davis, Miller & Mosher
ATTORNEYS

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PIECE-TURNING DEVICES

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Fig. 10

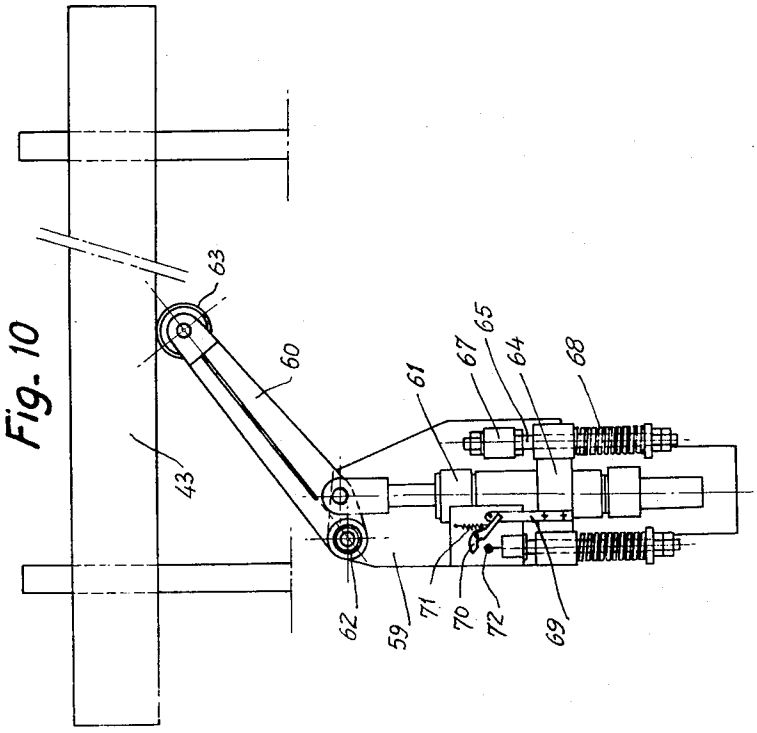
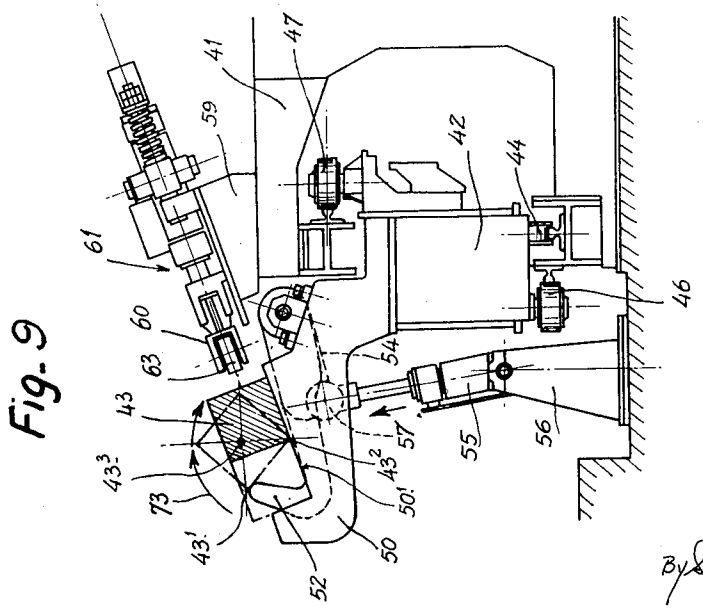


Fig. 9



INVENTOR
Lucien Péras
By Steward, Davis, Miller & Woodard
ATTORNEYS

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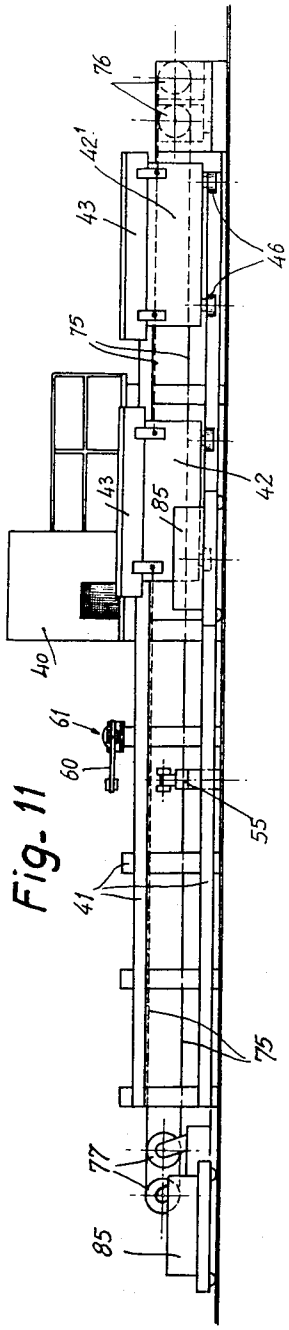


Fig. 11

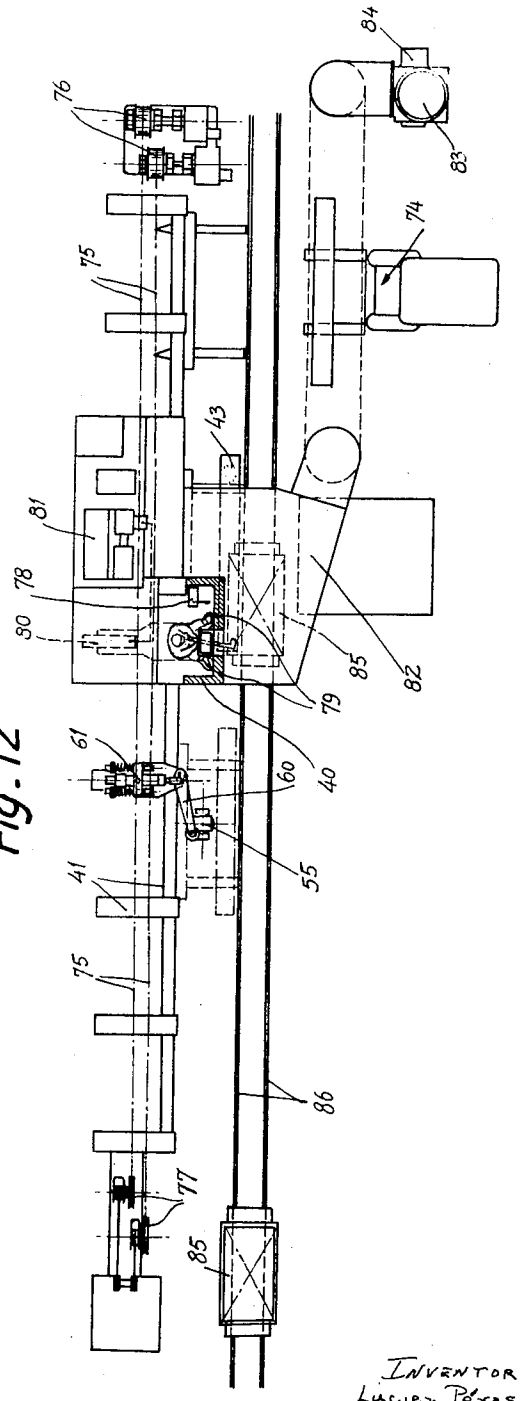


Fig. 12

INVENTOR
Lucien Péras
By Steward, Davis, Miller & Thrasher
ATTORNEYS

United States Patent Office

3,028,021
Patented Apr. 3, 1962

3,028,021

PIECE-TURNING DEVICES

Lucien Péras, Billancourt, France, assignor to Societe des Aciers Fins de l'Est, Billancourt, France

Filed June 4, 1958, Ser. No. 739,914
Claims priority, application France June 7, 1957
2 Claims. (Cl. 214—1)

This invention is concerned with a device for turning pieces, especially parallelepipedic pieces which are to be turned over on the spot in view of presenting successively a plurality of their longitudinal faces on which one or more operations requiring this specific handling are to be effected.

A typical industrial example of this requirement is the cleaning of metal pieces, such as the removal of cracks and chips from semi-products, ingots or the like, which is carried out with the assistance of a so-called "crack-suppressing" blow-pipe on the different faces of the pieces.

According to a specific feature of this invention the piece-turning device comprises on the one hand at least two bent supporting arms having their vertex pointing downwards so that the piece to be treated may rest in the hollow or bottom thereof, and on the other hand, between these arms, a pivoted turning lever actuated by a suitable device for causing at will the tilting and turning of the piece, said lever being arranged to lift the edge of the piece which is positioned in the bottom of the bent arms and bearing against one of the faces adjacent to said edge so as to cause the piece to pivot about the other edge of this bearing face.

According to a typical form of embodiment of the invention, the inclination of the sides of the bent arms on which the piece is turned is such that this piece will slide by gravity on these arms and thus resume automatically its position in the bottom of the bent arms upon completion of the piece-turning movement.

According to this form of embodiment and if for any reason such as the weight of the piece or its orientation in view of the treatment to be carried out one is led to give a steep inclination to the sliding faces of the inclined arms, or an account of the shape of the piece, a predetermined shifting of the center of gravity of the piece is provided in the direction to promote the turning movement. To this end, auxiliary bent arms are pivoted on the end of the fixed arms on the side thereof where the piece is to be turned, the turning lever being pivoted on the other end of the bent arms, and said auxiliary arms are operatively connected, at least partially, to this lifting movement, through the medium of adequate cam members so as to temporarily take over the weight of the piece by altering its orientation in the proper direction.

This arrangement is also advantageous when a predetermined positioning of the pieces is required in the bottom of the fixed bent arms with the assistance of blocks having the purpose of displacing the lower edges of these pieces along said arms, said pivoted auxiliary arms being also adapted to take over the weight of the piece in view of bringing the lower edge thereof to a suitable point of engagement with the turning lever.

According to a further form of embodiment of this invention, the sides of the bent arms on which the piece is turned have an inclination such that the piece is normally oriented in a manner adapted to promote the turning or pivoting movement thereof (that is with its centre of gravity located definitely between the verticals passing through the point of engagement of the lever and the edge on which the piece is pivoted), an auxiliary pushing member being provided at the turning station for restoring the piece in position after the turning movement, by causing the piece to slide on the supporting arms. Then the turning movement is effected advantageously on the side of the supporting arms where the turning lever is pivoted so that, considering the dimensions and the amplitude of the movement to be accomplished by this lever, particularly reduced over-all dimensions can be obtained as far as the supporting arm and lever assembly is concerned. Similarly, the thrust device may be placed on the side of the installation where the piece-turning lever is located, the other side being kept free for bringing and removing the pieces.

This invention is also concerned, as will be made clear presently, with the application of the device broadly set forth hereinabove to the construction of an installation for removing cracks and chips from ingots by means of blow-pipes or the like.

A few forms of embodiment of the device for turning pieces according to this invention will be described hereafter by way of example with reference to the accompanying drawings forming part of this invention. In the drawings:

FIGURE 1 is an elevational view showing a crack-removing station;

FIGURE 2 is a plane view from above showing one of the ingot-supporting carriages of FIG. 1, equipped with a piece-turning device according to this invention;

FIGURES 3 and 4 are sectional views of the device of FIG. 2, taken along the lines III—III and IV—IV of this figure respectively;

FIGURES 5 and 6 are views similar to FIG. 4 which show two successive steps of an ingot turning operation;

FIGURE 7 is a plane view from above showing an installation utilizing another form of embodiment of the turning device according to this invention;

FIGURE 8 is an elevational side view of the preceding installation at the level of the working station;

FIGURE 9 is a side view of the turning device during one phase of its operation;

FIGURE 10 is a plane view from above showing the thrust device for replacing the piece after the turning operation, this device being shown during one phase of its operation;

FIGURE 11 is an elevational view of a crack-removing installation provided at the working station, and

FIGURE 12 is a plane view of the installation of FIG. 11.

A brief description of the crack-removing installation shown in FIG. 1 will afford a clearer understanding of the various functions of the turning device provided therein. It differs from certain known installations of this character, wherein a working cab or the like travels relative to the pieces to be treated. This cab equipped with a blow-pipe carries the operator to protect him; furthermore, it must be connected to a great number of sources of fluids or power, and its displacement along the pieces is characterized by many drawbacks. The fact that the cab is fixed in the arrangement of this invention affords a greater accuracy in the accomplishment of the work and facilitates the task of the operator who is thus able to handle the blow-pipe without difficulty, inasmuch as the weight of the blow-pipe is compensated by a spring or the like. The backward movement of the blow-pipe as a consequence of the reaction produced by the oxygen jet is absorbed by a suitable support. This characteristic permits the use of large-sized blow-pipes of a type hitherto considered as unusual.

In the installation illustrated, on the contrary, the cab 1 is fixedly mounted on the frame 2, the latter constituting, as shown in the drawings, a runway for one or more movable carriages 3 provided for displacing the pieces in front of the operators; in the embodiment illustrated, two working stations are provided. Registering with each

working station are hoods 4 for exhausting smokes and sparks. Each carriage 3 is provided with three types of rollers: one pair of main rollers 5 engage rails 6 and support the weight of the carriage, and two pairs of guide rollers 7, 8 engage side races 9, 10 respectively for guiding purposes.

On the frame of each carriage are secured a pair of bent arms 11 adapted to receive in their bottom the ingot 12 to be treated so that the operator may direct the jet of the crack-removing blow-pipe tangentially against the face 12^1 of the piece as the carriage driven from any suitable means causes the ingot to move past the operator.

In this form of embodiment, the turning device for successively treating all the faces of the ingot is carried by the carriage arms 11.

The device illustrated in details in FIGS. 2 to 4 comprises a two-armed turning lever; each arm 13 of this lever has the contour shown in FIG. 4; the lever is keyed on a shaft 14 journalled at 15 on the arms 11 of the carriage. Between the two arms of this lever is a cam portion 16 having a contour suitable for lifting the lever under the influence of a vertically movable push-rod 17 having its lower end connected to a suitable driving member (not shown) such as a fluid-actuated cylinder or a rack-and-pinion device. This push-rod 17 carries at its upper end a yoke 18 provided with a roller 19 co-acting with the aforesaid cam member 16, as well as a heel 20 co-acting a correspondingly shaped notch 21 formed in this cam member under the operating conditions to be set forth presently.

The device comprises in addition a pair of auxiliary bent arms 22, pivoted at 23 on the free ends of the fixed supporting arms 11. The free ends of these auxiliary arms are each provided with followers 24 engaging cam faces formed on members 25 as shown in FIGS. 2 and 4; in these figures it is apparent that when the device is inoperative these arms 22 are slightly retracted relative to the fixed arms 11 supporting the ingots 12.

Under certain conditions, the movements of these auxiliary arms 22 are operatively connected to those of the turning lever 13 through the medium of cam members 25 keyed on the same shaft 14.

The device so far described operates as follows:

When the carriage has moved the ingot 12 under such conditions as to enable the operator to treat the face 12^1, the turning device will become operative to present the next face 12^2 to the treating flame issuing from the blow-pipe.

To this end the operator actuates the mechanism controlling the push-rod 17 which rises and therefore pushes the cam member 16, thereby rotating the turning lever 13 in the direction of the arrow 26 (FIG. 4). During this movement followed by the cams 25 the latter will firstly lift the auxiliary arms 22 to a certain extent until the followers 24 associated therewith pass from contour 27 to contour 28 of these cams (see FIGS. 3 and 5). The auxiliary arms 22 are now supporting the ingot 12 and it is clear that when the push-rod 17 continues its upward movement these arms 22 will remain stationary in the position shown in FIG. 5 due to the circular contour of cams 25.

During its rotation the turning lever 13 engages with the cavity 29 of its contour the lower edge 30 of the ingot and the latter is thus lifted and caused to rotate about its longitudinal edge 31 before tilting completely due to the thrust exerted by the suitably shaped extension 32 of lever 13 (see FIG. 6).

Upon completion of the turning movement imparted to the ingot, it is sufficient to allow the push-rod 17 to move downward for causing all the component elements of the mechanism to resume their initial position by gravity and also under the influence of the weight of the ingot, the latter sliding back to the bottom of the main supporting arms 11.

It will be noted that at the end of the upward stroke of the push-rod 17 the heel 20 engages the notch 21 formed in cam member 16 for the dual purpose of limiting the upward stroke of push-rod 17 and of acting as a safety device becoming effective when the component elements of the apparatus fall back to their initial positions. In fact, during the downward movement of push-rod 17 the heel 20 engaged in the notch 21 will automatically cause the cams 25 to move downwards, thus preventing any jamming of the cams and followers carried by the auxiliary arms 22 from taking place, as these arms are urged downwards by their weight and that of the ingot.

The auxiliary arms are also formed with a projection 33 adapted to stop the ingot in case it were thrown too far during the turning movement, for example if the latter were too fast.

Finally, it will be noted that the arrangement of the auxiliary arms 22 are adapted to meet a twofold requirement, as already indicated hereinabove.

In the example illustrated and considering the inclination of the stationary bent supporting arms 11 the auxiliary arms 22 will alter the setting of the ingot as they take it over from the main supporting arms 11, thereby shifting the centre of gravity 34 of the ingot relative to its edge responsive to the action of the turning lever 13 and in a direction adapted to promote or permit the desired turning movement, as will clearly appear from a comparison between FIGURES 3 and 5 of the drawings.

This arrangement is also advantageous, according to circumstances and, in this specific case, to the ingot size, in that it permits a predetermined setting or positioning of the ingots on the supporting arms 11 with the assistance of movable blocks such as 35 carried by these arms. In FIGS. 2 to 4 these two blocks are shown as being pivoted at 36 and in their retracted position relative to the main arms 11 when the blocks engage the stops 37, thus allowing the ingot to position itself in the bottom of the bent arms 11. In FIGS. 5 and 6, it will be seen that if these blocks were in position 35^1 shown in chain-dotted lines so as to be each supported by a stop 38 they would alter the position of the ingot by displacing its lowermost edge, for example the edge 30 would move to 30^1 assuming that the auxiliary arms are in their lowermost position (FIG. 5).

The disposition suggested in this figure proves that in this normal and modified position of the ingot the auxiliary arms 22, by taking over the ingot, bring the edge 30^1 to position 30 such that the hollow 29 of the turning lever 13 will actually contact this edge. Then the ingot is turned under the conditions already set forth, and it is clear that this would not be possible if these auxiliary arms were not provided.

Another possible arrangement of the piece-turning device according to this invention as well as its application to a crack- or chip-removing installation similar to the preceding one are described hereafter with reference to FIGS. 7 to 12 of the attached drawings.

Referring notably to FIGS. 7 and 8, the reference numeral 40 denotes the operator's cab at the crack-removing station with the usual protection means, this cab being disposed on the frame 41 of the installation which extends transversely to the cab and constitutes a kind of railway for at least one carriage 42 adapted to support ingots such as 43 and to constitute by itself one component element of the piece-turning device.

This carriage 42 is supported by vertical rollers 44 rolling on a rail 45; it is also guided by horizontal rollers 46, 47, engaging lower and upper side rails 48, 49. At its upper portion the carriage is provided with a pair of ingot supporting arms 50 mounted in overhanging relationship and constituting a first element of the turning device. These arms are bent and adapted to receive each ingot 43 to be treated in their hollow and in such position that at each stroke the operator may direct the jet of his blow-pipe 51 substantially at right angles to the upper face of the ingot to be cleaned, the turning

device being designed in view of successively treating all the longitudinal faces of the ingot.

In this form of embodiment, the turning movement is effected by causing the ingot to tilt inwards of the bent supporting arms, that is on the portion 50^1 thereof. To this end, the turning lever consisting in this case of two arms **52** is pivoted on a horizontal pin provided at the root of these supporting arms, in the form of a shaft **53** journalled thereon and having keyed on it the arms **52** and, therebetween, a turning lever **54** for the device actuating this pivoted assembly consisting in this case of a fluid-actuated cylinder **55**. In the inoperative position the free ends of the arms **52** of the turning lever are positioned beneath the lower face of the ingot resting on the inner portion 50^1 of the supporting arms and in the vicinity of the lower edge 43^1 of the ingot. These arms **52** are also bent to prevent them, when they are lifted to tilt the ingot about the other edge 43^2 of the face on which the lever is caused to bear, from engaging this last-mentioned face.

It will be seen that the inclination of the lower portion 50^1 of the supporting arms is such that the centre of gravity 43^3 of the ingot when the latter is properly positioned, lies between the verticals passing through the lifting edge 43^1 (or point of engagement of the lever) and also through the tilting edge 43^2, these conditions ensuring the proper accomplishment of the turning operation.

The control cylinder **55** is mounted permanently at the turning station provided in the vicinity of the working station as shown in FIG. 7, and is also pivotally mounted on a base **56** allowing same to tilt during the turning operation, although it is normally urged to a vertical position.

In fact, it is apparent that the bearing heads **57** of the movable member of this cylinder are adapted to position themselves, during the operation, in recesses **58** formed in the turning lever **54**.

Also mounted on the frame structure at the turning station is the pushing device for restoring the ingot to its proper position.

This device comprises a push-lever **60** and a cylinder **61** for actuating same, this assembly being mounted on a support **59** secured to the frame structure with an inclination corresponding to that of the portion 50^1 of the supporting arms **50**.

The lever **60** is adapted to oscillate transversely to the longitudinal dimension of the ingot, one of its ends being pivoted at **62** on the support **59**, the other end being provided with a push roller **63**, whilst the movable member of the fluid-actuated cylinder **61** is connected between these two points in the vicinity of the joint **62**.

To obtain an automatic operation of the pushing device proper, the cylinder **61** is mounted with a certain axial mobility by providing a sliding strap **64** adapted to slide in guide members **65** secured on the support **59**. The cylinder is urged in its thrust direction to an inoperative position in which the slideways **64** engage stop members **67** consisting of the fastening members provided for securing the guide members **65** under the influence of springs **68** mounted on said guide members. These springs are pre-compressed so as to constitute a stationary bearing point for the cylinder within the limit of the normal thrust efforts required for restoring the ingot in position.

Moreover, the cylinder **61** thus adapted to recede against the force of springs **68** carries a rod **69** adapted to actuate a pivot lever **70** urged by a spring **71** for controlling a switch **72**, the latter as well as the lever **70** being mounted on the support **59**.

The piece-turning device described hereinabove operates as follows:

The operator controls the to-and-fro movement of the carriage supporting the ingot and after having cleaned with his blow-torch the upper face of the ingot **43** with several strokes as required, causes the carriage to move to the turning station. Due to the operation of the control cylinder **55** the bearing heads **57** thereof push the turning lever **54** upwards, thus causing the two-armed turning lever **52** to rise. The arms of this lever **52** engage the lower face of the ingot **43** and cause the latter to revolve about the edge 43^2 in the direction **73** (FIG. 9) due to the arrangement of parts already described hereinabove. The ingot will thus tilt by itself after having overstepped the intermediate position shown in the figure. Then the cylinder **55** is retracted and the pivoted assembly constituting the turning lever moves downwards, the pushing device being actuated at the end of this step.

Due to the action of cylinder **61**, the push-lever **60** pushes the turned ingot back in the hollow or vertex of the supporting arms **50**. As the ingot engages this hollow the expansion movement of the cylinder continues and causes the cylinder body to recede and compress the springs **68**. After a certain backward movement of the cylinder body (see FIG. 10), the rod **69** actuates the lever **71** and consequently the switch **72** connected to control the supply of fluid to the cylinder but in the opposite direction, whereby this cylinder will be restored to its initial position and will restore by itself the push-lever **60** to its waiting or inoperative position.

Then the operator may cause the ingot-carriage to move back to the working station to clean the next face of the ingot.

It will be noted that the relative disposition of the component elements of this turning device is such that ingots of different sizes may be turned without any care whatsoever.

In fact, whatever the ingot size may be (within reasonable limits, of course) the free ends of arms **52** will always push the ingot in the vicinity of its lower edge more or less coincident with the apex of the supporting arms **50**, so that any thrust exerted at this point will always tend to tilt the ingot about the other edge of its lower bearing face.

Moreover, the mounting of the cylinder **61** of the pushing device, whereby this cylinder may move to a certain extent against the resistance of adjustable spring means, is such that the stroke of this cylinder may be adjusted automatically as a function of the ingot size while allowing for this cylinder a stroke amply sufficient for the purpose contemplated.

This last-mentioned disposition is also advantageous in that it makes it possible to protect the pushing device against possible damage in case it encountered an abnormal resistance.

This turning device arrangement is also convenient for a crack-removing station comprising two ingot-carriages and one turning station for one working station (see FIGS. 11 and 12).

The frame structure **41** on which two ingot-carriers **42**, 42^1 may roll has a length sufficient—with respect to the cab **40** of the crack-removing station—to permit the arrangement of a turning station as described hereinabove on one side of the cab, and on either side of these two stations, the putting of a carriage in a waiting position. In its waiting position each carriage may be loaded or unloaded, in this case by means of a fork lift truck as shown at **74**. The operator may optionally move one or the other of these carriages in either direction, and also cause them to travel through any desired range of speeds, even at very low speeds. To this end, each carriage is driven by means of a cable **75** connected thereto, this cable passing on the one hand over the pulley of a hydraulic gear-reduction power unit **76** mounted at one end of the frame structure and on the other hand over a return pulley **77** disposed at the opposite end thereof. The operator may select the carriage that he wishes to operate by actuating a control device **78** provided within easy reach of the operator in the cab for operating either of the hydraulic gear-reduction power units **76**.

The selected carriage may be operated in either direction through the medium of a set of two pedals **79** connected to a mechanical linkage box **80** controlling a hydraulic unit **81** actuating in turn the carriage in conjunction with the relevant reduction-gear power unit **76**.

In the surroundings of the working station the smokes are exhausted through a stationary hood **82** comprising a funnel **83** and a suction fan **84**.

The mounting of the ingot supporting arms in overhanging relationship to the carriage is advantageous in that the residues resulting from the action of the blowpipe may be collected in skips **85** displaceable on rails **86** under the ingot-carriages and parallel to the frame structure of the installation.

In this installation it is clear that when one of the carriages is in its waiting position at one end of the installation it may be unloaded and re-loaded thereat while the operator is removing the cracks from the ingot carried by the other carriage by causing the latter to travel from the working station to the turning station and subsequently transferring this carriage to the waiting position, upon completion of the ingot treatment, before resuming the operation of the other ingot-carriage.

Of course, the typical form of embodiment of the turning device of this invention which is described hereinabove and illustrated in the attached drawings should not be construed as limiting the purpose of the invention for it will readily occur to anybody conversant with the art that this arrangement is applicable to any installation requiring the handling of similar pieces without major modifications and without departing from the spirit and scope of the invention as set forth in the appended claims.

I claim:

1. An installation for surface conditioning an elongated metal workpiece of polygonal cross-section, for example, an ingot, said installation comprising a set of rails, at least one carriage mounted for movement along said rails, said carriage having cantilevered supporting arms adapted to carry a workpiece, means fixedly mounted at least in part adjacent a first position on said rails to turn over the workpiece carried by said supporting arms when said carriage is positioned on said rails in said first position, a cab fixedly mounted adjacent a second position along said rails remote from said first position and adapted to have scarfing operations performed therefrom by an operator on the workpiece carried by said supporting arms when said carriage is in said second position, and means to move said carriage along said rails, said means to turn said work piece over including a lever mounted on said carriage between said support arms extending from a pivot on said carriage in the same direction that said cantilevered support arms extend and adapted to turn over the work piece carried by said support arms when rotated about said pivot in a predetermined direction, wherein the part of said means to turn said work piece over fixedly mounted adjacent said first position comprises a jack adapted to engage said lever and rotate said lever in said predetermined direction when said carriage is in said first position, wherein the inner arm sections of said bent support arms are so inclined that the work piece carried by said support arms lies normally in a position facilitating the turning movement with its center of gravity placed between the verticals passing through the point of engagement of the lever with said work piece and the titling edge of said work piece, and wherein there is provided fixedly mounted adjacent said first position on said rails means to restore the work piece in position upon completion of the turning movement by causing the work piece to slide on the inner arm sections of said supporting arms.

2. An installation as recited in claim 1 wherein said means to restore the work piece comprises a push rod, a cylinder having its piston rod connected to actuate said push rod, a pre-compressed spring means constituting a fixed bearing point for said cylinder before said push rod attains the limit of the normal thrust efforts required for restoring the work piece, said cylinder having its body axially displaceable against the resistance of said pre-compressed spring means, said cylinder moving axially against the force of said pre-compressed spring means after the work piece is restored in position, and means including a switch adapted to be actuated when said cylinder moves axially to control the return of said push rod and said cylinder to their normal positions after the work piece has been restored in position.

References Cited in the file of this patent

UNITED STATES PATENTS

2,126,592	Walker	Aug. 9, 1938
2,361,222	McBride	Oct. 24, 1944
2,500,245	Doyle	Mar. 14, 1950
2,744,639	Evans	May 8, 1956
2,822,930	MacGregor	Feb. 11, 1958
2,918,180	Kendall	Dec. 22, 1959
2,959,304	Vial	Nov. 8, 1960

FOREIGN PATENTS

772,568	Great Britain	Apr. 17, 1957