No. 861,122. PATENTED JULY 23, 1907.

H. JOHN.

METAL CUTTING MACHINE.

APPLICATION FILED FEB. 14, 1907.

2 SHEETS—SHEET 1.

Fig. 1.

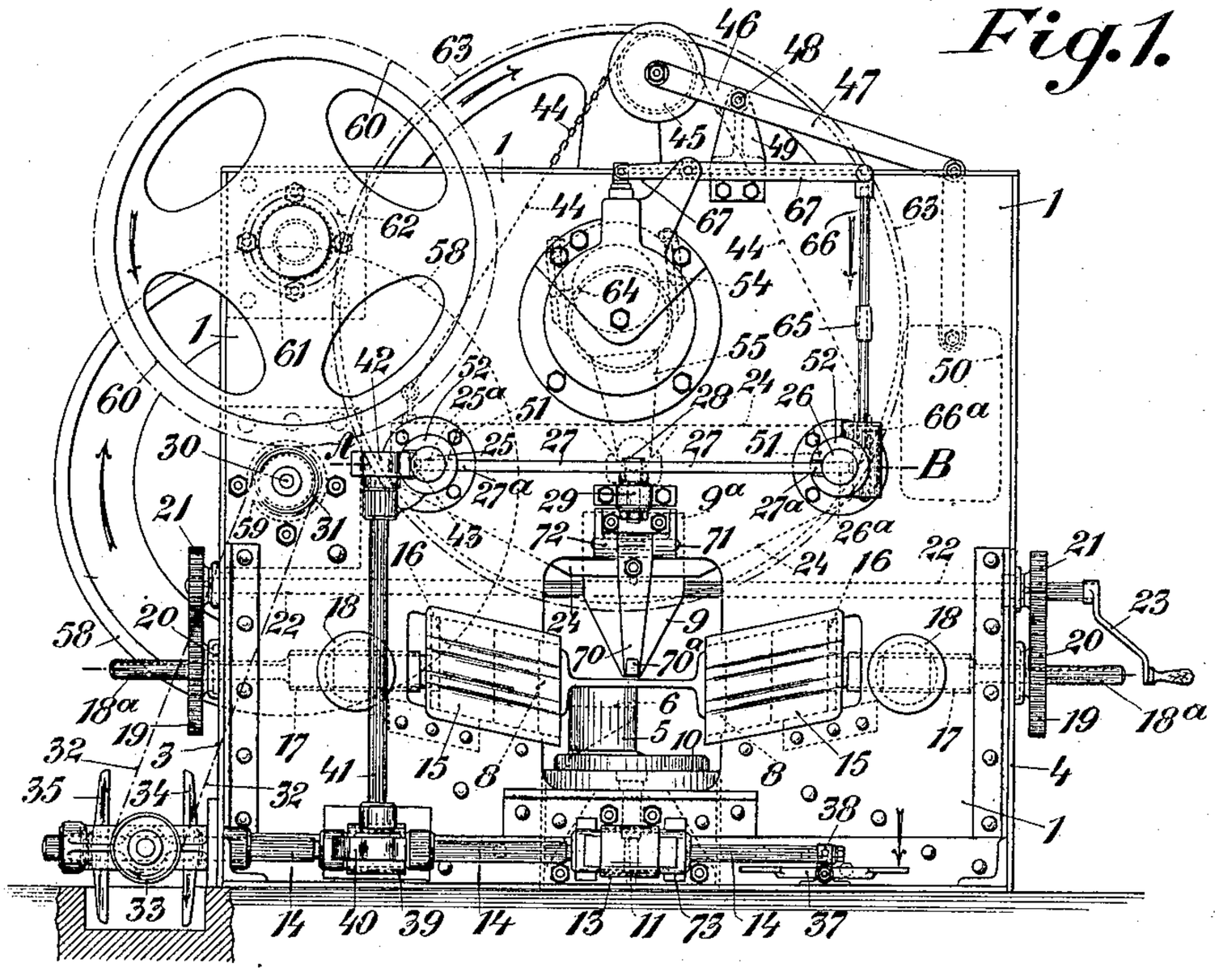
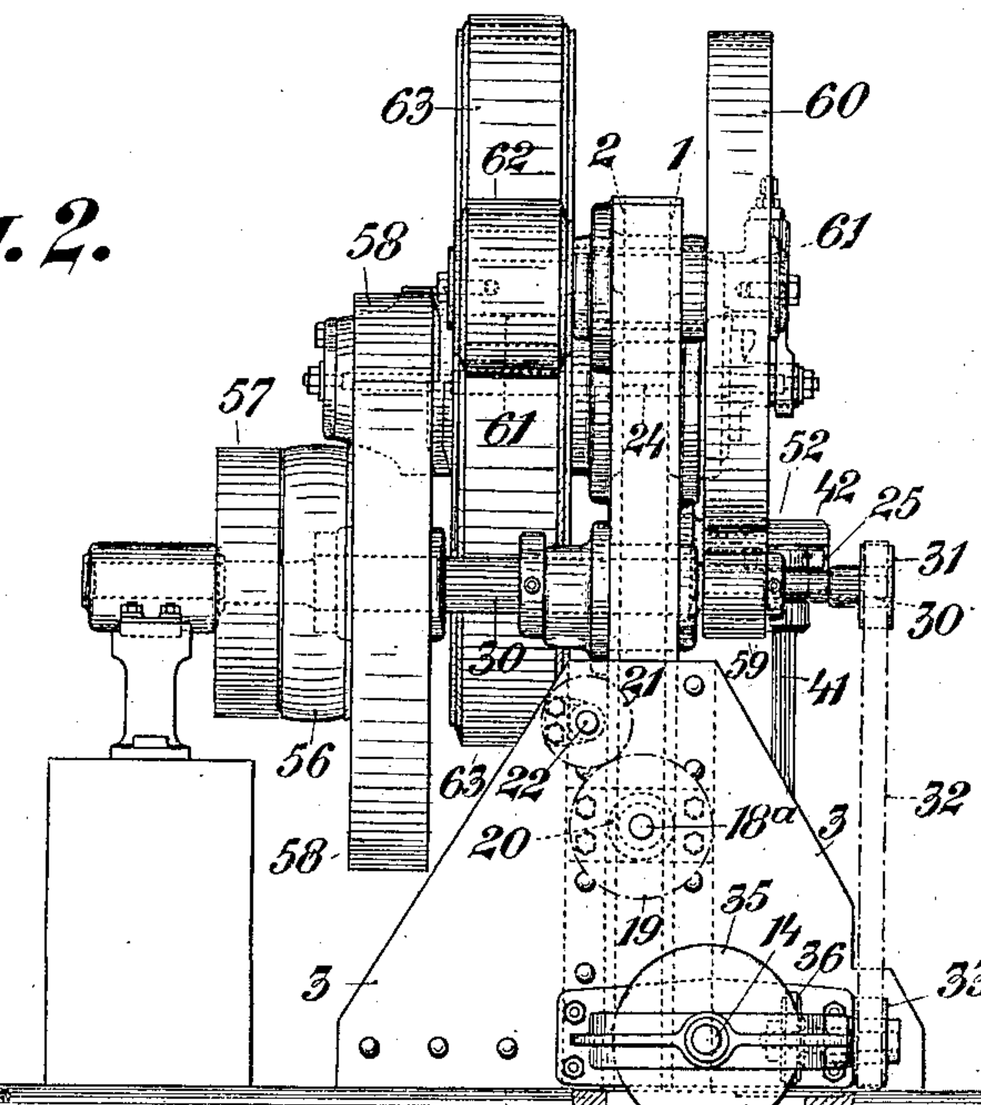


Fig. 2.



Witnesses

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Inventor

Hugo John

By

James L. Norris

Atty

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2 SHEETS—SHEET 2.

Fig. 3.

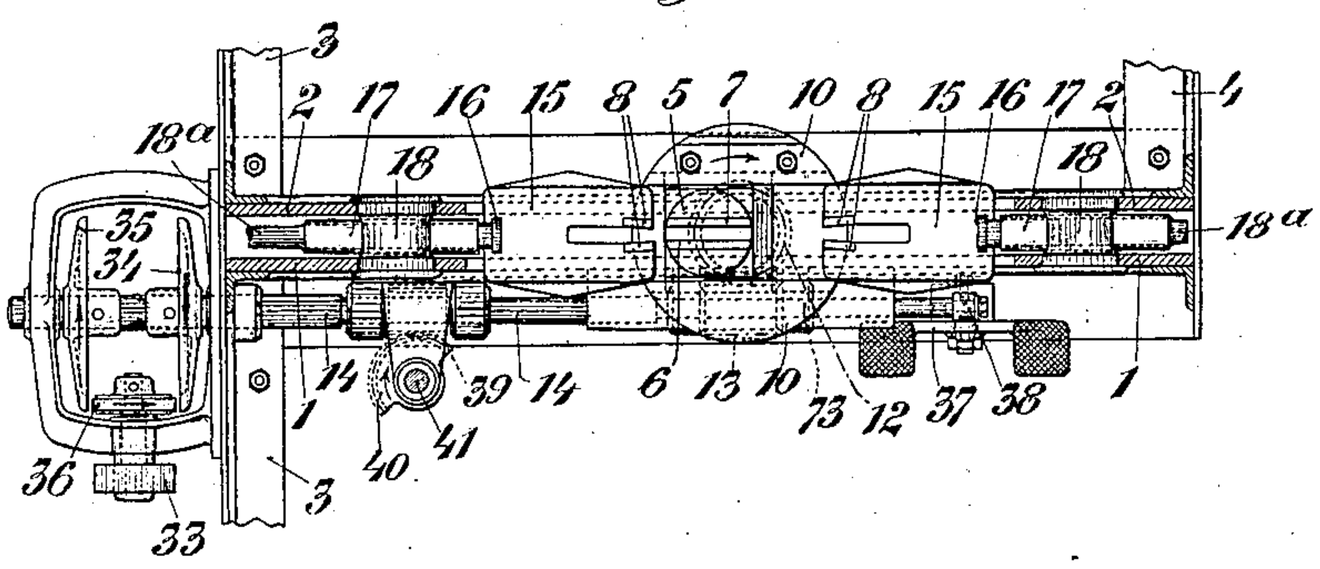


Fig. 4.

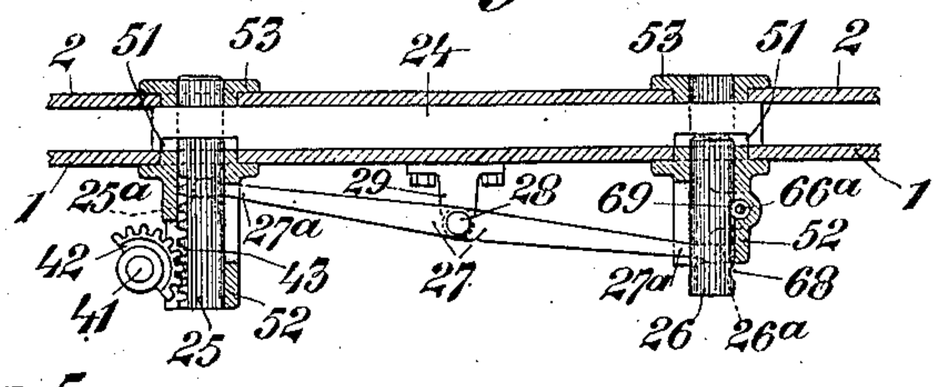


Fig. 5.

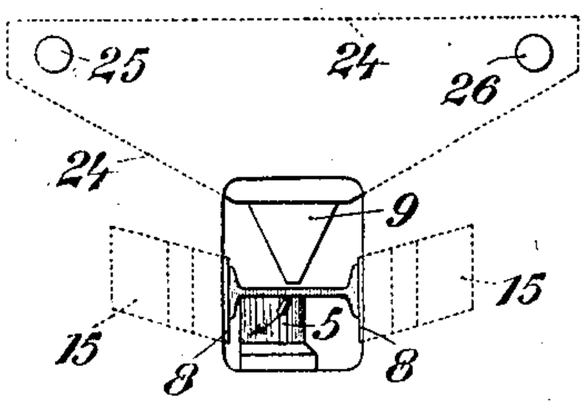


Fig. 6.

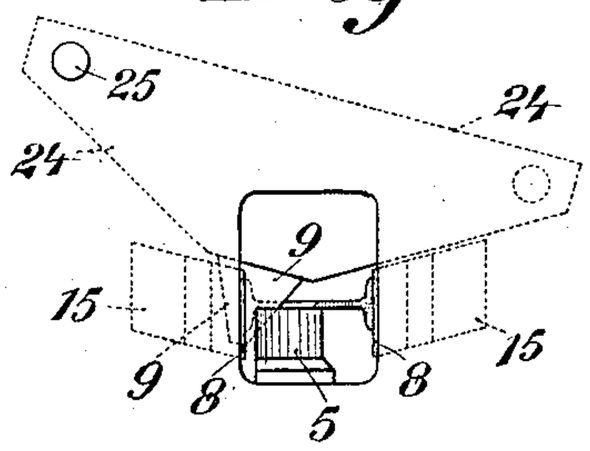


Fig. 7.

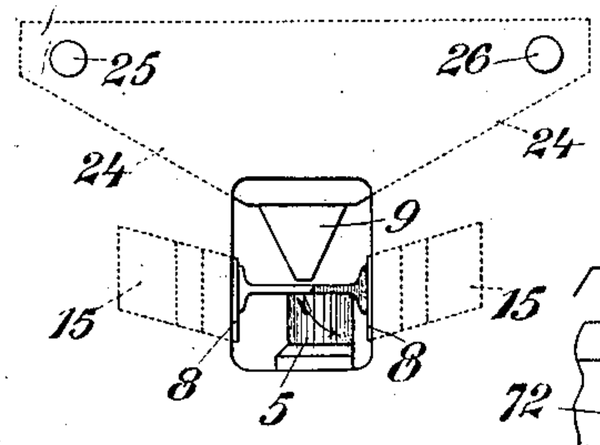


Fig. 8.

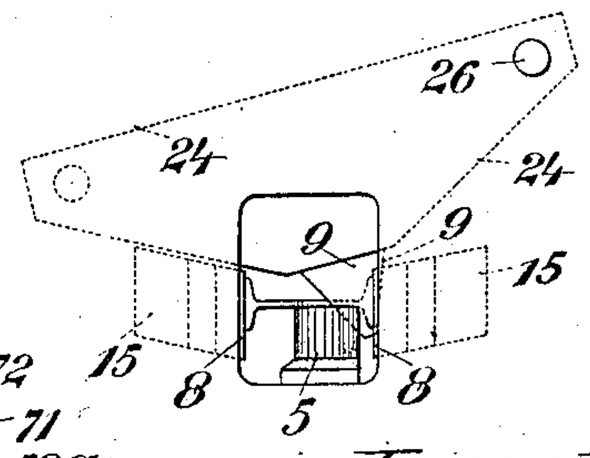
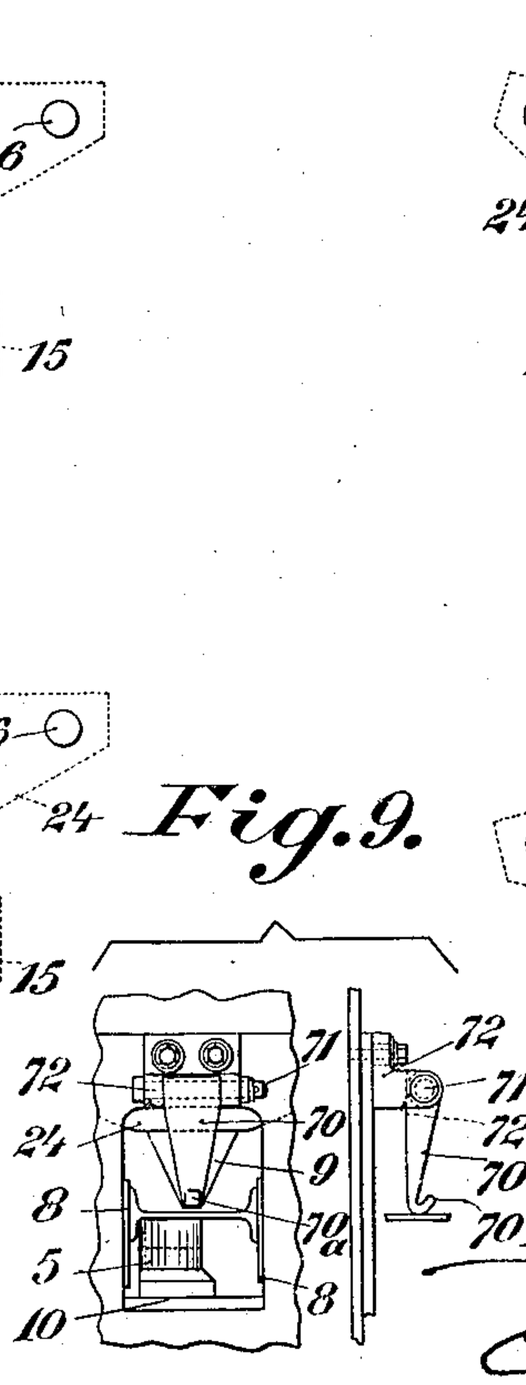


Fig. 9.



Witnesses:

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Inventor

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By James L. Norris.

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UNITED STATES PATENT OFFICE.

HUGO JOHN, OF ERFURT, GERMANY.

METAL-CUTTING MACHINE.

No. 861,122. Specification of Letters Patent. Patented July 23, 1907.

Application filed February 14, 1907. Serial No. 357,379.

To all whom it may concern:

Be it known that I, HUGO JOHN, manufacturer, a subject of the King of Prussia, residing at Erfurt, Kingdom of Prussia, German Empire, have invented certain new and useful Improvements in Metal-Cutting Machines, of which the following is a specification.

My invention relates to a machine for cutting sectional iron of all kinds by stamping out and shearing out a strip from the work and especially to a machine of the class intended chiefly for rolled sectional iron, double T-girders and rails, U-, Z- and angle iron.

In complex forms of iron such as double T girders, U-, Z- iron and rails, the cutting is effected in two operations, one on the right and the other on the left, in simple forms of iron such as T-girders and angle irons the cutting is complete in one operation.

The working of the machine is such that in cutting complex forms of iron, the upper cutter cuts at one time in the one, and at another time in the other direction, this result being obtained by the upper cutter being mounted on a balance beam which can be mounted in the frame either on the left or on the right hand side relatively to the upper cutter, and is alternately rotatable about pivots one on the left, and one on the right hand side. A special feature of the machine according to the present invention is further the use of a bottom cutter holder which is turned through an angle of 180°. This bottom cutter holder with its cutters is set in such manner that it rests, up to the inner flange of the girder to be cut, at least on one half of the girder web. This bottom cutter holder, rotatable to the extent of 180°, supports, during cutting, first one, and then the other side of the double T-girder to be cut. In this way, it is rendered possible to avoid turning over or shifting longitudinally of the girder during cutting. It is placed between two pairs of lateral cutters, resting laterally against the flanges, and on the bottom cutter holder which is turned under the girder to an angle of 180°. The construction of the machine is at the same time such that the withdrawal of the inoperative pivot pin, and the introduction of the operative one for the balance beam supporting the upper cutter, are effected simultaneously so that at all times only one bolt serves and operates as the pivot pin for the upper-cutter-balance-beam. Moreover the rotation of the bottom cutter holder can be made dependent on the introduction and withdrawal of the pivot pin of the upper-cutter-balance-beam in such manner that the upper cutter can cut only in the direction in which the girder is supported by the bottom cutter holder.

The two pairs of lateral cutters are simultaneously pressed in a uniform manner against the flanges of the double T-girder to be cut. The lateral cutter holders are arranged on paths or guides inclined towards the working opening, in order to enable the upper cutter to cut freely even girders of small cross-sections.

The driving gear for the machine is provided with such devices that it can be thrown in only when one of the pivot pins of the upper-cutter-balance-beam is in the operative, and the other in the inoperative position, and when also the upper cutter holder is in one or the other of its end positions. The balance beam for the upper cutter is balanced, so that the axis of the pivot pin to be introduced should always coincide with the perforation in the balance beam. Finally the machine is provided with a stripping off device which, after the first cut (before the throwing into gear of the machine for the second cut), effects the stripping off of the work and which also protects the upper cutter from damage during the introduction of the work.

A machine embodying the invention is shown in the accompanying drawings, of which,

Figure 1 shows the machine in side elevation, and Fig. 2 in front elevation, Fig. 3 is a horizontal cross-section above the bottom cutter holder, Fig. 4 is a horizontal cross-section in the direction of the level of the pivot pins on the line A B of Fig. 1. Fig. 4 shows the left hand pin thrown into gear, and therefore the bottom cutter holder operative on the left hand side. Figs. 5–8 illustrate the working of the machine during cutting in one or in the other direction, Fig. 5 showing the position of the upper cutter holder before the beginning of the left hand cut, Fig. 6 the position of the upper cutter holder after the completed left hand cut, Fig. 7 the position of the upper cutter holder before the beginning of the right hand cut, and Fig. 8 the position of the upper cutter after the completed right hand cut. Fig. 9 shows the stripping off device in front and side elevation.

The construction of the machine is as follows:—At the lower portion of the machine frame, made of suitable plates 1 and 2 and strengthened by two brackets 3 and 4, is provided the working opening. The tools consist of the rotatable bottom cutter holder 5 with the bottom cutters 6 and 7 held fast to their seat by means of screws and spring bolts, of the two lateral cutters 8, and of the upper cutter 9 cutting between the lateral cutters and the bottom cutters. The bottom cutter holder is adjustably mounted on a rotatable plate 10 and is held in position by suitable means. The plate 10 rests on the walls of the frame and rotates about the central pin 11 which is secured by a bolt, or in other suitable way, to the frame 1, 2. The bottom cutter holder 5 is set in accordance with the dimensions of the cross-section of the sectional iron to be cut. The diameter of the semicircle which it describes, is about equal to the inside height of the T-girder to be cut. After the cutting is completed, the bottom cutting holder is turned to an angle

of 180° before the second cutting is made. In order to bring about the turning of the bottom cutter holder, the plate 10 is provided at the bottom end with a worm wheel 12 with which engages a worm 13 mounted on a spindle 14. The means for rotating the spindle 14 will be described hereafter.

The lateral cutting device mounted adjustably on inclined paths or guides, comprises lateral cutter holders 15, 15 of which each has a pair 8 of lateral cutters. The two lateral cutter holders 15 are guided at top and bottom in corresponding recesses of the two frame walls 1 and 2. The bottom guide is completed by means of set pieces placed between the walls of the frame. The back surfaces of the lateral cutter holders 15 are provided with a through groove 16 with which engage correspondingly shaped heads of two screw spindles 17. These screw spindles 17 engage female threads in two pins 18 which pass through the frame body and are secured to it. On the grooved smooth end 18ª of each spindle 17 are mounted toothed wheels 19 which are prevented from shifting laterally by means of suitable bearings 20. With the toothed wheels 19 engage toothed wheels 21. The connection between the two systems of toothed wheels 19 and 21 is effected by means of a spindle 22 which is supported on the frame wall 1 and is parallel to the same and is provided with a crank handle 23. One of the spindles 17 is provided with a right-hand thread, and the other with a left hand thread. By rotating the spindle 22 by means of the crank handle 23, the screw spindles 17 are moved relatively to each other, and the lateral cutter holders 15 at the same time brought simultaneously nearer together or further apart, in accordance with the height of the cross-section to be cut.

The upper cutter 9 is the only power-driven cutting part of the machine, and serves for cutting out a strip from the work, for instance, from the double **T**-girder shown in the drawing. The upper cutter 9 is mounted on the adjustable upper cutter holder 24. An upper portion 9ª of the upper cutter 9 is embedded in the upper cutter holder in such manner that the cutting edge projects downwards. The upper cutter holder 24 has the shape of a balance beam, it is reduced towards the two ends and provided with a perforation at each end for receiving a pivot pin 25 or 26.

During the cutting of the upper cutter in one direction the upper cutter holder must be rotatable about one pivot pin, say 25, and during cutting in the other direction, about the other pivot pin 26. The upper cutter holder must, therefore, make an oscillating movement about one pivot pin, and during that time the other pivot pin must be removed, that is to say, withdrawn from its opening. This is done by means of the following arrangement:—

The two pivot pins 25 and 26 are connected by a double lever 27, of which the pivot point or fulcrum 28 is supported in a bearing 29, and its end 27ª engages with slots 25ª or 26ª of the pins 25 and 26. Owing to this arrangement the pivot pins move in opposite directions. On the fly wheel spindle 30 is mounted a pulley 31 which, by means of a belt 32, drives a pulley 33 of a reversing gear. This gear consists of disks 34 35 keyed to the spindle 14, and of the friction disk 36 driven by the pulley 33. The spindle 14 is adjustable in the longitudinal direction. It is shifted by a treadle 37 provided with a step for the right and left foot and engaging the spindle 14 by means of a short lever 38 and a clutch. On the spindle 14 is also rotatably mounted a worm 39 engaging with a worm wheel segment 40 keyed to the spindle 41. The spindle 41 is provided at its upper end with a toothed segment 42 engaging with the teeth 43 of the flat toothed side of the pivot pin 25. The method of driving the fly wheel spindle 30 and the reversing gear 34 35 36, as well as the direction of movement of the worm wheel gear 39 40 is selected in such manner that, on depressing the left treadle 37, the left hand pivot pin 25 is introduced, and forms a pivot pin for the upper cutter holder 24, while the right hand pin 26 is withdrawn from the upper cutter holder 24 by means of the double lever 27. On the spindle 14 is also mounted a worm 13 engaging with the worm wheel 12 of the bottom cutter holder 5. The direction of movement of this worm wheel gear is such that, when the left treadle 37 is depressed, and consequently the left hand pin 25 put in, the bottom cutter holder 5 is brought into its left hand position. On the right treadle being depressed, the right hand pin 26 becomes the pivot pin for the upper cutter holder 24, and the bottom cutter holder 25 is brought by the worm wheel gear 12 13 into its right hand position.

In order to bring about automatic return of the upper cutter holder 24 into its upper position, the upper cutter holder 24 is suspended at both ends by means of a chain 44 to a roller 45 rotatably mounted on the shorter lever end 46 of a double lever 46 47 rotatable about the pin 48 of a bearing 49 secured to the frame. To the longer end 47 of the double lever 46 47 is suspended a weight 50 which is so heavy that the upper cutter holder is more than balanced, taking into consideration the ratio of the lever arms. Owing to the suspension of the upper cutter holder 24 at both its ends by means of the chain 44 to the roller 45 mounted above the center of the upper cutter holder 24, the upper cutter holder can swing without disturbing the working of the balancing device. As, moreover, the ratio of the levers 46 47 is utilized for the purposes of balancing, and only one half of the upper cutter holder has to be balanced at a time, since the other half rotates about the pivot pin 26, it is necessary to have only a comparatively small weight 50, namely half of the upper cutter holder weight resulting from the ratio between the levers 46 47 for the purpose of balancing the upper cutter holder 24.

In order that the upper cutter holder, on its return into the upper end position, should again find the proper position, the pins 25 26 are made so that they cannot be withdrawn completely, but the portion of the material of the upper cutter holder 24, situated over the short end of the bolt 25 remaining in the upper cutter holder, is made into a channel or recess 51. In this way, the path of the upper cutter holder which receives its working pressure and its downward movement over the upper cutter, is free downwards when the pin is withdrawn, and the correctness of the upper end position is therefore always insured. The pins 25 26 are guided and supported each in a socket 52, and in a bearing ring 53 secured in a suitable manner to the walls of the frame.

The machine is driven from the fly wheel spindle 30 by means of a countershaft with eccentric 54. The

upper cutter holder 24 is operated by a beam 55. To that end, the fly wheel spindle 30 on which are mounted the driving pulley 56, and the loose pulley 57 as well as the fly wheel 58, is provided with a toothed wheel 59 engaging with the toothed wheel 60 of the intermediate spindle 61. The spindle 61 is provided with a toothed wheel 62 engaging with the large toothed wheel 63 on the eccentric spindle 64. The arrangement is such that a clutch is used which by pulling the handle 65 is thrown into engagement with a rod 66 by means of the lever 67, and rotates the eccentric spindle 64, while on the contrary, after a complete revolution of the eccentric 54, that is to say after half a cut has been effected the coupling is automatically thrown out of gear. Such couplings on machine tools are well known and do not form the subject of this invention.

In order to enable the coupling to take place, that is to say, the eccentric thrown into gear, only when the pins 25 and 26 and the bottom cutter holder 5 are in the position ready for cutting, and in order to prevent the throwing into gear when the said pins are, for instance, only in the central position, the pivot pin 26 is provided at its circumference with two recesses 68 69 (Fig. 4) with which the end 66^a of the rod 66 can engage. It follows therefrom that the rod 66 can be pulled down, for the purpose of throwing the clutch into gear and making the eccentric 54 operative only when the pin 26 is in one of its end positions. In the intermediate position, the bottom end 66^a of the rod 66 strikes against the solid body of the pin 26 and prevents the coupling from being effected.

For the double purpose, first of keeping the work, already partly cut during the first operation, in its position during the upward movement of the upper cutter, and, secondly of protecting the upper cutter from damage or breakage during the introduction of the bars to be cut, there is provided a stripping off device 70 (Figs. 1 and 9). This stripping off device 70 is bent to hook shape at its bottom end 70^a, for the purpose of deflecting the work moved towards the working opening, but perhaps held too high, and of guiding it between the cutters. The stripping-off device is pivoted by means of a pin 71 to a stripping-off bearing 72 screwed to the frame wall, so that it can be tipped over upwards when it is desired to render the working opening free for instance, when changing the work, or when the said stripping off device is not to be used, for instance, when cutting such kinds of iron bars which can be cut in one operation. The stripping off device cannot be forced from its bottom position towards the upper cutter, as it finds a stop surface 72^a in the stripping off bearing 72.

The working of the machine is as follows:—Assuming that it is desired to cut a double T-girder and that the parts of the machine are in the position shown in Fig. 1, the bottom cutter holder 5 is set and secured to suit the inside height of the cross-section of the work. Then the girder to be cut is introduced into the working opening, and the lateral cutters 6 brought against the flanges by turning the handle. Then the clutch is thrown in by means of the handle 65, whereupon the left cut is effected at once in the direction of the arrow, Figs. 5 and 6, and up to the point of the same, and the upper cutter returns in the same way into its upper end position Fig. 5, in order to be stopped by the throwing out of gear of the clutch. This cut has been effected by the operation of the left pedal 37, whereby the disk 35 came into connection with the friction wheel 36 driven from the fly wheel spindle, and the spindle 41 is moved by the worm gears 39 40 to actuate the toothed gear 42 43 of the pin 25, so that the latter formed the pivot for the upper cutter holder 24. If, after the left cut has been effected, the right hand pedal 37 is depressed, the pulley 34 comes into engagement with the friction disk 36. The spindle 14 is rotated in the opposite direction. Owing to the wheels 42 43 on the spindle 41, the pivot pin 25 is withdrawn from the upper cutter holder, and the pin 26 fully introduced, so that the end of the rod 66^a can engage with the recess 68 of the pin and thus the clutch can be thrown in. At the same time, however owing to the engagement of the worm 13 with the worm wheel 12, the bottom cutter holder 5 has been turned to an angle of 180° whereupon the right hand cut takes place, that is to say, the upper cutter holder 24 comes from the position shown in Fig. 7, into that shown in Fig. 8, whereupon it returns to its original position.

The process for cutting any I- U- and Z-girders and rails is the same as above described. The cutting of T- and angle-irons is effected only at one side, as they can be cut in one operation. For cutting smaller I- U- and Z- irons and rails, a smaller upper cutter, and a shorter bottom cutter holder, are put in. In order to enable small girders to be cut with the same lateral cutters 8, even when the bottom cutter holder is shorter, and the upper cutter smaller, the lateral cutter holders 15 are arranged on oblique paths or guides, inclined toward the center of the work, in order to enable the cutting to be effected without any obstacle and the lateral cutter holders not to be in the way of the upper cutter. It frequently happens that it is necessary to repeat like cuts for the same cross-section, then it is advantageous to use special bottom cutter holders which support the cross-sections in question throughout the whole of their width, so that it is not necessary to turn the bottom cutter holder but merely to shift the pivot pins 25 26 for the purpose of effecting a right and a left cut. To that end, the bearing 73 for the worm 13 is made detachable from, and adjustable on, the spindle 14, so that, after disconnecting the bearing 73 during the rotation of the reversing gear 34, 35, 36, the worm 13 moves loosely on the spindle 14 on which it is secured by means of key and groove, without the bottom cutter holder being rotated. Then the pins 25 26 are alternately introduced or withdrawn by means of the reversing gear 34 35 36.

What I claim is:

1. A machine of the class described involving a cutting element movable into working position, alternating pivotal connections for the cutting element, means for releasing one of the pivotal connections, while the other connection is in pivotal engagement with the element, and flexible weight controlled means for automatically moving the cutting element into position for receiving its alternately pivotal connections.

2. A machine of the class described involving a movable cutting element, laterally movable shearing devices cooperative therewith, means for bringing the cutting element into working position, alternating pivotal connections for the cutting element, mechanism for disconnecting one of the pivotal members while the other pivotal member has connection with the cutting element, and a

weight controlled suspending device for the cutting element to allow the relative movement thereof and to bring the same to an inoperative position.

3. In a machine of the class described, a movable cutting element, and coöperative shearing devices, a rotatable movable bottom work supporting element, alternating pivotal connections for the movable cutting element to form the axis of movement thereof, means for withdrawing one of the pivotal connections and for introducing the other pivotal connection in position in the cutting element for the axis of movement thereof, guide devices coöperative with the pivotal connection and the cutting element to position the latter for receiving pivotal connection, a fulcrum lever, a pulley mounted at one end of the lever, a weight connected to the opposite end of said lever, flexible means passing over the pulley and connected near opposite ends of the cutting element to allow swinging movement thereof and to automatically return the same to normal inoperative position, mechanism for operating the cutting element, and coöperative means for setting the shearing devices.

4. In a machine of the class described, a movable cutting member, a plurality of pivotal connections for the cutting member, means for withdrawing one of the pivotal connections from engagement with the cutting member when the remaining pivotal connection is in operative position to allow said cutting member to move in opposite directions, means for locking the pivotal connections in a fixed position, adjustable shearing devices, means for moving the shearing devices towards and away from each other; a revoluble adjustable work supporting plate, and flexible weight controlled means for suspending the cutting element to allow swinging movement of the latter on its pivotal axis and also for returning the same to normal position.

5. In a machine of the class described, a movable cutter head, a cutter associated with said cutter head, alternately movable pivotal pins for engagement with the cutter head to change the axis of movement of the cutter, a pivotal lever for connecting said pins, a rotatable shaft having a toothed gear in engagement with one of the pins, adjustable shearing devices for the cutters, a revoluble adjustable work supporting element, clutch reversing gear mechanism coöperative with said work supporting element and the said rotary shaft, pressure levers for actuating the clutch reversing gear to change the pivotal connection of the cutter head and also to change the position of the work supporting element, means for actuating the cutter head to bring the cutter into working position, and independent mechanism for simultaneously moving the shearing devices towards and away from each other.

6. In a machine of the class described, a movable cutter head, a cutter associated with said cutter head, alternately movable pivotal pins for engagement with the cutter head to change the axis of movement of the cutter, a pivotal lever for connecting said pins, a rotatable shaft having a toothed gear in engagement with one of the pins, adjustable shearing devices for the cutters, a revoluble adjustable work supporting element, clutch reversing gear mechanism coöperative with said work supporting element and the said rotary shaft, pressure levers for actuating the clutch reversing gear to change the pivotal connection of the cutter head and also to change the position of the work supporting element, means for actuating the cutter head to bring the cutter into working position, independent mechanism for simultaneously moving the shearing devices towards and away from each other, and a weight controlled flexible connection associated with the cutter head to allow the swinging of the same in its direction of movement and also to return said head to normal position.

7. In a machine of the class described, a movable cutting member having alternately pivotal axes to allow said member to move in different directions, shiftable shearing devices, mechanism for operating the cutting member, independent mechanism for actuating the shearing devices, and a weight controlled suspending device for the cutting member to allow the latter to swing upon its axes and also to return the same to normal position.

8. In a machine of the class described, a movable cutting member, the latter movable upon a plurality of pivotal axes, means for alternately releasing the axes, and a weight controlled suspending means coöperative with the cutting member to allow the swinging of the same on the respective axes and also for returning the same to normal position.

9. In a machine of the class described, a movable cutting element, the latter having different axis of movement, mechanism for alternately changing the axes of movement of the cutting element, means for locking said mechanism against movement, and a weight controlled suspending device associated with the cutting element to allow swinging movement of the latter upon its axes and for returning the same to normal position.

10. In a machine of the class described, a movable cutting element, the latter having different axis of movement, mechanism for alternately changing the axes of movement of the cutting element, means for locking said mechanism against movement, a flexible weight controlled suspending device associated with the cutting element to allow swinging movement of the latter upon its axes and for returning the same to normal position, and mechanism for actuating the cutting element to bring the same into working position.

11. In a machine of the class described, a movable cutting element having a plurality of axes of movement, mechanism for alternately changing the axis of movement, and flexible weight controlled suspending means associated with the cutting element to allow swinging movement thereof and also to return the same to normal position.

12. In a machine of the class described, a movable cutting element, alternating pivotal connections for the said element, mechanism for actuating the pivotal connections to change the axis of movement of the cutting element, means for moving the cutting element into operative position, coöperative means for locking the pivotal connections against movement, and a weight controlled flexible connection with the cutting element to allow the swinging movement of the latter upon its axes and for automatically returning the same to position for alternately changing its pivotal connection.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

HUGO JOHN.

Witnesses:
PAUL TSICHMANN,
ERNST EBERHARDT.