H. JOHN.

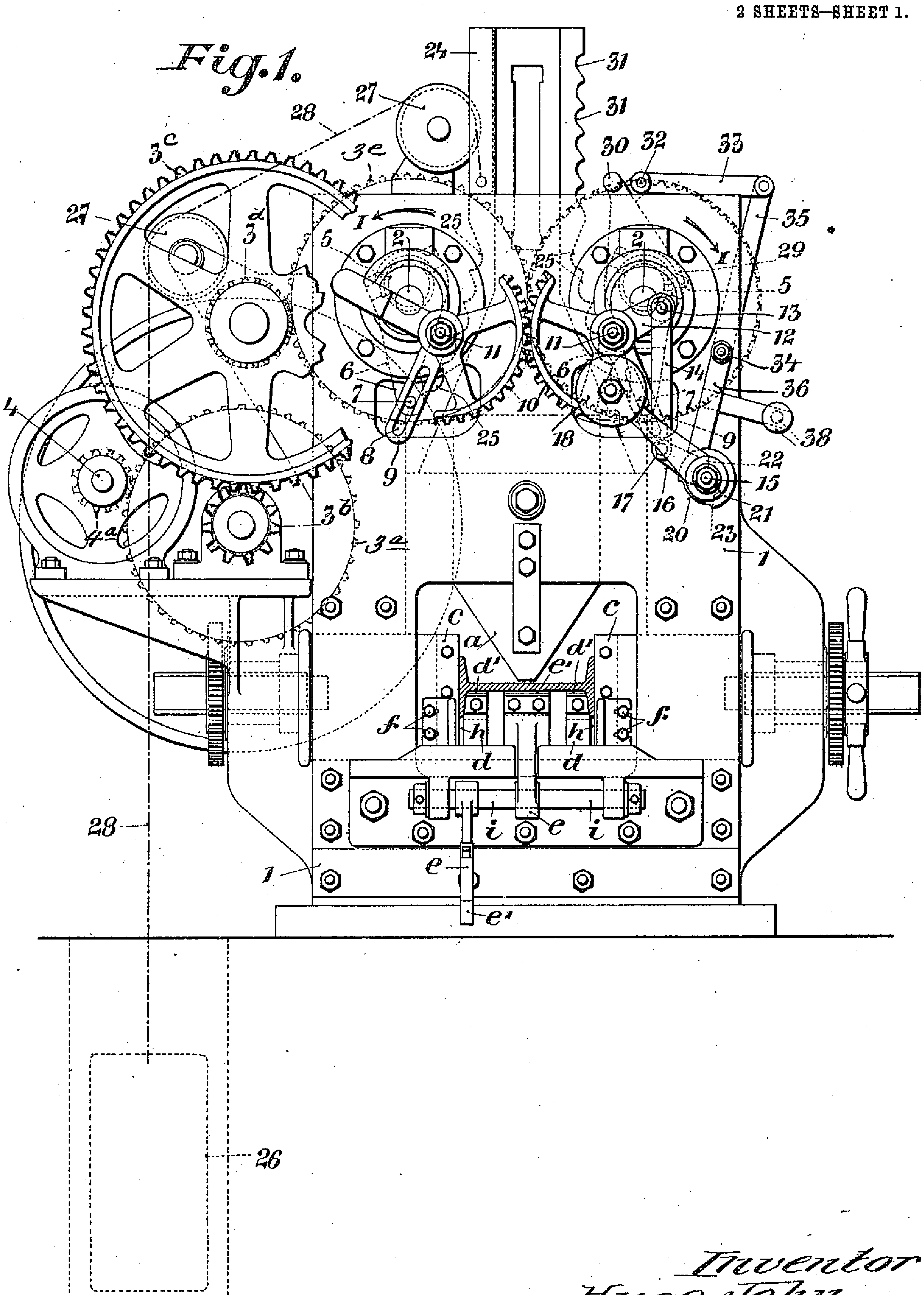
SHEARING MACHINE.

APPLICATION FILED OCT. 25, 1909.

985,599. Patented Feb. 28, 1911.

2 SHEETS—SHEET 1.

Fig.1.



Witnesses:

[signature]

[signature]

Inventor

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2 SHEETS—SHEET 2.

Fig. 2.

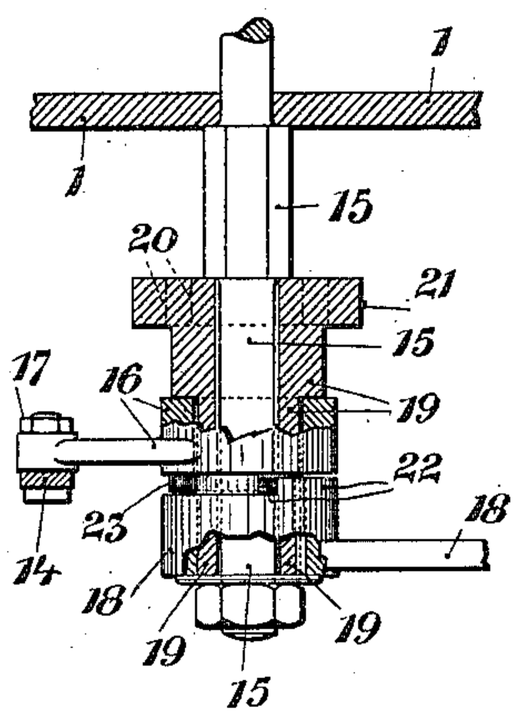


Fig. 3.

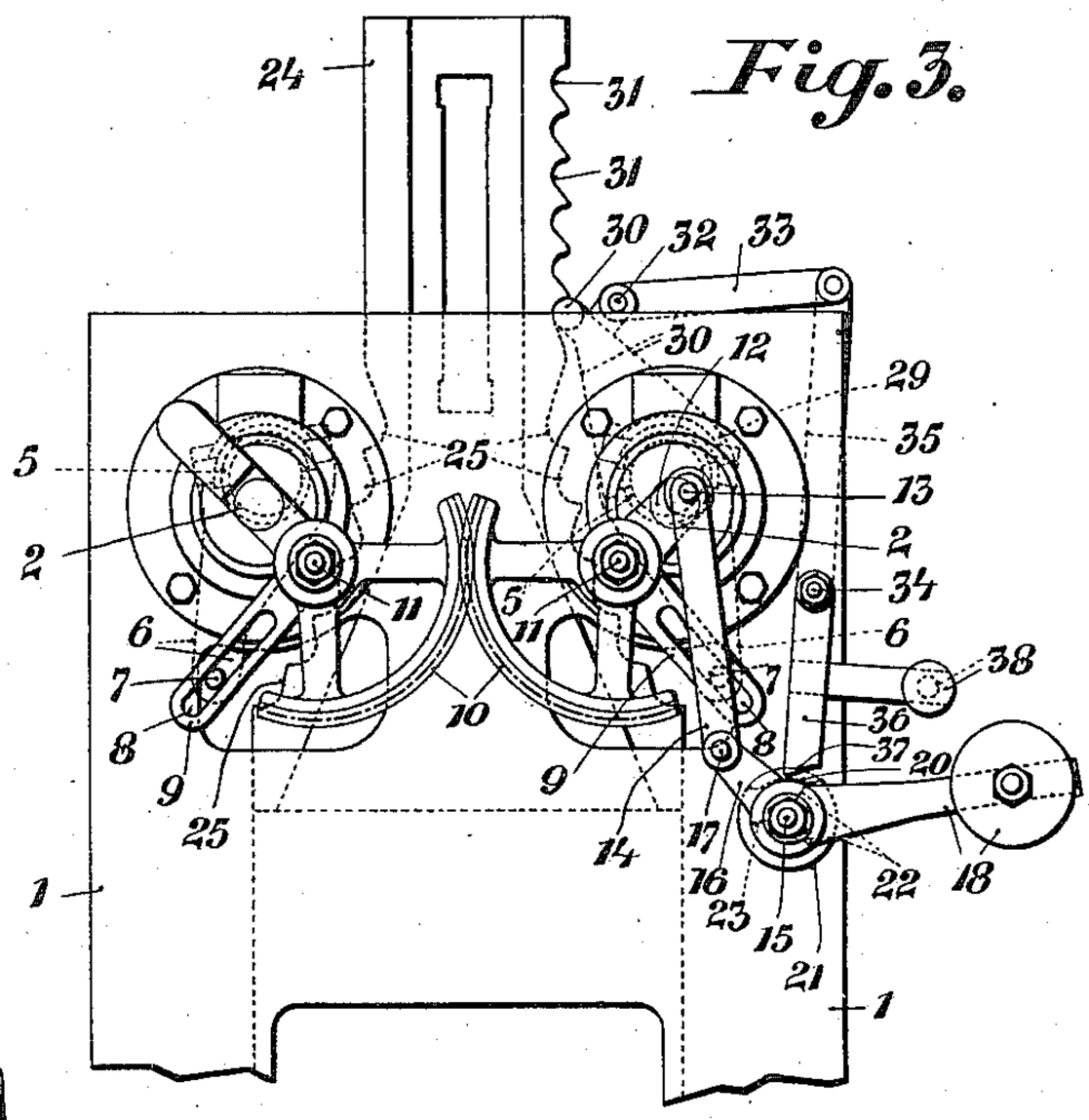


Fig. 4.

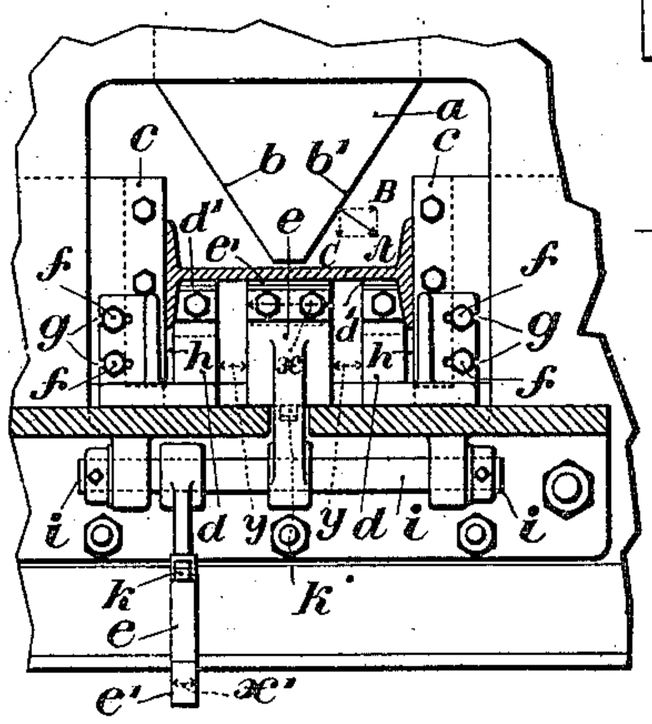


Fig. 5.

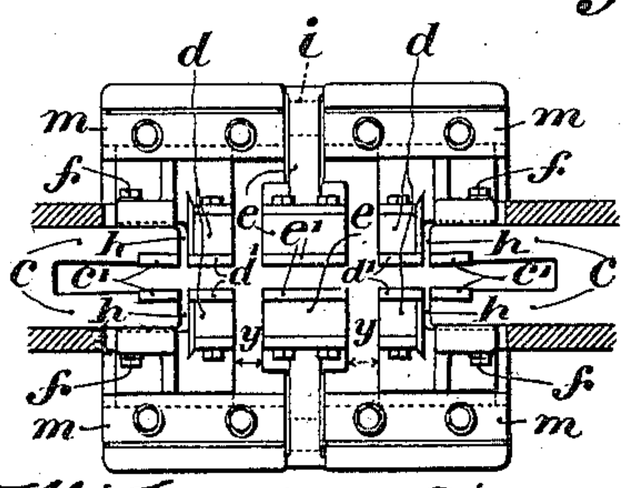
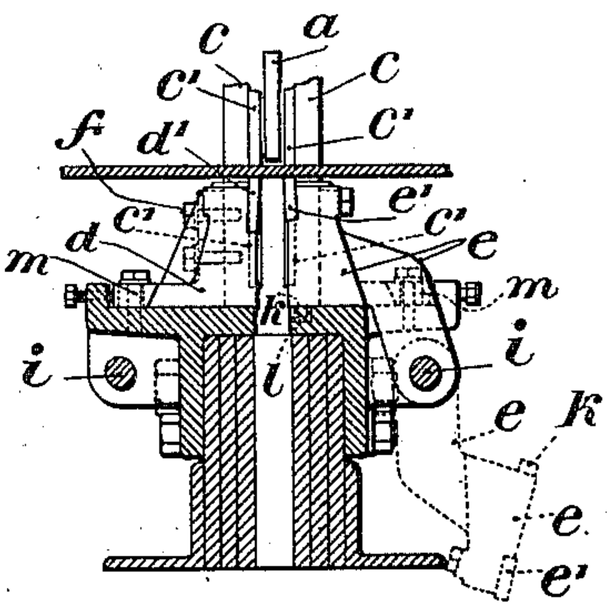


Fig. 6.



Witnesses:

Inventor

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UNITED STATES PATENT OFFICE.

HUGO JOHN, OF FLOERSGEHOFEN, NEAR ERFURT, GERMANY.

SHEARING-MACHINE.

985,599. Specification of Letters Patent. Patented Feb. 28, 1911.

Application filed October 25, 1909. Serial No. 524,411.

To all whom it may concern:

Be it known that I, HUGO JOHN, manufacturer, a subject of the German Emperor, residing at Floersgehofen, near Erfurt, Kingdom of Prussia, Germany, have invented certain new and useful Improvements in or Relating to Shearing-Machines, of which the following is a specification.

My invention relates to a machine for cutting through sectional iron of different heights of webs and flanges, in a single operation by cutting out a strip, in which the single vertically movable upper cutter has the shape of a wedge.

The machine in question is characterized by the arrangement of two pairs of side cutters adjustable relatively to each other, and of three pairs of bottom cutters, the central pair of which support in the center of the web the sectional iron to be cut, the lateral pairs of bottom cutters supporting it at the web, near the flanges, and being adjustable relatively to the latter in accordance with the thickness of the flanges. The central pair of the bottom cutters are rotatably mounted on spindles and can be replaced by other similarly arranged central cutters of a different width, that is to say exchanged for others.

Another novelty consists in the operation of the top cutter which is here the only movable part.

The object of the machine according to this invention is to cut in a single operation double T-irons with different heights of webs and flanges in such manner as to make impossible any deformation of the girder at the points of cutting. In order to attain that, the double T-iron is supported, according to this invention, in the center of the web, at the point where the top cutter makes the first cut with its bottom edge, by means of the central bottom cutters. The single movable top cutter is further made in elevation of the shape of a double wedge, and the angle of the wedge surfaces calculated in such manner that on the cutting edges of the top cutter penetrating into the web of the double T-iron, the pressure component in the horizontal direction is greater than the pressure component in the vertical direction acting against the bottom cutters. In that way, any deformation of the web at the points where it is free, that is to say not supported by the bottom cutters, is avoided. In order further to enable sectional irons with different heights of webs to be cut, the central pair of bottom cutters is interchangeable and can be replaced by others of a different width. The side cutters are horizontally adjustable by known devices. The lateral bottom cutter groups are connected, by a sliding carriage, to the groups of side cutters and are adjusted with the same; moreover each lateral group of bottom cutters is adjustable relatively to the adjoining group of side cutters to suit different thicknesses of flanges.

The device for driving the top cutter which also forms the subject of this invention is characterized by two pressure parts driven by means of eccentrics, being suitably guided, resting against recesses of the support carrying the top cutter, arranged in steps, and moving the said support or bracket downward step by step. On one of the two eccentric shafts is further arranged a second eccentric which moves upward the depressed support together with the top cutter, by engaging with upwardly directed recesses of the same, the arrangement being however such that the upward movement of the support after the cutting through of the sectional iron, can take place only when the pressure parts bringing about the depression of the support are out of engagement with the same, and conversely, the depression of the support is possible only when the pressure part raising the support is out of engagement with its recesses.

The pressure parts bringing about the depression of the support, which are suitably secured to the eccentrics, are controlled by slotted levers secured to toothed segments, the said levers, on a lever supporting a balance weight being turned over, pressing the pressure parts into the recesses of the support, arranged in steps, or removing them from the same.

A construction according to this invention is illustrated, by way of example, in the accompanying drawing, in which:—

Figure 1 is a general view showing the machine in the position in which the pressure parts moving the support downward are thrown into gear; Fig. 2 is a detail view; Fig. 3 shows an elevation of the upper part of the machine with the pressure parts thrown out of gear while the pressure lever is thrown into gear for forcing the support upward; Fig. 4 is an elevation of the groups of cutters; Fig. 5 is a corre-

sponding plan, and Fig. 6 a corresponding section.

The only power-driven top cutter a is provided with cutting edges b b^1 at such an angle to the vertical line that the horizontal force component of the pressure exercised by the cutting edge, is greater than the vertical component directed toward the bottom cutters, so that the horizontal thrust exercised by the top cutter a, on penetrating into the web, is greater than the vertical pressure.

For fixing the girder the two side cutter holders c are used with their cutters c^1 which are adjustable relatively to each other and can be set at will by means of any desired devices, such as for instance screw spindles.

There are three groups acting as bottom cutters, namely, the lateral bottom cutters d^1 which support the web near the flange and rest against the inner side of the flange, and the two central bottom cutters e^1 which support the web in the middle. The bottom cutters d^1 are mounted on bottom cutter holders d which are made in the form of slides and can be adjusted by means of screws f, in slots g of the side cutter holders c. The object of this adjustment is to enable the bottom cutters d^1 to be adjusted for girders of different thickness of flange in such manner that the bottom cutters should rest against the outer sides of the depending flanges. In order to enable double T-irons of different widths of flange to be cut, there is provided between the cutter holders d and the side cutters c^1 a hollow space h for receiving higher flanges.

The central group of bottom cutters, consists of cutters e^1 secured to cutter holders e. The said cutter holders e are rotatably mounted on horizontal spindles i mounted laterally of the cutting machine, and as shown in Figs. 1, 4 and 6, can be folded downward. On the spindles i are provided, if necessary, several groups of cutters e^1 with their holders e of different widths x x^1. The correct position of the central group of bottom cutters e^1 relatively to the center of the web, is obtained by means of projections k provided on the cutter holders e and engaging with corresponding grooves l of the frame of the machine.

As will be seen from Figs. 4 and 5, when large sectional irons are being cut, there remain between the central group of bottom cutters and the two lateral groups of bottom cutters, two intermediate spaces or intervals y. But nevertheless the sectional iron to be cut is supported in the center of the web by the central group of bottom cutters e^1. When, therefore, the top cutter a cuts against the web of the double T-iron, the latter is supported by the central group of bottom cutters e^1, and the top cutter penetrates smoothly. When the web has been cut to the width of the central bottom cutter e^1, the top cutter a, during its continued descent, cuts the double T-iron also along the distance corresponding to the interval y, where the web is not supported by a group of bottom cutters. But as owing to the angle of wedge adopted, the horizontal thrust due the component of the force, is greater than the vertical pressure, the web is cut, or a shaving is cut out, in a smooth manner without deformation of the web even at the unsupported points.

The lateral bottom cutters d^1 support the double T-iron during the cutting of the last outer portion of the web and of the flanges.

In cutting small double T-irons, the groups of side cutters c^1 are brought nearer to each other, and with the side cutter holders c, the lateral bottom cutter holders d are also moved nearer to the center of the girder-cutting machine, so that the intervals y between the groups of bottom cutters become smaller. The said interval y could be reduced to zero, so that the lateral bottom cutters d^1 would come to rest against the central bottom cutter e^1. In order to enable still smaller cross-sections to be cut, and at the same time the advantage of support of the web in the center where the top cutter first comes into contact with it to be maintained, the wider bottom cutter of the width x can be folded about the spindle i, and in its place a bottom cutter folded upward, which has a smaller width x^1 (Figs. 1 and 4). The spindle i is calculated in such manner that it can take central bottom cutters e^1 of different width, and there is always the advantage that the double T-iron to be cut is supported in the center, at the point where the top cutter a first comes into contact with the web and penetrates into it, so that a deformation of the web at that point is avoided. The side cutter holders c and the lateral bottom cutter holders d are jointly adjustable between guides m.

In order to drive the top cutter a, there are rotatably mounted in the frame 1 of the machine spindles 2 which are rotated by means of a countershaft gearing from a driving medium 4 in the direction of the arrow 1. This countershaft gearing includes the pinion 4^a which is mounted on the shaft of the driving medium 4, the gear wheel 3^a in mesh with the pinion 4^a, the pinion 3^b mounted on the shaft of the gear wheel 3^a, the gear wheel 3^c driven by the pinion 3^b, the pinion 3^d mounted on the shaft of the gear wheel 3^c, and the gear wheel 3^e driven by the pinion 3^d and mounted on the shaft 2. On the spindles 2 are mounted eccentrics 5 to which are secured pressure parts or drivers 6 carrying pins 7 engaging with slots 8 of slotted levers 9. The slotted levers 9 are secured to toothed segments 10 rotatably mounted about pins 11

on the frame 1 of the machine. One of the said toothed segments 10 is provided with a projection 12, to the pin 13 of which is connected a rod 14 which is in turn pivotally connected to a lever 16 mounted rotatably about a pin 15 in the frame 1 of the machine. On the pin 15 there is further mounted a weighted lever 18. The said lever 18 is keyed to the hub 19 of a disk 21 provided with a recess 20, and is provided with a stop 22 which strikes a corresponding projection 23 of the lever 16, and when the lever 18 is moved, moves the lever 16 from the position shown in Fig. 3 into that shown in Fig. 1, the rod 14 and the lever-like projection 12 of the toothed segments 10 downward, the toothed segments 10 upward, and the pressure part 6 inward. The pressure parts 6 engage then with the recesses 25 arranged step-like in the central portion of the support 24 and depress the support 24 together with the top cutter *a* when the eccentrics 5 rotate. The cutter *a* is thus forced downwardly in a step-by-step manner and each single step of movement of said cutter is of course a fraction of the complete operative stroke.

For balancing the support 24 there is provided a balance weight 26 suspended to a rope or chain 28 passing over rollers 27.

In order to move the support upward after the cutting of the girder introduced into the machine, there is provided on one eccentric spindle 2 another eccentric 29 which is also provided with a pressure part 30, which, however, in this case is directed upward, engages with recesses 31, having the shape of saw teeth, of the upper portion of the support 24, and raises it step by step. To the pressure part 30 is pivoted about a pin 32 a rod 33 connected to a double-armed lever 35, 36 rotatably mounted about a pin 34 of the frame 1 of the machine. The arm 36 of the said lever is recessed in the shape of an arc of a circle at its bottom end 37, and is situated in the plane of the disk 21.

In the position of the weighted lever 18 and of the disk 21 connected to it, shown in Fig. 3, the bottom edge 37 of the double armed lever 35, 36 can engage with the recess 20 of the disk 21 and move in the same. By pulling the handle 38 provided on the arm 36 of the lever 35, 36, the pressure part 30 is thus brought into engagement with recesses of the support 24. When the weighted lever 18 is moved from the position shown in Fig. 3 into that shown in Fig. 1, the arm 36 of the double-armed lever 35, 36 is moved to the left owing to the solid circumference of the disk 21 striking the lever end 37, and the pressure part 30 is thus withdrawn by means of the rod 33 from the recesses 31 of the support 24. Obviously the arrangement could be made so that, as soon as the arm 36 of the lever 35, 36 has been released by the disk 21 provided with the recess 20, the pressure part would automatically engage with the recesses 31 of the support 24 and be pressed against the same during its upward movement.

The working of the machine according to this invention is as follows:—After the turning upward into the frame of the machine of the bottom cutter holder *e* required for cutting the corresponding sectional iron, and after the corresponding adjustment of the side cutters c^1, as well as of the lateral bottom cutter holders *d*, the girder to be cut is placed on the same, and the weighted lever 18 is brought from the position shown in Fig. 3, into that shown in Fig. 1. The stop 22 of the said lever then strikes the corresponding stop 23 of the lever 16 rotatably mounted on the hub 19 of the disk 21, and moves the latter lever partly downward (Fig. 2). This movement is transmitted by the rod 14 and the lever-like projection 12 of one toothed segment 10, and by the toothed segments 10 engaging with each other, to the slotted levers 9 secured to them, which drive the pressure parts 6 at their pins 7 and move them inward, that is to say, press them against the step-like recesses 25 of the support 24. The eccentric spindles 2 rotating in the direction of the arrow 1, drive the pressure parts 6 mounted on the eccentrics 5, and move them downward or upward. The said movement of the pressure parts 6 is transmitted to the support 24 in such manner that it is pressed downward by the pressure parts 6 engaging with each step 25. This continues until the top cutter *a* secured to the support 24, has completely cut through the sectional iron introduced. The weighted lever 18 which has sunk farther down from the position shown in Fig. 1, is now brought from the left hand lower side into the position shown in Fig. 3. The pressure parts 6 are disengaged from the steps 25 of the support 24, and the disk 21 rotatably mounted on the pin 15 and secured to the lever 18 is rotated in such manner that its recess 20 releases the double armed lever 35, 36 which operates the upper pressure part, whereupon the said lever being moved by pulling the handle 38, presses the pressure part 30 against the recess 31 of the support 24 and thus utilizes the movement of the eccentric 29 for raising the support 24 step by step. It must also be pointed out that it is impossible to bring the pressure part 30 into engagement with the teeth 31 of the support as long as the pressure parts 6 work on the support, and an engagement of the pressure parts 6 with the steps 25 is impossible as long as the pressure part 30 is in engagement with one of the teeth 31, so that any jamming or the like and therefore, damage to any part of the machine, are rendered impossible.

What I claim is:

1. A machine of the type set forth, comprising a wedge shaped reciprocatory top cutter, three pairs of bottom cutters supporting the web of the iron, and side cutters positioned against the outer faces of the flanges of the iron, the side cutters and the end pairs of bottom cutters being laterally adjustable with respect to the central pair of bottom cutters.

2. A machine of the type set forth, comprising a wedge shaped reciprocatory top cutter, laterally adjustable bottom cutters disposed in pairs and side cutters also laterally adjustable.

3. A machine of the type set forth, comprising a wedge shaped reciprocatory top cutter, laterally adjustable bottom cutters disposed in pairs and side cutters connected to the bottom cutters for lateral adjustment therewith.

4. A machine of the type set forth, comprising a wedge shaped reciprocatory top cutter, laterally and vertically adjustable bottom cutters disposed in pairs and side cutters also laterally adjustable.

5. A machine of the type set forth, comprising a wedge shaped reciprocatory top cutter, side cutters mounted for lateral adjustment and bottom cutters connected to the side cutters for lateral adjustment therewith and for vertical adjustment with relation thereto.

6. A machine of the type set forth, comprising a wedge shaped reciprocatory top cutter, three pairs of bottom cutters, and side cutters, the latter and the end pairs of bottom cutters being mounted for lateral adjustment and the bottom cutters of the central pair being pivotally supported.

7. A machine of the type set forth, comprising a supporting bed, a wedge-shaped reciprocatory cutter and means mechanically operating to produce step by step movements of the cutter, each single movement thus produced being a fraction of a complete operative stroke.

8. A machine of the type set forth, comprising side and bottom cutters, the latter being arranged in spaced pairs, a wedge shaped reciprocatory top cutter and means mechanically operating to produce step by step movements of the top cutter, each single movement thus produced being a fraction of a complete operative stroke.

9. A machine of the type set forth comprising a supporting bed, a reciprocatory cutter, a cutter support having a series of recesses in an edge thereof, a spindle, an eccentric mounted thereon and provided with a pressure part, and means for positioning the pressure part with its end in or out of engagement with the recesses.

10. A machine of the type set forth, comprising a supporting bed, a reciprocatory cutter, a cutter support having a series of recesses in the edges thereof, a pair of spindles, an eccentric mounted on each spindle and provided with a pressure part, the pressure parts extending in opposite directions and being engageable in or disengageable from the correspondingly located recesses, and mechanism operable to engage or disengage one of the pressure parts in said recesses and during the engagement of said part to positively hold the other part out of engagement with the correspondingly located recesses.

11. A machine of the type set forth, comprising a supporting bed, a reciprocatory cutter, a cutter support having a series of recesses in the edges thereof, a pair of spindles, an eccentric mounted on each spindle and provided with a pressure part, the pressure parts extending in opposite directions and being engageable in or disengageable from the correspondingly located recesses, and mechanism operable to engage or disengage one of the pressure parts in said recesses and during the engagement of said part to positively hold the other part out of engagement with the correspondingly located recesses, said mechanism comprising a pivoted slotted arm, one of the pressure parts having a pin which engages in the slot of the arm, a pivotally mounted lever 16, an extension 12 of the arm, a link 14 connecting the extension 12 and the lever 16, a weighted lever 18 pivoted coincidently with the lever 16 and having means to engage and produce movements of said link, a lever 35 connected to the other pressure part and operable to produce the engagement or disengagement of the latter with reference to the corresponding recesses and means associated with the lever 18 to engage the lever 35 and to prevent such movement of the latter as would establish the engagement of the pressure part controlled thereby during the engagement of the other pressure part.

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

HUGO JOHN.

Witnesses:
OSKAR HEIMANN,
ERNST EBERHARD.