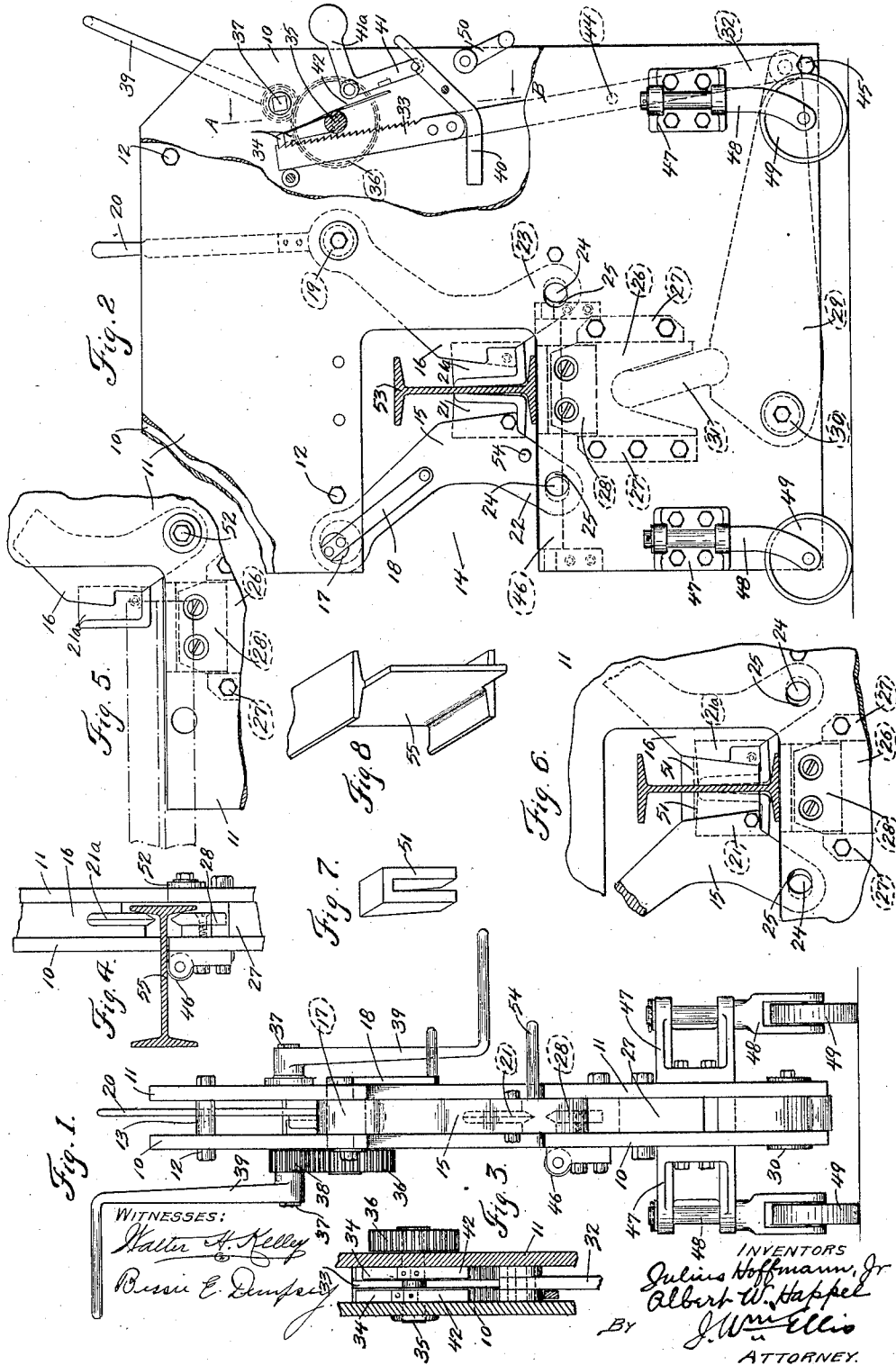


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METAL CUTTING AND COPING MACHINE.
APPLICATION FILED MAY 16, 1911.

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Patented Nov. 12, 1912.



UNITED STATES PATENT OFFICE.

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Specification of Letters Patent.

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To all whom it may concern:

Be it known that we, JULIUS HOFFMANN, Jr., and ALBERT W. HAPPEL, citizens of the United States of America, residing at Buffalo, in the county of Erie and State of New York, have invented certain new and useful Improvements in Metal Cutting and Coping Machines, of which the following is a full, clear, and exact description.

Our invention relates generally to metal cutting machines and more particularly to portable machines which have two oscillating knives and one reciprocating knife.

One of the main objects of our invention has been to provide a machine with an open throat, thus making it possible to make a cut in a long piece of structural steel by simply putting the work piece into the throat of the machine at the point where the cut is to be made, thus avoiding the necessity of having to run said work piece in the machine from the end up to where it is to be cut.

Another object of our invention has been to provide a machine which shall be very simple to operate—so simple that it may be operated by unskilled labor with perfect safety. To this end, we have arranged the operating cranks so that they may be turned in either direction. We have also provided an automatic release whereby the cutting knives will be returned to their normal position when they have cut through the metal, thus making it impossible for them to cut into one another or damage the edge thereof.

Heretofore, in machines of this type, after the work has been put into place, it has been necessary to move out of place the roller of the machine before it could be operated. In providing our invention, we have overcome this inconvenience and have provided a stationary roller which remains in a fixed position at all times. Furthermore, the one set of knives in our machine may be used for either ordinary cutting or coping, thus obviating the necessity of changing the knives for either operation and thereby saving time, trouble and inconvenience. Moreover, with our invention, it is possible to cut most shapes of structural steel without any adjustments whatever.

Reference is to be had to the accompanying drawings forming part of the specification, in which like characters of ref-

erence indicate like parts throughout the several views of which:

Figure 1 is a vertical front elevation of our machine. Fig. 2 is a vertical side elevation of the same, showing a portion of one plate broken away for clearness. Fig. 3 is a sectional view taken on line A—B of Fig. 2. Fig. 4 is a fragmental front view of our machine as it is used for coping and shows an I-beam in position for cutting the web thereof. Fig. 5 is a fragmental side elevation of the parts shown in Fig. 4. Fig. 6 is a fragmental view of our machine, showing the position of the parts during a coping operation and the position of an I-beam when cutting the flanges thereof only. Fig. 7 is a perspective view of one of the riders used during the operation of coping. Fig. 8 is a perspective view of the end of an I-beam which has been coped.

In the drawings 10 and 11 are preferably sheets of boiler plate which form the frame or housing for our machine. These plates are held apart preferably by means of bolts 12 and spacers 13. Each of the said plates is provided in one side with an opening 14, which together form the throat of the machine. Pivotaly mounted between the plates 10 and 11 are knife holders 15 and 16. The knife holder 15 is mounted upon an eccentric 17, pivotaly carried by the plates 10 and 11 and provided with a handle 18, whereby the said knife holder 15 may be raised and by the aid of a handle 54 be swung out of the way. The knife holder 16 is mounted upon a pivot pin 19 which is carried by the plates 10 and 11. This knife holder is provided at its upper end with a handle 20 by which the same may be manually revolved about the pivot pin 19. Carried by each knife holder 15 and 16 is a side cutting knife 21 and 21* respectively. These cutting knives have preferably right-angle cutting edges and are arranged to cut part way through the flange, for instance, of an I-beam and substantially one-half or more of the web thereof. The knife holders 15 and 16 are pivoted at some distance from each other so that, when a pressure is brought to bear upon the said cutting knives from beneath, the same will move inwardly toward each other. These knife holders 15 and 16 are each provided, beneath the knives with an arm 22 and 23 respectively. In each of the said arms is provided an aperture 24

which may be made to register with corresponding apertures 25 in the plates 10 and 11 for the purposes hereinafter described.

Slidably disposed between the plates 10 and 11 is a vertically reciprocating knife holder 26. Guides 27 are secured between the plates 10 and 11 and serve to keep the knife holder 26 in place. A vertically reciprocating cutting knife 28 is secured to and movable with the knife holder 26. The cutting knives are all moved through the movement of the vertically reciprocating cutting knife 28. This knife is operated by means of a toggle joint (see Fig. 2), which comprises a toggle lever 29, pivotally secured to the plates 10 and 11 by means of the pin 30, and a toggle link 31. The upper end of this link is disposed in a semi-circular recess in the vertically reciprocating knife holder 26, and the lower end thereof is disposed in a semi-circular depression in the upper part of the toggle lever 29. To the outer end of the toggle lever 29 is pivotally secured an operating arm 32, which is slidably disposed between the plates 10 and 11. At the upper end of this arm is provided a double faced ratchet rack 33. Engageable with each face of the ratchet is a pawl 34. These pawls are mounted on an eccentric shaft 35, the two eccentrics of which are set diametrically opposite, thus causing the pawl to be raised and lowered alternately when the eccentric shaft is revolved. This eccentric shaft is rotatably carried by the plates 10 and 11 and it has secured on the outer end thereof preferably a spur gear 36. Also rotatably carried by the plates 10 and 11 is an operating shaft 37, on one end of which is secured a spur gear pinion 38, which meshes with the spur gear 36. Each end of the shaft 37 is preferably of square conformation and each has detachably secured thereon an operating crank 39.

Suitable means are employed for tripping the ratchet pawls 34 when the cutting knives have been moved a predetermined distance. We prefer to carry this out in the following manner: Pivoted between the plates 10 and 11 is a release arm 40 and a trip arm 41 the lower end of the trip arm being engageable with a notch in the outer end of the release arm. The trip arm is provided with a weighted arm 41^a which holds the said trip arm and the release arm into engagement with each other, and which, when this engagement is broken, causes the weighted arm to suddenly drop, thus carrying the trip arm 41 inwardly. When the trip arm 41 is disengaged from the release arm 40, it strikes the downwardly projecting members 42 on the pawls 34, and causes the same to be disengaged from the ratchet rack 33, which allows the arm 32 to fall by gravity, thus releasing the cutting knives. A pin 44

is disposed in the arm 32 and when this arm is raised a predetermined distance by means of the ratchet pawls 34, the said pin 44 engages with the lower end of the release arm 40 and disengages the outer end thereof from the trip arm 41, thus causing the ratchet pawls 34 to be disengaged from the ratchet rack 33 as hereinbefore described. A suitable stop 45 is provided so as to prevent the toggle lever 29 from dropping beyond a predetermined point.

Disposed slightly above the lower edge of the throat 14 is a roller 46, which is suitably supported by one of the plates 10 or 11, in a rotatable manner. Secured to the plates 10 and 11 are suitable brackets 47 in which are pivotally journaled the wheel carriers 48. Rotatably mounted in each wheel carrier 48 is a wheel 49, on which the machine may be conveniently moved to any desired place. Any suitable handle 50 may be provided to facilitate the handling of the machine.

A rider 51 is placed over the vertical cutting edge of each of the cutting knives 21 and 21^a when they are being used to cut the flanges of an I-beam in coping the same as clearly shown in Fig. 6. When our machine is used to cut the web of an I-beam or similar section as shown in Figs. 4 and 5, a pin 52 is placed in one of the apertures 25 in the plates 10 and 11 and through the aperture 24 in either the knife holder 15 or 16, but preferably through the holder 16. (See Fig. 5).

Having thus described our invention, we will now describe its operation.

When it is desired to use our machine to cut, for instance, the I-beam 53 (Fig. 2), the knife holder 15 is first raised by means of the handle 18 and eccentric 17 and then swung clear of the throat of the machine by means of the handle 54, whereupon the beam may be inserted into the machine with the throat open. After the beam to be cut has been put in place in the machine, the knife holder 15 is swung back into place and the handle 18 rotated to lower the said holder to the position shown in Fig. 2, where all parts are in their normal position prior to the cutting operation. The cranks 39 are now rotated in either direction, which causes the cam shaft 35 to be revolved through the medium of the spur gears 38 and 36. As the said eccentric shaft is revolved the pawls 34 carried thereby are made to rise and lower alternately, thus gradually raising the ratchet rack 33 and the operating lever 32 secured thereto. When the operating lever 32 is moved upwardly the vertically reciprocating cutting knife 28 is also moved upwardly by means of the toggle lever 29 and toggle link 31, which operate upon the vertically reciprocating knife holder 26 carrying the knife 28. As hereinbefore stated the

pivotal points of the knife holders 15 and 16 are separated some distance from each other so that, when the vertically reciprocating cutting knife 28 is forced up against the flange of the beam and made to cut the same, the side cutting knives 21 and 21^a are forced toward each other and made to cut the web of the beam as well as the flange thereof. When the knives have been forced through the beam and made to sever the part covered by the same, the pin 44 in the operating lever 32 will engage the lower end of the release arm 40 and raise the same. This will disengage the upper end of the said release arm from the trip arm 41, which has been previously engaged therewith, and thus release the pawls 34 as hereinbefore described. When the said pawls are released, the operating arm 32 and the toggle joint parts connected therewith will fall by gravity, thus releasing the cutting knives, whereupon the beam may be revolved 180° and another cut taken thus completely severing the same.

When our machine is used for coping a structural steel shape, as for instance, the I-beam 55 shown in Fig. 8, the knife holder 16 is made rigid by inserting the pin 52 (Fig. 5) and after having swung the knife holder 15 out of the way the beam is placed in position as shown in Figs. 4 and 5. In this position the web of the beam may be cut close to the flange thereof by operating the machine as hereinbefore described. When the web of the beam has been cut beneath both flanges, the pin 52 is removed, the knife holder 15 put in its normal position and a rider 51 placed over the vertical cutting edge of each of the knives 21 and 21^a. When the machine is now operated the flange only of the beam will be cut, because the rider 51 prevent the vertical cutting edges of the knives 21 and 21^a from cutting into the web. Obviously, when cutting the flange only of an angle, channel, or Z-shaped section, the machine may remain as shown in Fig. 5.

Obviously, some modification of the details herein shown and described, may be made without departing from the spirit of our invention and we do not wish to be limited to the exact embodiment herein shown and described.

Having thus described our invention, what we claim is:

1. A metal cutting and coping machine, constructed with an interspaced frame and an open throat, comprising a vertically reciprocating knife disposed in said frame, a pair of laterally movable knives pivotally carried by said frame and disposed above said vertically reciprocating knife, and means for operating said vertically reciprocating knife.

2. A metal cutting and coping machine, constructed with an interspaced frame and an open throat, comprising a vertically re-

ciprocating knife disposed in said frame, a pair of laterally movable knives pivotally carried by said frame and disposed above said vertically reciprocating knife, means for operating said vertically reciprocating knife, and means for automatically releasing said operating means.

3. A metal cutting and coping machine constructed with an interspaced frame and an open throat, comprising a vertically reciprocating knife disposed in said frame, a rear laterally movable knife pivotally carried by said frame, a front laterally movable knife pivotally carried by said frame and mounted upon an eccentric, means for revolving the said eccentric, an operating arm, means connecting said operating arm with said vertically reciprocating knife, a ratchet rack carried by said operating arm, pawls engageable with said ratchet rack, means for operating said pawls, and automatic means for releasing said pawls.

4. A metal cutting and coping machine, constructed with an interspaced frame and an open throat, comprising a vertically reciprocating knife disposed in said frame, a pair of laterally movable knives pivotally carried by said frame and disposed above said vertically reciprocating knife, an operating arm, means disposed within said frame connecting said operating arm with said vertically reciprocating knife, a ratchet rack carried by said operating arm, pawls engageable with said ratchet rack, means for operating said pawls, and automatic means for releasing said pawls.

5. A metal cutting and coping machine, constructed with an interspaced frame and an open throat, comprising a vertically reciprocating knife disposed in said frame, a pair of laterally movable knives pivotally carried by said frame and disposed above said vertically reciprocating knife, an operating arm, means connecting said operating arm with said vertically reciprocating knife, a double faced ratchet rack carried by said operating arm, a double eccentric shaft carried by said frame, pawls engageable with said ratchet rack and rotatably carried by said eccentric shaft, means for operating said shaft, and means for automatically releasing said pawls.

6. A metal cutting and coping machine, constructed with an interspaced frame and an open throat, comprising a vertically reciprocating knife disposed in said frame, a pair of laterally movable knives pivotally carried by said frame and disposed above said vertically reciprocating knife, an operating arm, means connecting said operating arm with said vertically reciprocating knife, a double-faced ratchet rack carried by said operating arm, a double eccentric shaft carried by said frame, pawls carried by said eccentric shaft, said pawls being en-

engageable with said ratchet rack and each provided with a downwardly projecting arm, a release arm, a trip arm engageable with the downwardly projecting arm of said pawl, said release arm and said trip arm being carried by said frame and normally engaged with each other, means carried by said operating arm for disengaging said trip arm from said release arm whereby the said pawls are automatically disengaged from said ratchet rack when the said operating arm has been moved a predetermined distance.

7. A metal cutting and coping machine constructed with an interspaced frame and an open throat, comprising a vertically reciprocating knife holder, slidably carried by said frame, a knife carried by said holder, a pair of laterally movable knife holders disposed above said vertically reciprocating knife holder and pivotally carried by said frame, a side knife having a right-angled cutting edge carried by each of said laterally movable holders, a toggle lever disposed below said knives and pivotally carried by said frame, a toggle link connecting said vertically reciprocating knife holder with said toggle lever, an operating lever connected to the outer end of said toggle lever, means for raising said lever, and means carried by said frame for automatically releasing said operating arm.

8. A metal cutting and coping machine comprising a frame, provided with an open throat, a vertically reciprocating knife disposed within said frame and arranged to operate within said throat, a pair of laterally movable knives carried by said frame and arranged to operate within said throat, means for operating said vertically reciprocating knife, and means for automatically releasing said operating means.

9. A metal cutting and coping machine comprising an interspaced frame, provided with an open throat, a vertically reciprocating knife holder slidably disposed in said frame, a knife carried by said holder and arranged to operate in said throat, a

rear laterally movable knife holder pivotally carried by said frame, a front laterally movable knife holder pivotally carried by said frame, a knife provided with a right-angled cutting edge carried by each of said laterally movable knife holders and arranged to operate within said throat, means for moving said front laterally movable knife holder out of said throat, a toggle lever carried by said frame, a toggle link disposed in said frame and connecting said vertically reciprocating knife holder with said toggle lever, an operating lever pivotally connected to said toggle lever, means for raising said operating lever, and means carried by said frame for automatically releasing said operating lever.

10. A metal cutting and coping machine constructed with an interspaced frame and an open throat, comprising a vertically reciprocating knife holder slidably carried by said frame, a knife carried by said holder, front and rear laterally movable knife holders disposed above said vertically reciprocating knife holder and pivotally carried by said frame, a side knife having a right-angled cutting edge carried by each of said laterally movable holders, means for rigidly securing said front or rear laterally movable knife holders to said frame, riders arranged to fit over the vertically disposed edges of said side knives, a toggle lever disposed below said knives and pivotally carried by said frame, a toggle link connecting said vertically reciprocating knife holder with said toggle lever, an operating lever connected to the outer end of said toggle lever, means for raising said lever, and means carried by said frame for automatically releasing said operating arm.

In witness whereof, we have hereunto set our hands in the presence of two witnesses.

JULIUS HOFFMANN, JR.
ALBERT W. HAPPEL.

Witnesses:

J. WM. ELLIS,
WALTER H. KELLEY.