A. BERG & J. A. FRAY.

FLYING SHEARS.

APPLICATION FILED JULY 25, 1910.

1,010,571.

Patented Dec. 5, 1911.

4 SHEETS—SHEET 1.

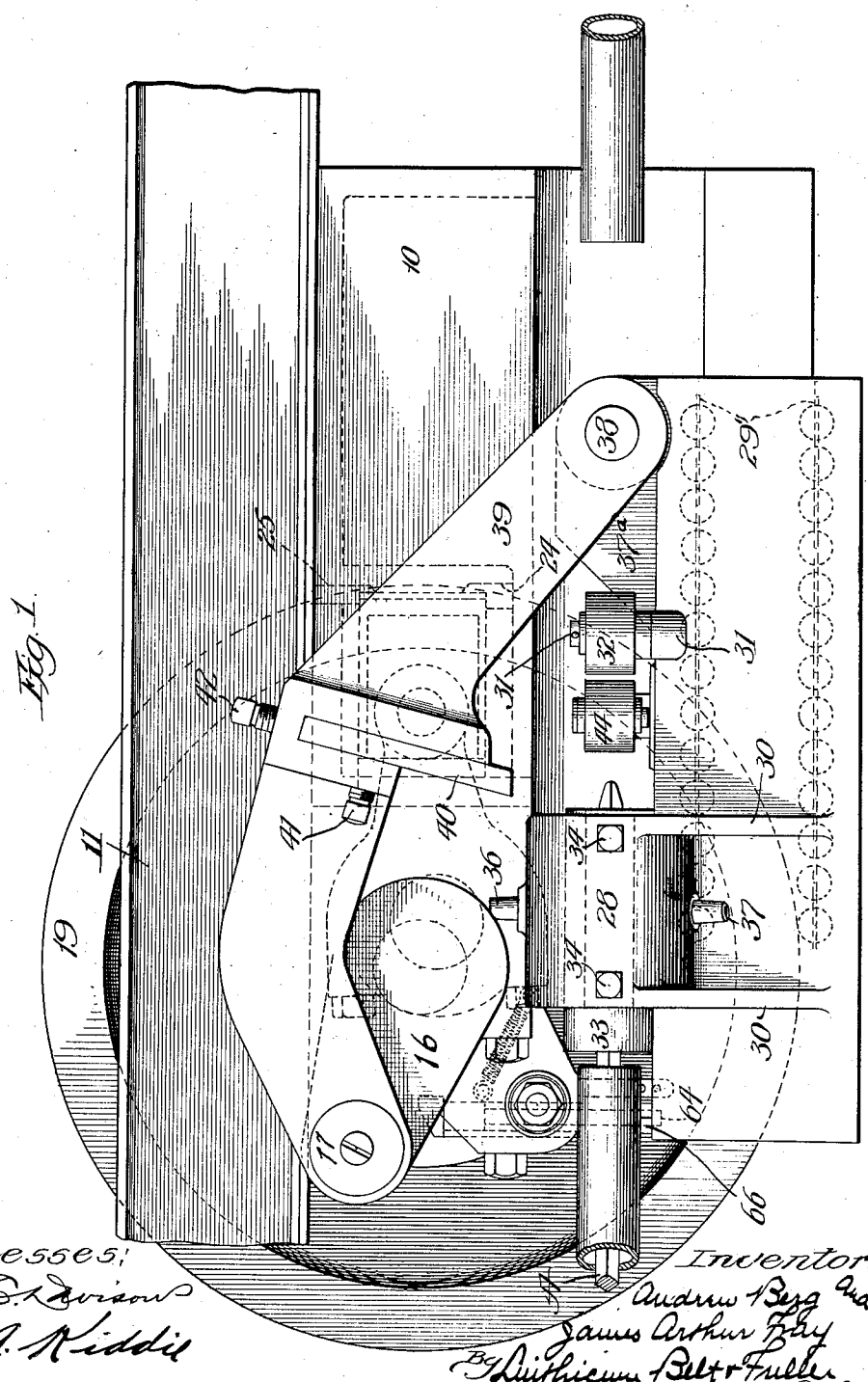

Fig. 1.

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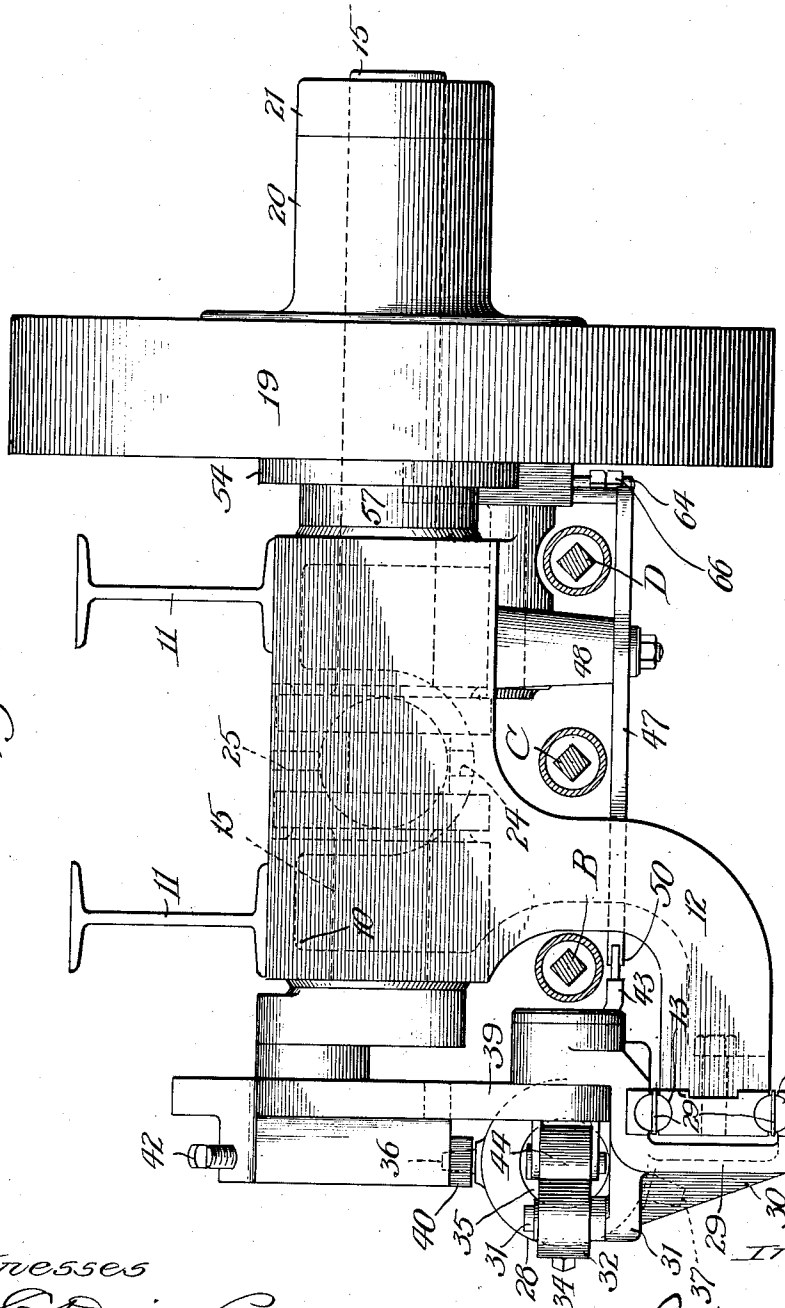
4 SHEETS—SHEET 2.

Fig. 2.



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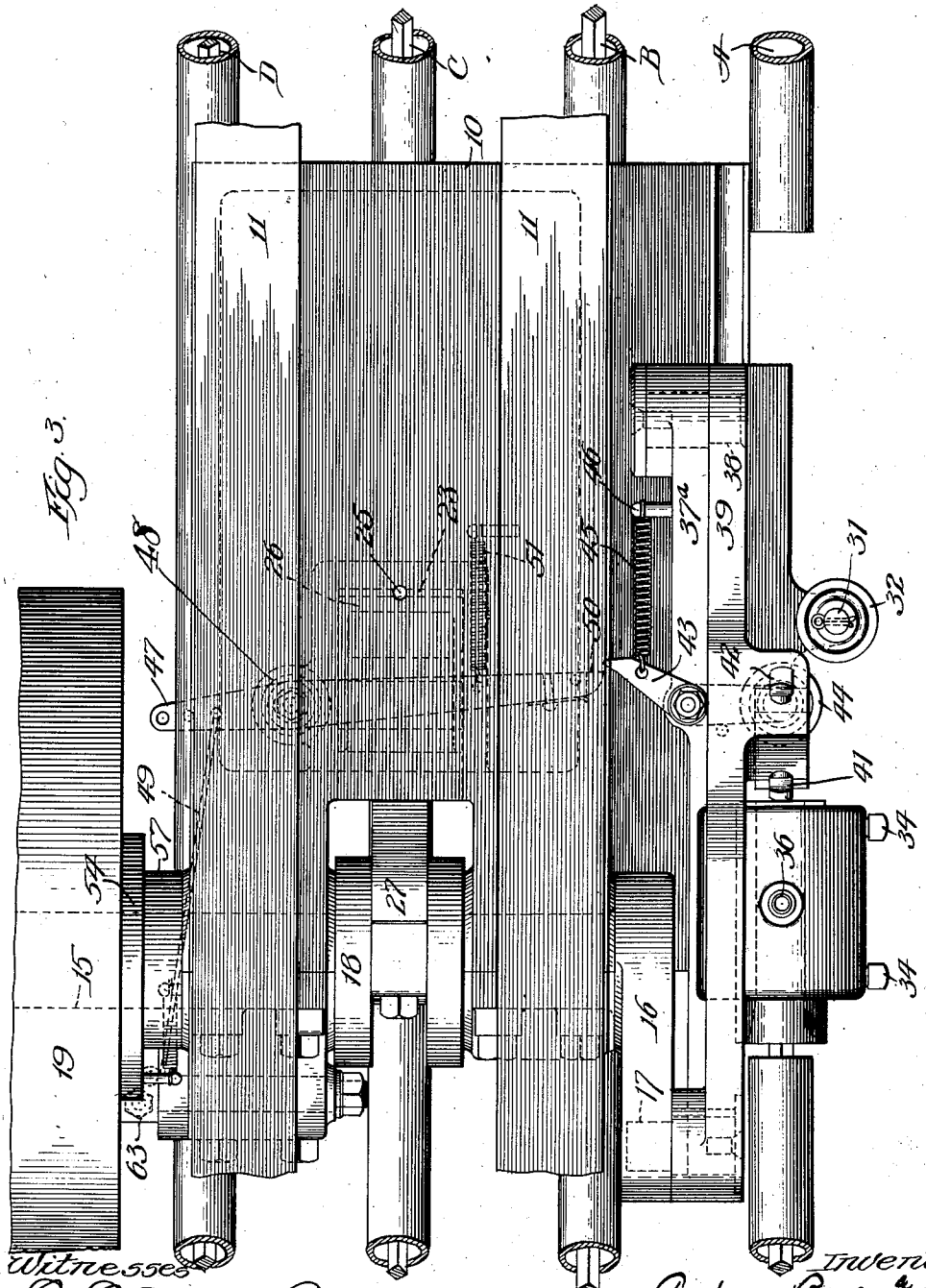
4 SHEETS—SHEET 3.

Fig. 3.



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4 SHEETS—SHEET 4.

Fig. 4

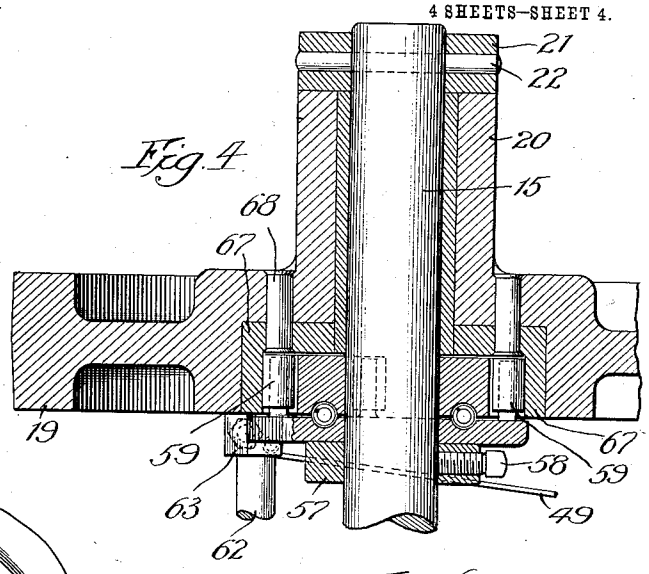


Fig. 5.

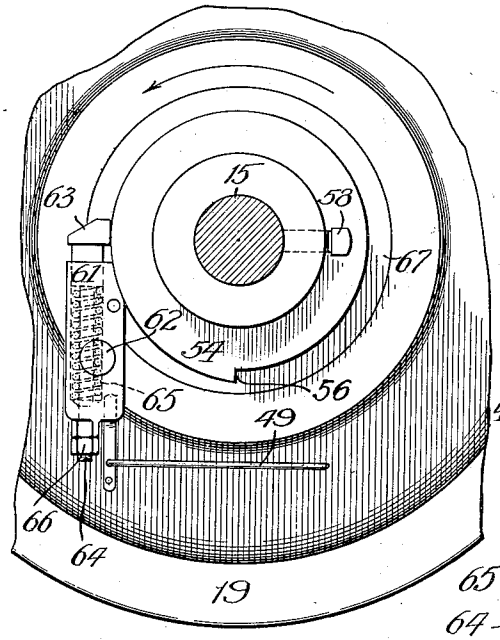
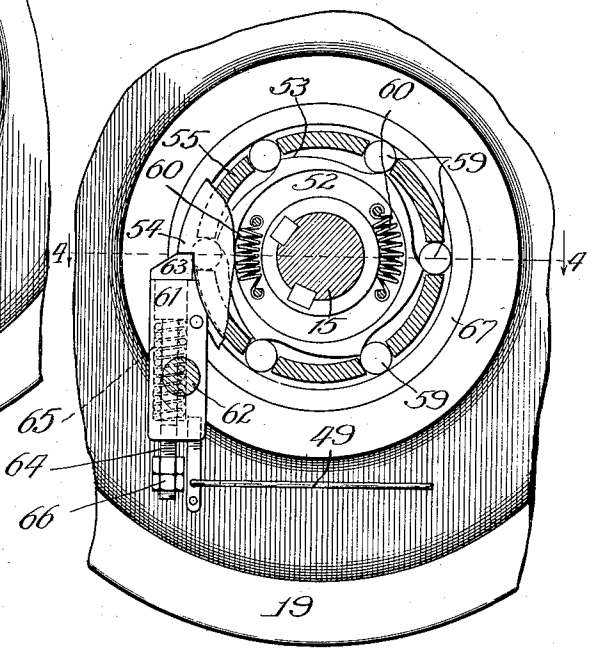


Fig. 6



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UNITED STATES PATENT OFFICE.

ANDREW BERG AND JAMES ARTHUR FRAY, OF BRIDGEPORT, CONNECTICUT, ASSIGNORS TO THE AMERICAN STEEL & WIRE COMPANY OF NEW JERSEY, OF WORCESTER, MASSACHUSETTS, A CORPORATION OF NEW JERSEY.

FLYING SHEARS.

1,010,571. Specification of Letters Patent. Patented Dec. 5, 1911.

Application filed July 25, 1910. Serial No. 573,626.

To all whom it may concern:

Be it known that we, ANDREW BERG and JAMES ARTHUR FRAY, both of the city of Bridgeport, county of Fairfield, in the State of Connecticut, have invented certain new and useful Improvements in Flying Shears, of which the following is a specification.

Our invention relates to devices for cropping the forward ends of bars or rods as they are delivered from the rolls in a wire or rod mill and to perform this operation without retarding the speed of travel of the product.

Various forms of such machines have been devised and our invention relates to such a device, which shall be of simple and durable construction.

Inasmuch as shears of this sort, which shall be of sufficient weight and rigidity to sever rods of suitable size, must of necessity start and stop with considerable shock, a further object is the provision of cushioning means in connection with the machine which shall be adapted to take up a portion of such shock.

A further object is the provision of an improved clutch which shall be adapted to cause a single revolution of the shearing mechanism and then operate to stop the same.

A further object is the provision of means for cooling the guide for the bar, including the shearing face or surface.

Our invention will be more readily understood by reference to the accompanying drawings, wherein;

Figure 1 is a side elevation showing a rod having entered the guide and projecting through the cutting face or shearing surface and about to contact the tripping mechanism which will start the shearing mechanism into operation. Fig. 2 is an end elevation of the device. Fig. 3 is a plan view. Fig. 4 is a sectional view showing in detail the friction clutch mechanism. Fig. 5 is a fragmentary side elevation of the fly wheel and outside of the clutch disk after the detent has been released, and Fig. 6 is a similar view, partly in section, showing the clutch mechanism in detail.

Referring more particularly to the drawings, it will be seen that the device is provided with a main frame or bed, 10, which is preferably suspended from the I-beam supports, 11. This frame member, 10, has a downwardly and outwardly extending integral portion, 12, which is provided at its extremity with top and bottom race-ways, 13, 14, for a purpose hereinafter described. Mounted within the frame, 10, by means of suitable bearings, I provide a shaft, 15, having on one end a crank arm, 16, and a crank pin, 17. Midway of its length, a further crank arm and pin, 18, are provided, for a purpose hereinafter described. On the overhung end of the shaft, 15, is revolubly mounted a fly wheel on driving pulley, 19, having a long bearing hub, 20, as best shown in Figs. 2 and 4. This wheel is secured on said shaft by means of the collar, 21, and pin, 22, both of the last mentioned parts being secured to the shaft, 15.

As will be seen by reference to Fig. 3, we have shown guides for four bars or rods, A, B, C, D, only one of which is acted upon by the device described. This arrangement would be used where a train or gang of shears is necessary to handle the product of rolls which were delivering more than one rod at a time, but inasmuch as the remainder of the shears would be the same as the one described herein, I have shown but one thereof.

The frame or bed, 10, is provided with a cylinder, 23, as an integral part thereof. This cylinder is provided with intake and exhaust orifices, 24, 25, respectively, as best shown in Figs. 2 and 3. These orifices are, in practice, provided with valves, which, forming no part of my invention, are not shown. A piston, 26, is mounted within the cylinder and is reciprocated by means of the connecting rod, 27, mounted on the crank arm, 18, midway of the length of the shaft, 15. As will be understood, the shock of starting and stopping the described mechanism is considerable and the air compressed within this cylinder is intended to act as a cushion to reduce the said shock.

A guide, 28, for the rod to be sheared, is mounted on anti-friction means, such as the balls, 29′, in the race-ways, 13, 14. This guide is supported on a long bearing member, 29, having supporting or strengthening ribs, 30. For further guiding the product after it has passed through the guide, 28, I provide on the upper surface of the portion, 29, a stud, 31, on which is mounted an anti-

friction guiding roller, 32. The guiding member, 28, has a concentric opening in which is mounted a member, 33, secured against rotation therein or withdrawal therefrom, by the set screws, 34. As will be seen, this member, 33, projects from the end of the member, 28, and provides the shearing surface or face, as at, 35. As this shearing face becomes worn at its lower edge, due to the shearing action, it may be turned slightly by loosening the set screws, 34, thus presenting a new shearing face.

In order to keep the member, 33, with its shearing face, 35, cool, we provide a water space or reservoir in the member, 28, water being supplied through the connection, 36, and discharged at, 37. On the forward end of the member, 29, we provide an upstanding lug, 37ª, having a pin, 38, to which is secured the arm, 39, which provides the connection between the reciprocating member, 28, and the crank arm, 16. Secured to the connecting rod, 39, by means of the set screws, 41, 42, is the shear blade, 40.

Mounted on the member, 29, is a rocker arm, 43, carrying on one end the roller, 44, and normally held in the position shown in Fig. 3, by means of the spring, 45, secured to a lug, 46, also secured to the member, 29. A rocker arm, 47, best shown in Fig. 3, mounted on a depending lug, 48, together with a rod, 49, provide a connection between the trip arm, 43, and the clutch mechanism about to be described. The rocker arm, 47, is provided at the point of contact with the arm, 43, with a hinged tip, 50, in roder to permit the arm, 43, to pass on its return movement. The arm, 47, is normally held in the position of Fig. 3, by means of the coiled spring, 51, shown in Fig. 3.

The clutch mechanism shown in Figs. 4, 5 and 6, is composed of a member, 52, keyed to the shaft, 15, and having on its periphery a plurality of cam surfaces or ways, 53. Loosely mounted on the shaft is the disk, 54, having the integral, inwardly extending, segmental portions, 55, and having in its periphery a shoulder, 56, as shown in Fig. 5. This disk is held against longitudinal movement in one direction by means of the collar, 57, and set screw, 58. Interposed between the segmental, inwardly extending portions, 55, we provide rollers, 59. Springs, 60, fastened on one end to the portion, 52, and on the other end to the disk, 54, tend to rotate the parts, 52, and 54, in opposite directions; that is, they tend to force the part, 52, clockwise and the part, 54, counter-clockwise, which would cause the rollers, 59, to ride up the cam surfaces, 53, and wedge between the said surfaces and the inner surface of the wheel, 19. This action is prevented, however, by the detent which is mounted for oscillation on a part of the bed or frame of the machine by means of the pin, 62. This detent is composed of the main member, 61, having a longitudinal opening therein, in which is mounted a spring-pressed portion, 63, having a shank, 64, a spring, 65, and adjusting nuts, 66. The portion, 63, is normally held in the position shown in Fig. 5, but in order to lessen the shock caused by the sudden stoppage of the disk, 54, occasioned by the contact of the shoulder, 56, with the detent, the part is spring mounted in order to cushion the same. This is best shown in Fig. 6, wherein the part, 54, has just been stopped by the detent, the spring being depressed to its full extent. In order to provide a wearing surface for the interior of the fly wheel, 19, I provide the insert or wearing face, 67, which may be renewed at times if necessary. This is secured within the wheel center by means of the rivets, 68, or any other suitable means.

The operation of my shear may be described as follows: Assume a rod passing through the machine, as shown in Fig. 1. The parts, as shown in Fig. 1, are all inactive with the exception of the fly wheel, 19, which is constantly revolving at a high speed. As the rod, which I will designate as, A, advances farther, it contacts the roller, 44, mounted on the rocker, 43, this rocker arm contacting the end, 50, of the lever, 47, turning on its pivot and exerting a pull on the rod, 49. The pull on the rod, 49, rocks the detent, 61, on its pivot, 62, and releases the disk, 54. The springs, 60, thereupon instantly cause the part, 54, to travel in the direction of the arrow, (Fig. 5) thus carrying the rollers, 59, with it and wedging said rollers between the inclined surface, 53, of the part, 52, and the part, 67, of the wheel 19. This causes the rotation of the shaft, 15, with the wheel, 19, which continues until the disk, 54, travels one complete revolution, when the shoulder, 56, thereon, contacts the detent, 61, and stops the disk, 54, thus stopping the rollers, 59, and forcing them into the larger part of the inclined surface, 53, upon the part, 52. At this time, the stroke of the shaft has caused the piston, 26, to travel in the cylinder, 23, and to take up the greater portion of the acquired momentum of the parts, but any additional force is taken up and the shaft and associated parts abruptly stopped by contact of the rollers and the parts, 54, and 55, with the enlarged portions of the inclined ways, 53. This shock is transmitted by the springs, 65, to the pivot, 62, and thence to the main bed.

As will be seen by reference to Fig. 1, the shaft in its rotation causes the turning of the crank arm, 16, and as this motion is transmitted to the knife-carrying, connecting rod, 39, the guide and shearing face are caused to travel in the direction of the moving rod and at the same speed thereof. As

the parts travel forward, the connecting rod will descend, carrying the knife, 40, with it and at the lowest point in its travel, will have severed the front end portion of the rod, A. The travel is continued until the crank arm is carried past the center and begins to rise, when the knife will be lifted out of the way and the parts will return to the position shown in Fig. 1, and be stopped abruptly at that point, the roller, 44, meantime being held against the traveling product. As the rear end of the bar runs through the machine, the rocker, 43, with its roller, 44, will be returned, the spring point, 50, of the part, 47, allowing this to occur.

Inasmuch as various modifications of our invention will readily suggest themselves to those skilled in the art, we do not limit ourselves to the precise construction herein shown and described.

We claim:

1. In a flying shear mechanism, the combination of means adapted to travel with the material to be severed, a first shear element mounted on said means, a second shear element co-acting with said first element and means to operate said second element, including a constantly moving driving part and a clutch adapted to operatively connect said part to the second shear element, and means controlled by the material to be cut, governing the actuation of said clutch, substantially as described.

2. In a flying shear mechanism, the combination of means adapted to travel with the material to be severed, a first shear element mounted on said means, a second shear element co-acting with said first element and means to operate said second element and said traveling means, including a constantly moving driving part, and a clutch adapted to operatively connect said part to the second shear element and said traveling means, and means controlled by the material to be cut, governing the actuation of said clutch, substantially as described.

3. In a flying shear mechanism, the combination of a reciprocatory slide adapted to travel with the material to be severed, a shear element mounted thereon, a constantly rotating part, a rotary shaft, a crank arm on said shaft, a rod connecting said crank arm to said slide, a second shear element on said connecting rod and adapted to coöperate with said first shear element to sever the material while the latter is traveling, a clutch between said constantly rotating part and said rotary shaft and means governed by the movement of the material to be severed, controlling the actuation of said clutch, substantially as described.

4. In a flying shear mechanism, the combination of a shear device, a driving mechanism for said shear device, including a clutch, a spring actuated means governing the operation of said clutch, a catch co-acting with said spring actuating means, and means controlled by the movement of the material to be severed, adapted to operate said catch, substantially as described.

5. In a flying shear mechanism, the combination of a shear device, a driving device for said shear device including a clutch, a spring actuated means governing the operation of said clutch, a catch co-acting with said spring actuated means and a shock absorbing means associated with said catch, and means controlled by the movement of the material to be severed, adapted to operate said catch, substantially as described.

6. In a flying shear mechanism, the combination of a shear device, a constantly rotating member, a rotary shaft, means connecting said shaft with said shear device, a plurality of rollers between said constantly rotating member and said saft, coöperating with cam surfaces on one of said parts, spring actuated means adapted to shift the position of said rollers on the cam tracks, whereby to clutch said constantly rotating member to said shaft and unclutch it therefrom, a catch coöperating with said spring actuated member and means controlled by the movement of the material to be severed, adapted to operate said catch, substantially as described.

7. In a flying shear mechanism, the combination of means adapted to travel with the material to be severed, a first shear element mounted on said means, a second shear element adapted to move with said traveling means and co-acting with said first shear element to sever the material, and means to operate said second shear element and traveling means, including a clutch, a rotary, spring actuated, shouldered disk, having means to render said clutch operative and inoperative, an oscillatory catch coöperating with the shoulder of said disk, and means to regulate said catch, said means being controlled by the movement of the material to be severed, substantially as described.

8. A device for severing rolled product, comprising in combination, a frame, a shaft having a crank arm, a reciprocating guide for said product, a shear mounted on said connecting rod between said crank arm and said reciprocating member, and means for causing a single revolution of said shaft intermittently, substantially as described.

9. A device of the class described, comprising in combination, a frame, a shaft mounted in said frame, a reciprocating guide or carrier mounted on said frame, means connecting said shaft with said guide or carrier, a revolving member mounted on said frame, a clutch between said revolving member and said shaft and means interposed in

the path of a rolled product tending to operate the clutch between said revolving member and said shaft, substantially as described.

10. A device of the class described, comprising, in combination, a frame portion having a shaft mounted therein, a reciprocating guide also mounted on said frame, a connecting rod between said guide and said shaft, a shear carried by said connecting rod, a constantly revolving member secured to said frame and means for intermittently operating said shaft and said shear by means of a clutch interposed between said constantly revolving member and said shaft, substantially as described.

11. A flying shear, comprising, in combination, a frame and a shaft mounted for intermittent rotation therein, a reciprocating guide or carrier mounted on said frame, a crank arm mounted on said shaft and a connecting rod between said crank arm and said reciprocating guide, a constantly revolving member mounted on said frame, a friction clutch between said revolving member and said shaft and means carried by said reciprocating member normally in the path of the product to be sheared, whereby said clutch is operated to produce a single revolution of said shaft, substantially as described.

12. A device for shearing hot rolled product, comprising a frame, a shaft rotatably mounted therein, said shaft being provided with a crank arm, a reciprocating member mounted on said frame and serving as a guide for the product to be sheared, a connecting rod between said crank arm and said reciprocating member, said connecting rod carrying a shear blade, a tripping roller carried by said reciprocating member and adapted to connect said shaft with a source of supply, substantially as described.

13. A device for shearing the ends of rolled product without retarding the speed thereof, which comprises, in combination, a frame, a rotatable shaft having a crank arm carried by said frame, a reciprocating guide or carrier for said product during the shearing operation, a connecting rod between said crank arm and said reciprocating member, said connecting rod carrying a shear blade, a constantly revolving fly wheel mounted on said frame, a friction clutch between said wheel and said shaft and means carried by said reciprocating member adapted to operate said friction clutch, substantially as described.

14. A device for shearing the ends of rolled product without retarding the speed thereof, which comprises in combination, a frame, a rotatable shaft having a crank arm carried by said frame, a reciprocating guide or carrier for said product during the shearing operation, a connecting rod between said crank arm and said reciprocating member, said connecting rod carrying a shear blade, a constantly revolving fly wheel mounted on said frame, a friction clutch between said wheel and said shaft and means carried by said reciprocating member adapted to operate said friction clutch and cushioning means carried in said frame and operated by said shaft, substantially as described.

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