June 20, 1944. M. MORGAN 2,351,868

SHEAR

Filed Nov. 21, 1941 2 Sheets-Sheet 1

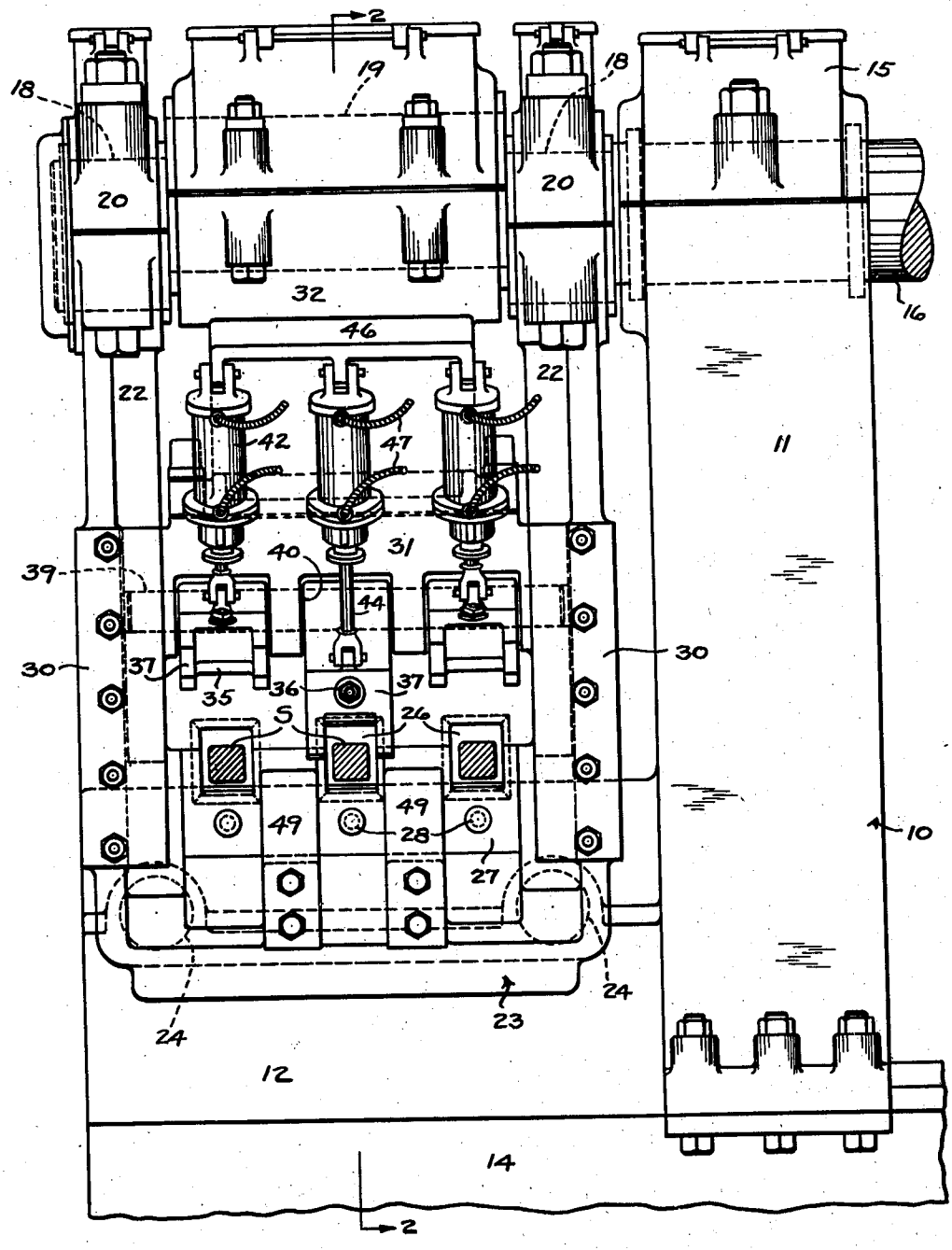



Fig. 1

INVENTOR
MYLES MORGAN
BY Albert G. Blodgett
ATTORNEY

June 20, 1944. M. MORGAN 2,351,868

SHEAR

Filed Nov. 21, 1941 2 Sheets-Sheet 2

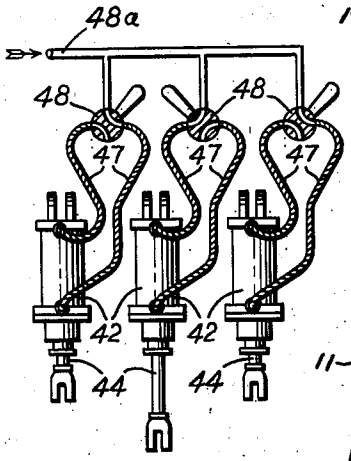



Fig. 3

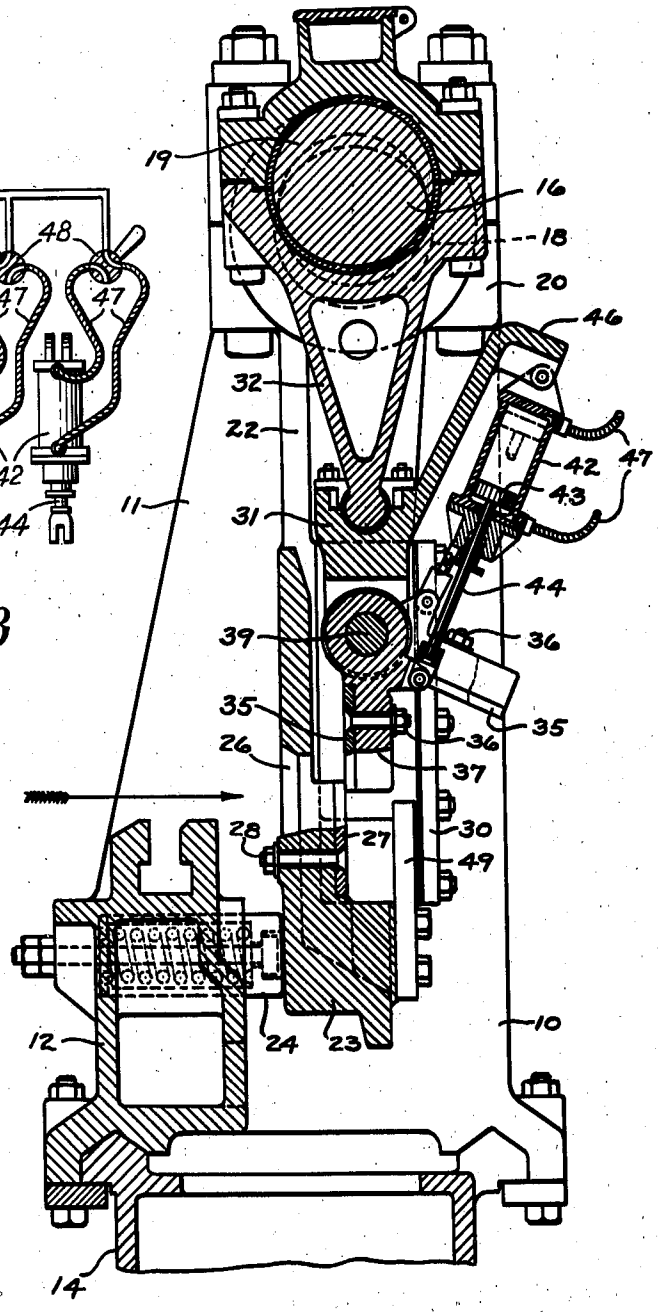



Fig. 2

INVENTOR
MYLES MORGAN
BY Albert G. Blodgett
ATTORNEY

Patented June 20, 1944

2,351,868

# UNITED STATES PATENT OFFICE

2,351,868

## SHEAR

Myles Morgan, Worcester, Mass., assignor to Morgan Construction Company, Worcester, Mass., a corporation of Massachusetts

Application November 21, 1941, Serial No. 419,845

20 Claims. (Cl. 164—47)

This invention relates to shears, and more particularly to machines for cutting up elongated metal bars.

In the production of certain rolled metal products it is a common practice to employ a rolling mill having a plurality of pass lines, and to supply the mill with a separate strand of material for each pass line. Thus there may be two or more lines of hot metal billets approaching a rolling mill in parallel substantially horizontal paths. The ends of each billet may need to be cropped, and it may also be necessary to cut each billet into a plurality of separate pieces so that the final rolled product may be of a desired length or weight. Furthermore, these cuts must be made on one billet at a time and without interfering with laterally adjacent billets, since the billets in one pass line overlap those in the other pass line. In some cases the billets may be of large cross-section, so that the shear must be of a heavy power-actuated type. Ordinarily, the cuts will have to be made without interrupting the forward longitudinal travel of the stock. While many different types of shears have been known heretofore, none of these prior machines has been suitable for use under such circumstances.

It is accordingly one object of the invention to provide a power-actuated shear of rugged and dependable construction capable of cutting any selected one or more of a plurality of parallel bars.

It is a further object of the invention to provide a power-actuated shear particularly adapted for installation at the inlet side of a multiple strand rolling mill and capable of cutting any selected strand of the stock approaching the mill.

It is a further object of the invention to provide a shear of compact construction adapted for installation in the comparatively small space available between a heating furnace and the first stand of a multiple strand rolling mill to cut individual strands of the stock selectively.

With these and other objects in view, as will be apparent to those skilled in the art, the invention resides in the combination of parts set forth in the specification and covered by the claims appended hereto.

Referring to the drawings illustrating one embodiment of the invention and in which like reference numerals indicate like parts,

Fig. 1 is an elevation of a shear, viewed from the rear or discharge side;

Fig. 2 is a section taken on the line 2—2 of Fig. 1; and

Fig. 3 is a diagram showing certain control valves.

The embodiment illustrated comprises an L-shaped stand or unitary frame 10 including an upright column 11 and a laterally extending base portion 12. This stand is mounted for lateral sliding movement in known manner on a suitable subbase 14. At the upper end of the column 11 there is provided a bearing 15 (Fig. 1) for a horizontal rotatable drive shaft 16 which extends through the bearing and overlies the base portion 12. This extended part of the shaft is shaped to provide two axially spaced and aligned eccentrics 18 with an additional eccentric 19 between them and diametrically opposed thereto. The eccentrics 18 are surrounded by bearings 20 on the upper ends of the upwardly extending branches 22 of a U-shaped frame 23. This frame depends from the shaft 16 and is free to swing forwardly in the direction of stock travel, rearward swinging movement being limited by a pair of spring bumpers 24 carried by the base portion 12. The swing frame 23 is provided with three openings 26 (Fig. 1) for the passage of three parallel horizontal strands or bars of stock S therethrough. A knife 27 is attached to the lower portion of the frame 23 beneath the openings 26 by means of bolts 28, this knife being suitably notched in its upper edge to register with the openings. While the knife 27 is, preferably, made from a single piece of material, it is obvious that a separately formed knife might be used for each strand.

The upright sides 22 of the swinging frame 23 are provided with gibs 30 and are otherwise so constructed as to form vertically extending channels or guideways within which a carrier in the form of a crosshead 31 may slide. This crosshead is connected to the eccentric 19 thereabove by a pitman or connecting rod 32 of suitable construction, these parts being so arranged that as the shaft 16 makes one revolution the crosshead will slide first downwardly and then upwardly in the frame 23. At the same time the eccentrics 18 will cause the frame 23 and knife 27 to move first upwardly and then downwardly. Thus the crosshead 31 will approach the knife 27 and then recede therefrom.

The crosshead 31 carries three laterally adjacent knives 35, one for each strand of the stock, and these knives are arranged to be retracted individually, so that any selected knife may be left unretracted and thus held in operative position to sever the corresponding strand. For this purpose each of the upper knives 35 is fastened by means of a bolt 36 to a knife block 37, and all three of these knife blocks are pivotally supported at their upper ends on a transverse hori-

zontal shaft or bar 39 mounted in the crosshead 31. As shown particularly in Fig. 1, the crosshead is provided with separate recesses 40 to receive the blocks 37, so that the shaft 39 may be adequately supported between the blocks. Adjacent each knife block there is provided a fluid motor comprising a cylinder 42, a piston 43 slidable therein, and a piston rod 44 extending downwardly from the piston. The cylinders are pivotally connected at their upper ends to a bracket 46 which projects upwardly and rearwardly from the crosshead 31. The piston rods are pivotally connected at their lower ends to the corresponding knife blocks 37. Flexible tubes 47 are connected to the cylinders, and these tubes may lead to suitable four-way valves 48 (Fig. 3) of well-known construction for controlling the flow of pressure fluid to the motors from a supply pipe 48a. It will be apparent that the motors provide a convenient and dependable mechanism for swinging the knives 35 about the shaft 39 into their operative or inoperative positions.

It will be noted from Fig. 2 that when one of the knives 35 is lowered to its operative position, its lateral portions will slightly overlap the lower knife 27 at each side of the stock, even though the crosshead 31 is fully raised. Hence there is no danger of the knives failing to slide over one another properly during the cutting stroke. As a further precaution to ensure proper cooperating action of the knives, a guide plate 49 is secured to the rear face of the swinging frame 23 between each pair of upper knives 35. As the upper knife descends, it will be held firmly against the lower knife by the adjacent guide plate.

The operation of the invention will now be apparent from the above disclosure. The shaft 16 will normally remain stationary in the position shown in the drawings, so that the three strands of stock may travel freely through the openings 26. If one of the strands (say the middle strand) is to be severed, the corresponding upper knife block 37 will be swung downwardly by admitting pressure fluid to the upper end of its cylinder 42. Then at the proper time the shaft 16 will be given one complete revolution in known manner through the medium of a suitable clutch, causing the knives to approach one another and cut the middle strand of stock between them. The other upper knives will remain in their retracted positions so that they will not engage the strand beneath them. During the cutting operation the frame 23 is free to swing with the stock so that the movement thereof will not be retarded, and as the knives separate once more the frame will swing back by gravity against the bumpers 24.

The shear is of a rugged and dependable construction adapted to cut comparatively heavy metal bars in a multiple strand mill. Any desired strand may be cut separately without interfering with the remaining strands. The shear requires comparatively little space in the direction of stock travel, and it is therefore well suited for installation between the heating furnace and the first stand of a rolling mill.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

1. A shear for the selective cutting of a plurality of parallel strands extending simultaneously through the shear comprising a unitary frame, a unitary movable carrier supported by the frame and extending transversely of said strands, a plurality of knives mounted in laterally adjacent positions on the carrier and opposite the respective strands, each knife being movable relative to the carrier between an operative position on the carrier and an inoperative position on the carrier, and power driven means mounted on the frame and connected to the carrier to actuate the same and cause such of the knives as are in their operative positions to sever the corresponding strands.

2. A shear for the selective cutting of a plurality of parallel strands extending simultaneously through the shear comprising a unitary frame, a unitary movable carrier supported by the frame and extending transversely of said strands, a plurality of knives mounted in laterally adjacent positions on the carrier and opposite the respective strands, power driven means mounted on the frame and connected to the carrier to actuate the same and cause the knives to sever the corresponding strands, and means to retract each knife selectively to an inoperative position on the carrier so that only a selected strand or strands will be severed when the carrier is actuated.

3. A shear for the selective cutting of a plurality of parallel strands extending simultaneously through the shear comprising a unitary frame, a unitary movable carrier supported by the frame and extending transversely of said strands, a plurality of knives mounted in laterally adjacent positions on the carrier and opposite the respective strands, power driven means mounted on the frame and connected to the carrier to actuate the same and cause the knives to sever the corresponding strands, and a separate motor connected to each knife to retract the same relative to the carrier so that only a selected strand or strands will be severed when the carrier is actuated.

4. A shear for the selective cutting of a plurality of parallel strands extending simultaneously through the shear comprising a unitary frame, a unitary carrier supported by the frame and extending transversely of said strands, the carrier being mounted for reciprocation toward and away from the strands, a plurality of knives mounted in laterally adjacent positions on the carrier and opposite the respective strands, power driven means mounted on the frame and connected to the carrier to reciprocate the same and cause the knives to sever the corresponding strands, and means to retract each knife selectively to an inoperative position on the carrier so that only a selected strand or strands will be severed when the carrier is reciprocated.

5. A shear for the selective cutting of a plurality of parallel strands extending simultaneously through the shear comprising a unitary frame, a unitary carrier supported by the frame and extending transversely of said strands, the carrier being mounted for reciprocation toward and away from the strands, a plurality of knives pivotally mounted in laterally adjacent positions on the carrier and opposite the respective strands, power driven means mounted on the frame and connected to the carrier to reciprocate the same and cause the knives to sever the corresponding strands, and means to retract each knife selectively by swinging it about its pivot to an inoperative position on the carrier so that only a selected strand or strands will be severed when the carrier is reciprocated.

6. A shear for the selective cutting of a plurality of parallel substantially horizontal strands extending simultaneously through the shear comprising a unitary frame, a substantially horizontal unitary movable carrier supported by the frame and extending transversely of said strands,

a plurality of knives mounted in laterally adjacent positions on the carrier and opposite the respective strands, each knife being movable relative to the carrier between an operative position on the carrier and an inoperative position on the carrier, and power driven means mounted on the frame and connected to the carrier to actuate the same and cause such of the knives as are in their operative positions to sever the corresponding strands.

7. A shear for the selective cutting of a plurality of parallel substantially horizontal strands extending simultaneously through the shear comprising a unitary frame, a substantially horizontal unitary movable carrier supported by the frame and extending transversely of said strands, a plurality of knives mounted in laterally adjacent positions on the carrier and opposite the respective strands, power driven means mounted on the frame and connected to the carrier to actuate the same and cause the knives to sever the corresponding strands, and means to retract each knife selectively to an inoperative position on the carrier so that only a selected strand or strands will be severed when the carrier is actuated.

8. A shear for the selective cutting of a plurality of parallel substantially horizontal strands extending simultaneously through the shear comprising a unitary frame, a substantially horizontal unitary movable carrier supported by the frame and extending transversely of said strands, a plurality of knives mounted in laterally adjacent positions on the carrier and opposite the respective strands, power driven means mounted on the frame and connected to the carrier to actuate the same and cause the knives to sever the corresponding strands, and a separate motor connected to each knife to retract the same relative to the carrier so that only a selected strand or strands will be severed when the carrier is actuated.

9. A shear for the selective cutting of a plurality of parallel substantially horizontal strands extending simultaneously through the shear comprising a unitary frame, a substantially horizontal unitary movable carrier supported by the frame and extending transversely of said strands, the carrier being mounted for reciprocation toward and away from the strands, a plurality of knives mounted in laterally adjacent positions on the carrier and opposite the respective strands, power driven means mounted on the frame and connected to the carrier to reciprocate the same and cause the knives to sever the corresponding strands, and means to retract each knife selectively to an inoperative position on the carrier so that only a selected strand or strands will be severed when the carrier is reciprocated.

10. A shear for the selective cutting of a plurality of parallel substantially horizontal strands extending simultaneously through the shear comprising a unitary frame, a substantially horizontal unitary movable carrier supported by the frame and extending transversely of said strands, the carrier being mounted for reciprocation toward and away from the strands, a plurality of knives pivotally mounted in laterally adjacent positions on the carrier and opposite the respective strands, power driven means mounted on the frame and connected to the carrier to reciprocate the same and cause the knives to sever the corresponding strands, and means to retract each knife selectively by swinging it about its pivot to an inoperative position on the carrier so that only a selected strand or strands will be severed when the carrier is reciprocated.

11. A shear for the selective cutting of a plurality of parallel substantially horizontal strands extending simultaneously through the shear comprising a frame, a substantially horizontal unitary movable upper carrier supported by the frame, the carrier extending transversely above the strands, a plurality of knives mounted in laterally adjacent positions on the carrier and above the respective strands, each knife being movable relative to the carrier between an operative position on the carrier and an inoperative position on the carrier, and power driven means mounted on the frame and connected to the carrier to actuate the same and cause such of the knives as are in their operative positions to sever the corresponding strands.

12. A shear for the selective cutting of a plurality of parallel substantially horizontal strands extending simultaneously through the shear comprising a frame, a substantially horizontal unitary movable upper carrier supported by the frame, the carrier extending transversely above the strands, a plurality of knives mounted in laterally adjacent positions on the carrier and above the respective strands, power driven means mounted on the frame and connected to the carrier to actuate the same and cause the knives to sever the corresponding strands, and means to retract each knife selectively to an inoperative position on the carrier so that only a selected strand or strands will be severed when the carrier is actuated.

13. A shear for the selective cutting of a plurality of parallel substantially horizontal strands extending simultaneously through the shear comprising a frame, a substantially horizontal unitary movable upper carrier supported by the frame, the carrier extending transversely above the strands, a plurality of knives mounted in laterally adjacent positions on the carrier and above the respective strands, power means mounted on the frame and connected to the carrier to actuate the same and cause the knives to sever the corresponding strands, and a separate motor connected to each knife to retract the same relative to the carrier so that only a selected strand or strands will be severed when the carrier is actuated.

14. A shear for the selective cutting of a plurality of parallel substantially horizontal strands extending simultaneously through the shear comprising a frame, a substantially horizontal unitary upper carrier supported by the frame and extending transversely above the strands, the carrier being mounted for reciprocation toward and away from the strands, a plurality of knives mounted in laterally adjacent positions on the carrier and above the respective strands, power driven means mounted on the frame and connected to the carrier to reciprocate the same and cause the knives to sever the corresponding strands, and means to retract each knife selectively to an inoperative position on the carrier so that only a selected strand or strands will be severed when the carrier is reciprocated.

15. A shear for the selective cutting of a plurality of parallel substantially horizontal strands extending simultaneously through the shear comprising a frame, a substantially horizontal unitary upper carrier supported by the frame and extending transversely above the strands, the carrier being mounted for reciprocation toward and away from the strands, a plurality of knives piv-

otally mounted in laterally adjacent positions on the carrier and above the respective strands, power driven means mounted on the frame and connected to the carrier to reciprocate the same and cause the knives to sever the corresponding strands, and means to retract each knife selectively by swinging it about its pivot to an inoperative position on the carrier so that only a selected strand or strands will be severed when the carrier is reciprocated.

16. A shear for the selective cutting of a plurality of parallel substantially horizontal strands extending simultaneously through the shear comprising a frame, a vertically reciprocable and substantially horizontal unitary upper carrier supported by the frame and extending transversely above the strands, a plurality of upper knives mounted in laterally adjacent positions on the carrier and above the respective strands, lower knife means beneath the strands, power driven means mounted on the frame and connected to the carrier to actuate the same so that each strand may be severed by the cooperative action of the corresponding upper knife and the lower knife means, and means to retract each upper knife selectively to an inoperative position on the carrier so that only a selected strand or strands will be severed when the carrier is actuated.

17. A shear for the selective cutting of a plurality of parallel substantially horizontal strands extending simultaneously through the shear comprising a frame, a vertically reciprocable and substantially horizontal unitary upper carrier supported by the frame and extending transversely above the strands, a plurality of upper knives mounted in laterally adjacent positions on the carrier and above the respective strands, vertically reciprocable lower knife means beneath the strands, power driven means mounted on the frame and connected to both the carrier and the lower knife means to actuate the same simultaneously so that each strand may be severed by the cooperative action of the corresponding upper knife and the lower knife means, and means to retract each upper knife selectively to an inoperative position on the carrier so that only a selected strand or strands will be severed when the carrier is actuated.

18. A shear for the selective cutting of a plurality of parallel substantially horizontal strands comprising a horizontal rotatable drive shaft extending transversely above the strands and provided with two axially spaced and aligned eccentrics, a U-shaped frame depending from the eccentrics with its bottom portion beneath the strands, lower knife means on the said bottom portion, a crosshead above the strands and slidable vertically in the said frame, the drive shaft having a third eccentric between the axially spaced eccentrics and opposed thereto, a pitman connecting the third eccentric to the crosshead, a separate upper knife mounted on the crosshead above each strand, and means to retract each upper knife selectively relative to the crosshead so that only a selected strand will be severed when the drive shaft is rotated.

19. A shear for the selective cutting of a plurality of parallel substantially horizontal strands comprising a horizontal rotatable drive shaft extending transversely above the strands and provided with two axially spaced and aligned eccentrics, a U-shaped frame depending from the eccentrics with its bottom portion beneath the strands, lower knife means on the said bottom portion, a crosshead above the strands and slidable vertically in the said frame, the drive shaft having a third eccentric between the axially spaced eccentrics and opposed thereto, a pitman connecting the third eccentric to the crosshead, a transverse horizontal shaft mounted on the crosshead, a separate upper knife pivotally mounted on the last-mentioned shaft above each strand, and a separate motor mounted on the crosshead for each upper knife and connected thereto so that each upper knife may be swung selectively into an inoperative position and only a selected strand will be severed when the drive shaft is rotated.

20. A shear for the selective cutting of a plurality of parallel substantially horizontal strands comprising a horizontal rotatable drive shaft extending transversely above the strands and provided with two axially spaced and aligned eccentrics, a U-shaped frame depending from the eccentrics with its bottom portion beneath the strands, lower knife means on the said bottom portion, a crosshead above the strands and slidable vertically in the said frame, the drive shaft having a third eccentric between the axially spaced eccentrics and opposed thereto, a pitman connecting the third eccentric to the crosshead, the crosshead having a recess therein above each strand, a transverse horizontal shaft mounted on the crosshead and extending across the recesses, a knife block pivotally mounted on the last-mentioned shaft within each recess, an upper knife secured to each knife block, and a separate fluid motor mounted on the crosshead for each knife block and connected thereto so that each upper knife may be swung selectively into an inoperative position and only a selected strand will be severed when the drive shaft is rotated.

MYLES MORGAN.