

June 10, 1952

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2,600,224

TOOL FOR TENSIONING AND CUTTING BINDING STRAPS

Filed Jan. 4, 1950

2 SHEETS—SHEET 1

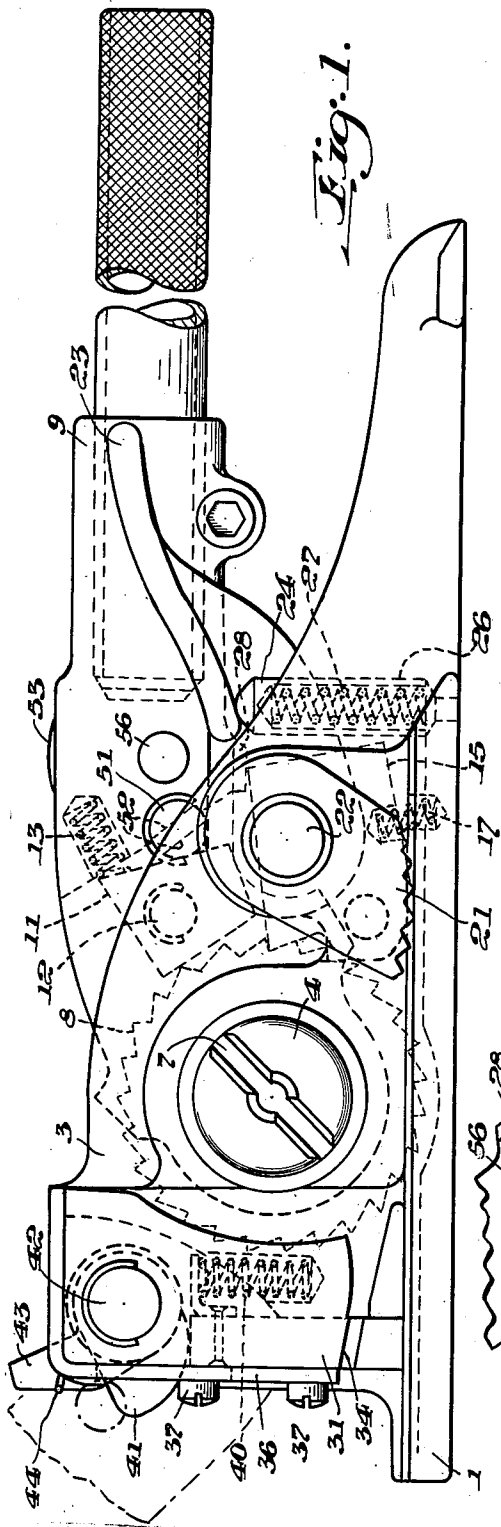


Fig. 1.

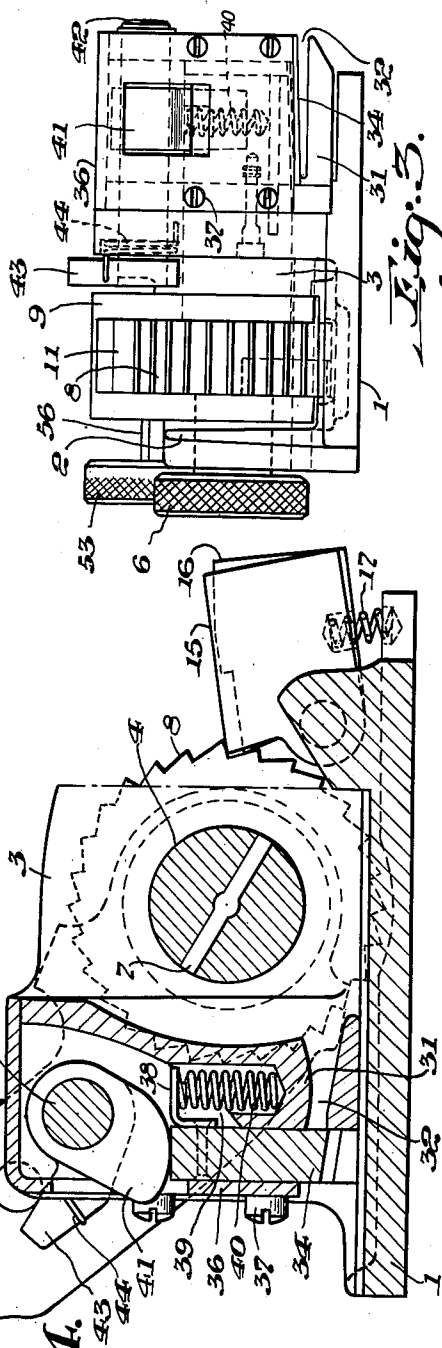


Fig. 3.

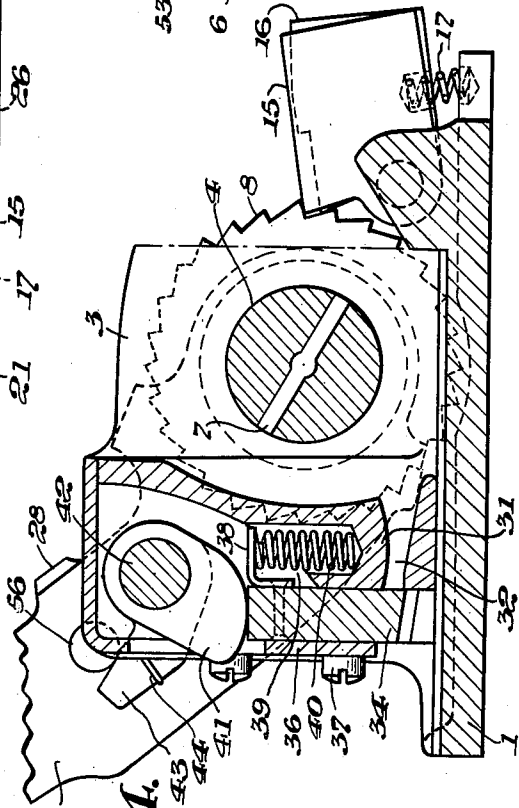


Fig. 4.

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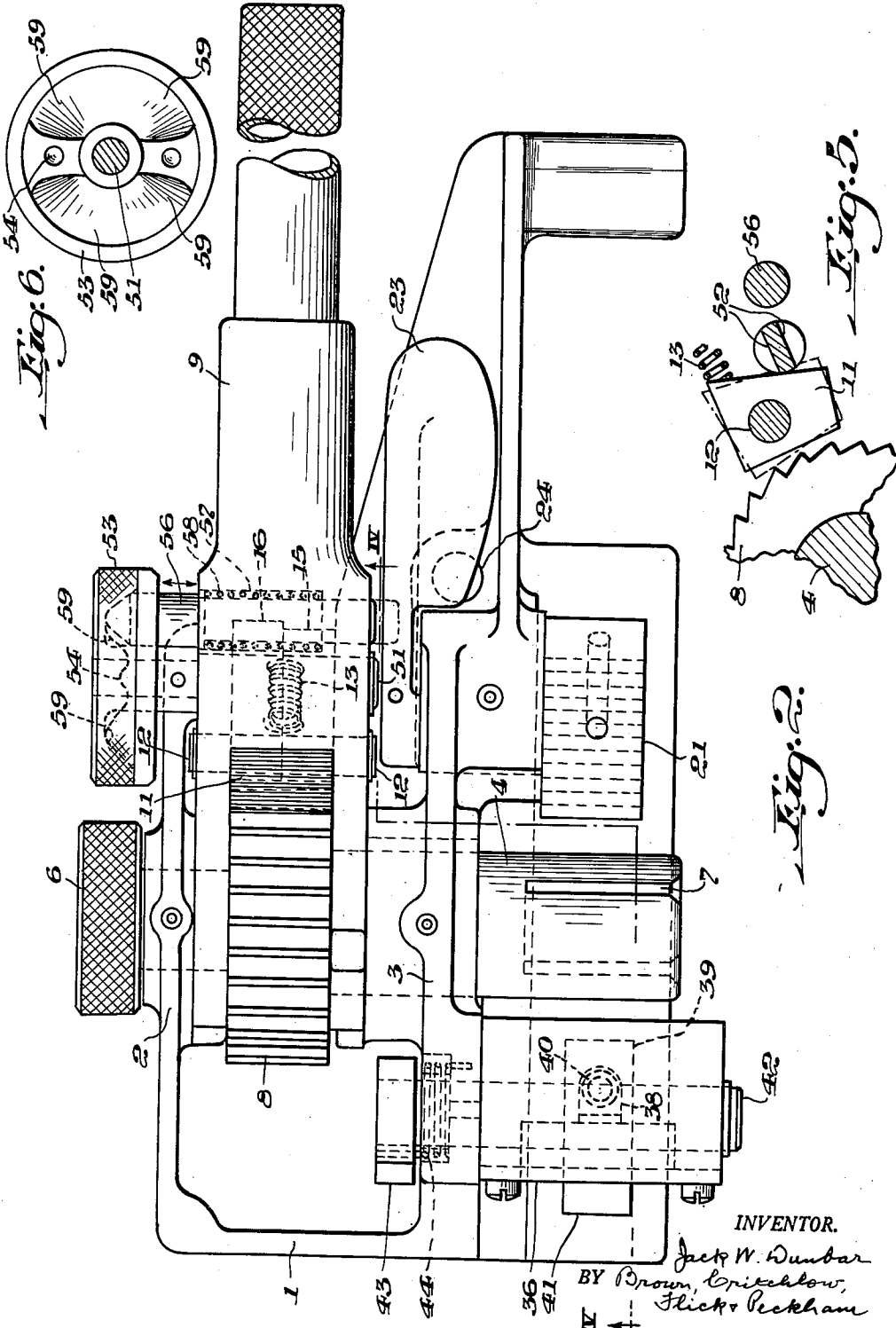
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TOOL FOR TENSIONING AND CUTTING BINDING STRAPS

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2 SHEETS—SHEET 2



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UNITED STATES PATENT OFFICE

2,600,224

TOOL FOR TENSIONING AND CUTTING
BINDING STRAPS

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Application January 4, 1950, Serial No. 136,719

11 Claims. (Cl. 140—93.3)

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This invention relates to tools for stretching flexible metal straps around articles to bind them, and more particularly to such a tool equipped to cut off the portion of the strap extending beyond the point at which it is attached to the opposite end of the strap.

In one type of strap tensioning tool the binding strap is stretched by a windlass which is rotated by a ratchet wheel turned periodically by an oscillatable handle. For certain reasons it is desirable that the operating handle be swung forward as far as possible during each operating stroke, but it also is a great convenience to be able to use the handle for operating a shear for cutting off the portion of the strap wound on the windlass after the strap has been tensioned and its overlapping portions sealed together. This double use of the operating handle presents a problem.

It is among the objects of this invention to provide a strap tensioning and cutting tool so constructed and arranged that its operating handle can make long operating strokes and yet, when desired, can be used to operate the shear. Another object is to provide such a tool in which, by a simple manual manipulation, the operating handle can be put in condition for shear operation and simultaneously be disconnected from the ratchet wheel.

In accordance with this invention one end of a flexible metal binding strap (either a flat band or a wire) is anchored by a gripper supported by a tool base that rests against the object that is to be bound. The strap extends around that object and has its other end engaged by a rotatable member, such as a windlass, that also is supported by the tool base. The windlass is rotated, for winding up the strap, by means of a ratchet wheel which is turned by an actuating pawl carried by an oscillatable operating handle when the handle is swung forward. A check pawl, supported by the base, prevents reverse rotation of the ratchet wheel when the handle is swung backward. Supported by the tool base in front of the windlass is a shear that is adapted to straddle the end portion of the strap attached to the windlass. The tool is provided with manually operable means for withdrawing the operating pawl from the ratchet wheel after the strap has been tensioned and the seal has been applied in front of the shear, and for projecting an abutment laterally from the handle. Then, when the handle is swung forward, it does not turn the ratchet wheel, but the projecting abutment strikes and moves means by which the shear is

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operated to cut the strap extending through it. As soon as the abutment is withdrawn from operative position and the actuating pawl is allowed to engage the ratchet wheel again, the tool is ready to stretch the next strap. Preferably, these movements of the actuating pawl and shear-operating abutment are controlled by a single rotatable knob.

The preferred embodiment of this invention is illustrated in the accompanying drawings, in which Fig. 1 is a side view of the tool, showing the extreme forward position of the operating handle in broken lines; Fig. 2 is a plan view of the tool; Fig. 3 is a reduced front end view; Fig. 4 is a vertical longitudinal section, taken on the line IV—IV of Fig. 2, showing the operating handle in shear-operating position; Fig. 5 is a fragmentary detail in section showing the actuating pawl held in inoperative position; and Fig. 6 is a view of the inside of one of the knobs.

Referring to the drawings, the tool has a substantially flat base 1 provided integrally with an upstanding side wall 2 and a laterally spaced central wall 3. These two walls are provided with aligned bearing openings in which a heavy shaft 4 is journaled. Rigidly mounted on the end of this shaft disposed in side wall 2 is a knob 6 for turning the shaft at certain times, as will be described later. The opposite end of the shaft extends through the central wall 3 and across the underlying base, and is provided with a slot 7 extending inwardly from its outer end and diametrically through it. This slotted portion of the shaft forms a windlass on which one end of a flexible binding strap can be wound.

For rotating the windlass when a strap is attached to it, a ratchet wheel 8 is rigidly mounted on shaft 4 between the two walls 2 and 3, from both of which the wheel is spaced. An operating handle 9 is provided for turning the ratchet wheel. This handle has a forked inner end that straddles the ratchet wheel, with its forks pivotally mounted on the windlass shaft on opposite sides of the wheel. The handle, therefore, can be swung forward and backward around the shaft. When it is swung forward toward the broken line position shown in Fig. 1 it turns the ratchet wheel by means of an actuating pawl 11 that is mounted between the handle forks on a pivot pin 12 extending through them. The front end of the pawl is pressed against the teeth of the ratchet wheel by means of a coil spring 13 mounted in a socket in the handle behind the pawl. To keep the ratchet wheel from turning in reverse direction when the handle is swung back-

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ward and the actuating pawl is sliding over the teeth, a pair of check pawls 15 and 16 are pivotally mounted near the base on a pivot pin secured in walls 2 and 3. The outer ends of the check pawls are urged upward by means of coil springs 17 projecting from sockets in the base. The inner end of check pawl 15 is half a tooth higher than the other one so that every time the ratchet teeth are moved ahead a distance equal to one-half the width of a tooth, one or the other of the check pawls will snap in below a tooth to prevent reverse rotation of the wheel. Thus, by using two check pawls the same effect is obtained as would be produced by a single check pawl engaging a ratchet wheel of the same size having twice as many teeth as the one disclosed.

Disposed behind the windlass is an inclined gripper 21 which is rigidly mounted on a shaft 22 extending through a bearing in the rear portion of the central wall 3. On the other side of the wall the shaft is rigidly connected to a rearwardly extending lever 23. Engaging the bottom of this lever is a vertical plunger 24 that is slidably mounted in a vertical socket 26 in the central wall. The plunger is pressed against the lever by means of a compression spring 27 compressed between the bottom of the socket and the plunger. Due to the inclination of the gripper, rearward pull on a binding strap extending between the gripper and the base will increase the pressure of the gripper on the strap. The gripper can be released from a strap at any time by pressing down on lever 23, which will swing the gripper forward and upward.

In use, one end of a binding strap is slipped between the gripper and base and extended forward from the front of the base far enough to receive a conventional seal. The rest of the strap, extending from the rear end of the base, is wrapped around the object to be bound and is brought back over the forwardly projecting anchored end of the strap. The outer or upper end of the strap is inserted in the slot 7 in the windlass, which can be turned by knob 6 to position the slot for this purpose. At such times the pawls are withdrawn from the ratchet wheel to permit it to be turned freely. The check pawls 15 and 16 are withdrawn by pressing down on the operating handle so that a boss 28 on the bottom of the handle will swing the outer ends of the pawls downward. The actuating pawl is retracted in a manner that will be described presently. After the strap has been inserted in the windlass slot the operating handle 9 is swung forward and backward enough times to wind the strap on the windlass until the strap has been drawn tightly around the article it surrounds. Any suitable seal then can be clamped on the overlapping portions of the strap in front of the base to fasten them together. It is a feature of this invention that after the seal has been applied, the short length of strap between it and the windlass is severed so that the tool and the portion of the strap wound on the windlass can be removed from the bound article.

Accordingly, a shear is mounted in front of the windlass. The shear includes a block 31 that is attached to central wall 3 and that extends across the base 1. The major portion of the block is spaced just far enough from the base to permit the anchored end of the strap to extend between them. The lower portion of the block is provided with a slot 32 extending through it from front to rear and having an open outer

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end to permit the upper portion of the strap to be inserted edgewise into it. The front edge of the part of the block below the slot serves as a stationary blade for the shear. Above the slot the block projects in front of the slot and is provided with a recess in which the movable blade 34 of the shear can slide up and down. The blade is held in the block by a cover plate 36 attached to the front of it by screws 37. The upper end of the movable blade has a rearwardly extending bracket 38 attached to it. This bracket projects into an open front vertical slot 39 and rests on top of a coil spring 40 that urges the blade upward. Upward movement of the blade is limited by a cam 41 rigidly mounted on a horizontal shaft 42 that is rotatably mounted in the top of the shear block and extends entirely through the central wall. The shaft projects from the ratchet side of the wall and has an upwardly extending lever 43 rigidly mounted on it. The wall around this shaft is provided with an annular recess in which a torsion spring 44 is mounted. One end of the spring projects from this recess and across the front face of the lever to swing the lever backward. However, cam 41 may be shaped in such a way that the pressure of the movable blade against its bottom will swing it upward and thereby swing the lever backward without the help of a torsion spring.

During strap tensioning the operating handle 9 can be swung forward and down past shear lever 43 without striking it. Consequently, the lever does not interfere with long strokes of the handle while the strap is being stretched. However, the construction of the tool is such that after tensioning has been completed, the handle can be used for swinging the shear lever forward to cause cam 41 to force the movable blade down against the strap for shearing it against the stationary lower blade of the shear. In order to do this it is necessary to be able to swing the handle forward without turning the windlass. Accordingly, a horizontal shaft 51 is rotatably mounted in the handle directly behind the actuating pawl 11. The central portion of this shaft is exposed between the two forks of the handle and is located so close to the ratchet wheel that it has to be recessed to receive the rear part of the actuating pawl so that the front end of the pawl can engage the teeth of the wheel. However, if the shaft is turned, its unrecessed portion will slide into contact with the pawl and swing its rear part forward, thereby withdrawing the pawl from the ratchet wheel teeth. When this is done the operating handle can be swung forward without turning the ratchet wheel. By recessing two opposite sides of the shaft it has to be turned only 90 degrees in either direction to move the pawl either into or out of engagement with the ratchet teeth. The shaft therefore is provided with a central cam portion provided with parallel flat sides 52, as shown in Fig. 5.

For turning shaft 51, its outer end projects from the handle and has a knob 53 rigidly mounted on it. The inner surface of the knob is provided at two diametrically opposite points with shallow depressions 54 (Figs. 1 and 6) for receiving the outer end of a pin 55 that is slidably mounted in a passage 57 extending horizontally through the handle behind shaft 51. The pin is urged outward by a coil spring 58 encircling it and compressed between a shoulder on the pin and a shoulder near the inner end of the passage. When the

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knob 53 is turned so that the pin projects into either of the depressions 54, shaft 51 is held in the position shown in Fig. 5, in which it withdraws the actuating pawl 41 from the ratchet wheel teeth. Between the two shallow depressions the inside of the knob is provided with a pair of deep depressions that have inclined walls 59 which form cam surfaces for sliding pin 56 inward through the handle when the knob is turned 90 degrees to withdraw the actuating pawl from the ratchet wheel. When this is done the inner end of the pin is projected from the inner face of the handle (as indicated in broken lines in Fig. 2) far enough for the pin to form an abutment that will strike shear lever 43 when the handle is swung forward as shown in Fig. 4. This will swing the lever forward and cam 41 downward and thus cause the shear to cut the strap extending through slot 32.

It will be observed that pin 56 is never projected into shear operating position except when actuating pawl 41 is withdrawn from the ratchet wheel. Therefore, the windlass is never turned when the operating handle is swung forward to cut the strap. After the strap has been cut, knob 53 can be turned 90 degrees in either direction so that the pin will be retracted by its spring 58, and the actuating pawl will be permitted to engage the ratchet teeth again, ready for tensioning the next strap. After the strap has been cut, it is an easy matter to press down on gripper lever 23 to release gripper 21 from the strap so that the tool can be removed from the binding strap and the bound object.

According to the provisions of the patent statutes, I have explained the principle of my invention and have illustrated and described what I now consider to represent its best embodiment. However, I desire to have it understood that, within the scope of the appended claims, the invention may be practiced otherwise than as specifically illustrated and described.

I claim:

1. A tensioning and cutting tool for flexible binding straps, comprising a base adapted to rest against an object to be bound, a gripper supported by the base and adapted to anchor one end of a binding strap extending around said object, a rotatable member supported by the base for putting the other end of the strap under tension, a ratchet wheel for turning said member, an oscillatable operating handle, an actuating pawl carried by said handle for turning the ratchet wheel when the handle is swung forward, a check pawl supported by said base for preventing reverse rotation of the ratchet wheel, a shear supported by the base in front of said rotatable member and adapted to straddle the end portion of the strap attached to said member, an abutment movably supported by said handle and normally disposed in retracted position relative thereto, manually operable means for withdrawing said actuating pawl from the ratchet wheel after the strap has been tensioned and for projecting said abutment laterally from said handle, and means engaged and actuated by said projecting abutment when the handle is swung forward for operating the shear to cut the strap.

2. A tensioning and cutting tool for flexible binding straps, comprising a base adapted to rest against an object to be bound, a gripper supported by the base and adapted to anchor one end of a binding strap extending around said object, a windlass supported by the base for winding up the other end of the strap to tension it, a ratchet

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wheel for turning the windlass, an oscillatable operating handle, an actuating pawl carried by said handle for turning the ratchet wheel when the handle is swung forward, a check pawl supported by said base for preventing reverse rotation of the ratchet wheel, a shear supported by the base in front of the windlass and adapted to straddle the end portion of the strap attached to the windlass, a rotatable cam for moving said actuating pawl away from the ratchet wheel, a manually rotatable member connected to said cam for turning it after the strap has been tensioned, an abutment adapted to be projected laterally from said handle when the actuating pawl is withdrawn from the ratchet wheel, and means engaged and actuated by said projecting abutment when the handle is swung forward for operating the shear to cut the strap.

3. In a tensioning and cutting tool for flexible binding straps, the combination with a base adapted to rest against an object to be bound, a gripper supported by the base and adapted to anchor one end of a binding strap extending around said object, a windlass supported by the base for winding up the other end of the strap to tension it, a ratchet wheel for turning the windlass, an oscillatable operating handle, an actuating pawl carried by said handle for turning the ratchet wheel when the handle is swung forward, and a check pawl supported by said base for preventing reverse rotation of the ratchet wheel, of a shear supported by the base in front of the windlass and adapted to straddle the end portion of the strap attached to the windlass, a normally retracted abutment carried by said handle, manually operable means for withdrawing said actuating pawl from the ratchet wheel after the strap has been tensioned and for substantially simultaneously projecting said abutment laterally from the handle, and means engaged and actuated by said projecting abutment when the handle is swung forward for operating the shear to cut the strap.

4. In a tensioning and cutting tool for flexible binding straps, the combination with a base adapted to rest against an object to be bound, a gripper supported by the base and adapted to anchor one end of a binding strap extending around said object, a windlass supported by the base for winding up the other end of the strap to tension it, a ratchet wheel for turning the windlass, an oscillatable operating handle, an actuating pawl carried by said handle for turning the ratchet wheel when the handle is swung forward, and a check pawl supported by said base for preventing reverse rotation of the ratchet wheel, of a shear supported by the base in front of the windlass and adapted to straddle the end portion of the strap attached to the windlass, a normally retracted abutment carried by said handle, manually operable means for withdrawing said actuating pawl from the ratchet wheel after the strap has been tensioned and having a cam surface for forcing said abutment to project laterally from the handle, and means engaged and actuated by said projecting abutment when the handle is swung forward for operating the shear to cut the strap.

5. A tensioning and cutting tool for flexible binding straps, comprising a base adapted to rest against an object to be bound, a gripper supported by the base and adapted to anchor one end of a binding strap extending around said object, a windlass supported by the base for winding up the other end of the strap to tension it, a ratchet

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wheel for turning the windlass, an oscillatable operating handle, an actuating pawl carried by said handle for turning the ratchet wheel when the handle is swung forward, a check pawl supported by said base for preventing reverse rotation of the ratchet wheel, a shear supported by the base in front of the windlass and adapted to straddle the end portion of the strap attached to the windlass, a rotatable cam for moving said actuating pawl away from the ratchet wheel, a manually rotatable member connected to said cam for turning it after the strap has been tensioned, said member having a cam surface, a pin slidably mounted transversely in said handle with one of its ends adjacent said member, said cam surface being adapted to force the opposite end of the pin out of the handle when said member is turned to withdraw the actuating pawl from the ratchet wheel, and means engaged and actuated by the projecting pin when the handle is swung forward for operating the shear to cut the strap.

6. A tensioning and cutting tool for flexible binding straps, comprising a base adapted to rest against an object to be bound, a gripper supported by the base and adapted to anchor one end of a binding strap extending around said object, a windlass supported by the base for winding up the other end of the strap to tension it, a ratchet wheel for turning the windlass, an oscillatable operating handle, an actuating pawl carried by said handle for turning the ratchet wheel when the handle is swung forward, a check pawl supported by said base for preventing reverse rotation of the ratchet wheel, a shear supported by the base in front of the windlass and adapted to straddle the end portion of the strap attached to the windlass, manually rotatable means for withdrawing said actuating pawl from the ratchet wheel after the strap has been tensioned, said rotatable means including a cam surface, a pin slidably mounted transversely in said handle, a spring normally projecting one end of the pin into engagement with said cam surface, whereby upon turning of said rotatable means to withdraw the actuating pawl from the ratchet wheel said cam surface will slide the pin through the handle and project its opposite end from the opposite side of the handle, and means engaged and actuated by said projecting opposite end of the pin when the handle is swung forward for operating the shear to cut the strap.

7. A tensioning and cutting tool for flexible binding straps, comprising a base adapted to rest against an object to be bound, a gripper supported by the base and adapted to anchor one end of a binding strap extending around said object, a windlass supported by the base for winding up the other end of the strap to tension it, a ratchet wheel for turning the windlass, an oscillatable operating handle, an actuating pawl carried by said handle for turning the ratchet wheel when the handle is swung forward, a check pawl supported by said base for preventing reverse rotation of the ratchet wheel, a shear supported by the base in front of the windlass and adapted to straddle the end portion of the strap attached to the windlass, a shaft rotatably mounted transversely in said handle and projecting from one side of it, the shaft having a cam portion engaging said actuating pawl, a knob rigidly mounted on the projecting end of the shaft for turning it to withdraw the actuating pawl from the ratchet wheel after the strap has been tensioned, the inner surface of said knob being pro-

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vided with a cam surface, a pin slidably mounted in the handle beside said shaft, a spring urging one end of the pin against said cam surface, whereby when the knob is turned to withdraw the actuating pawl from the ratchet wheel said cam surface will slide the opposite end of the pin out of the opposite side of the handle, and means engaged and actuated by said projecting opposite end of the pin when the handle is swung forward for operating the shear to cut the strap.

8. A tensioning and cutting tool for flexible binding straps, comprising a base adapted to rest against an object to be bound, a gripper supported by the base and adapted to anchor one end of a binding strap extending around said object, a windlass supported by the base for winding up the other end of the strap to tension it, a ratchet wheel for turning the windlass, an oscillatable operating handle, an actuating pawl carried by said handle for turning the ratchet wheel when the handle is swung forward, a check pawl supported by said base for preventing reverse rotation of the ratchet wheel, a shear supported by the base in front of the windlass and adapted to straddle the end portion of the strap attached to the windlass, an abutment movably supported by said handle and normally disposed in retracted position relative thereto, manually operable means for withdrawing said actuating pawl from the ratchet wheel after the strap has been tensioned and for projecting said abutment laterally from said handle, a pivotally mounted lever in the path of said projecting abutment when the handle is swung forward, said lever being adapted to be swung forward by said abutment, and means actuated by said lever for operating the shear to cut the strap.

9. A tensioning and cutting tool for flexible binding straps, comprising a base adapted to rest against an object to be bound, a gripper supported by the base and adapted to anchor one end of a binding strap extending around said object, a windlass supported by the base for winding up the other end of the strap to tension it, a ratchet wheel for turning the windlass, an oscillatable operating handle, an actuating pawl carried by said handle for turning the ratchet wheel when the handle is swung forward, a check pawl supported by said base for preventing reverse rotation of the ratchet wheel, a shear supported by the base in front of the windlass and adapted to straddle the end portion of the strap attached to the windlass, said shear including a movable blade, an abutment movably supported by said handle and normally disposed in retracted position relative thereto, manually operable means for withdrawing said actuating pawl from the ratchet wheel after the strap has been tensioned and for projecting said abutment laterally from said handle, a pivotally mounted cam for forcing said blade through the strap to cut it, and a lever for turning the cam, said lever being in the path of said projecting abutment when the handle is swung forward and being adapted to be swung forward by the abutment.

10. A tensioning and cutting tool for flexible binding straps, comprising a base adapted to rest against an object to be bound, a gripper supported by the base and adapted to anchor one end of a binding strap extending around said object, a windlass supported by the base for winding up the other end of the strap to tension it, a ratchet wheel for turning the windlass, an oscillatable operating handle, an actuating pawl carried by said handle for turning the ratchet wheel when

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the handle is swung forward, a check pawl supported by said base for preventing reverse rotation of the ratchet wheel, a shear supported by the base in front of the windlass and adapted to straddle the end portion of the strap attached to the windlass, a shaft rotatably mounted transversely in said handle and projecting from one side of it, the shaft having a cam portion engaging said actuating pawl, a knob rigidly mounted on the projecting end of the shaft for turning it to withdraw the actuating pawl from the ratchet wheel after the strap has been tensioned, the inner surface of said knob being provided with a cam surface, a pin slidably mounted in the handle beside said shaft, a spring urging one end of the pin against said cam surface, whereby when the knob is turned to withdraw the actuating pawl from the ratchet wheel said cam surface will slide the opposite end of the pin out of the opposite side of the handle, said shear including a movable blade, a pivotally mounted cam for forcing the blade through the strap to cut it, and a lever for turning the cam, said lever being in the path of said projecting opposite end of the pin when the handle is swung forward and being adapted to be swung forward by the pin.

11. A tensioning and cutting tool for flexible binding straps, comprising a base adapted to rest against an object to be bound, a gripper supported by the base and adapted to anchor one end of a binding strap extending around said object, a rotatable member supported by the base for putting the other end of the strap under tension, a ratchet wheel for turning said member,

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an oscillatable operating handle, an actuating pawl carried by said handle for turning the ratchet wheel when the handle is swung forward, a pivoted check pawl supported by said base on a horizontal axis beneath the handle for preventing reverse rotation of the ratchet wheel, a shear supported by the base in front of said rotatable member and adapted to straddle the end portion of the strap attached to said member, an abutment movably supported by said handle and normally disposed in retracted position relative thereto, manually operable means for withdrawing said actuating pawl from the ratchet wheel after the strap has been tensioned and for projecting said abutment laterally from said handle, the handle being adapted to be pressed down against the rear end of the check pawl to disengage its front end from the ratchet wheel, and means engaged and actuated by said projecting abutment when the handle is swung forward for operating the shear to cut the strap.

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