

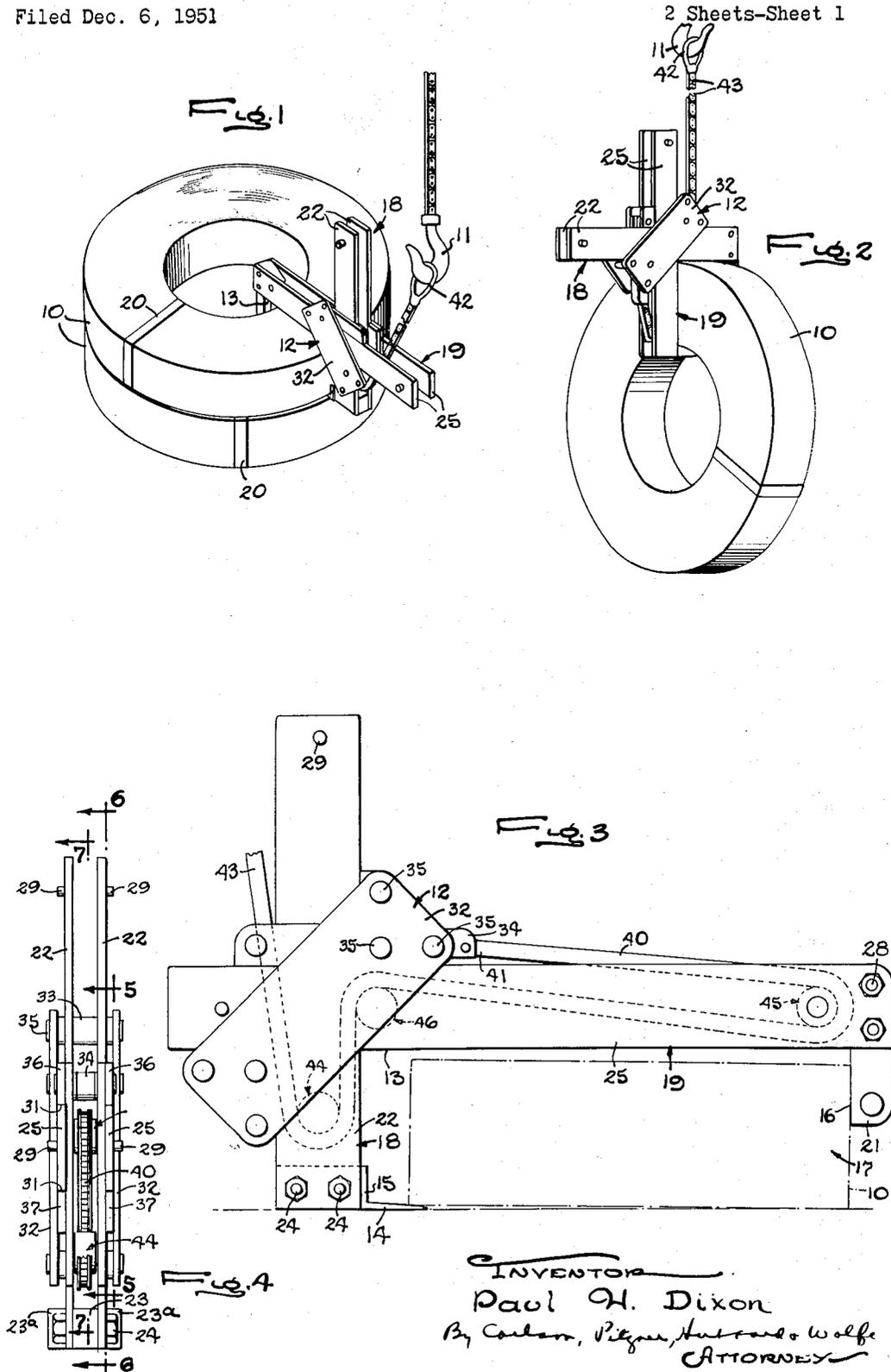
May 8, 1956

P. H. DIXON
CLAMPING DEVICE

2,744,780

Filed Dec. 6, 1951

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

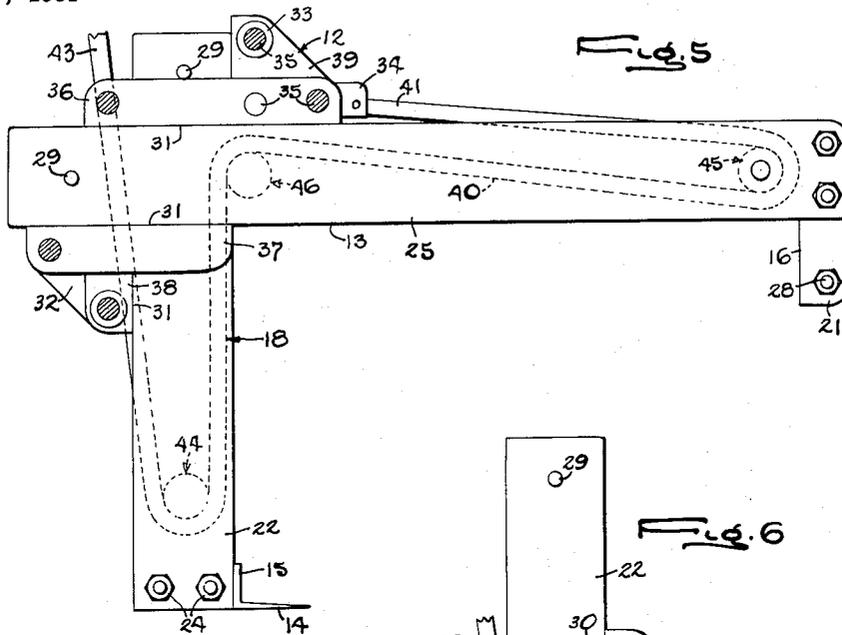


Fig. 5

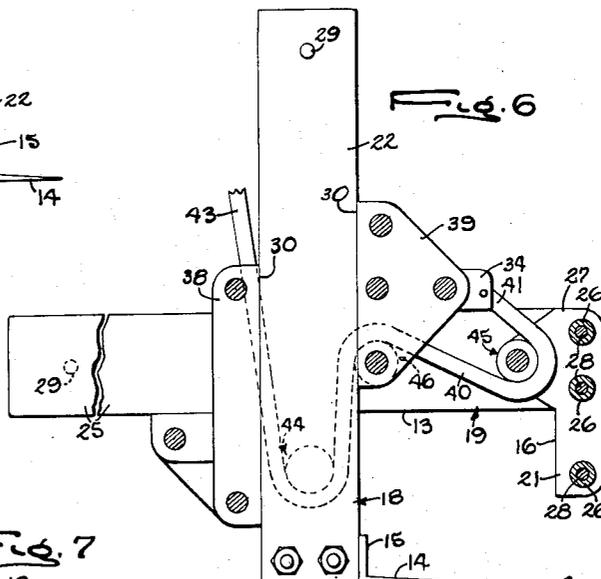


Fig. 6

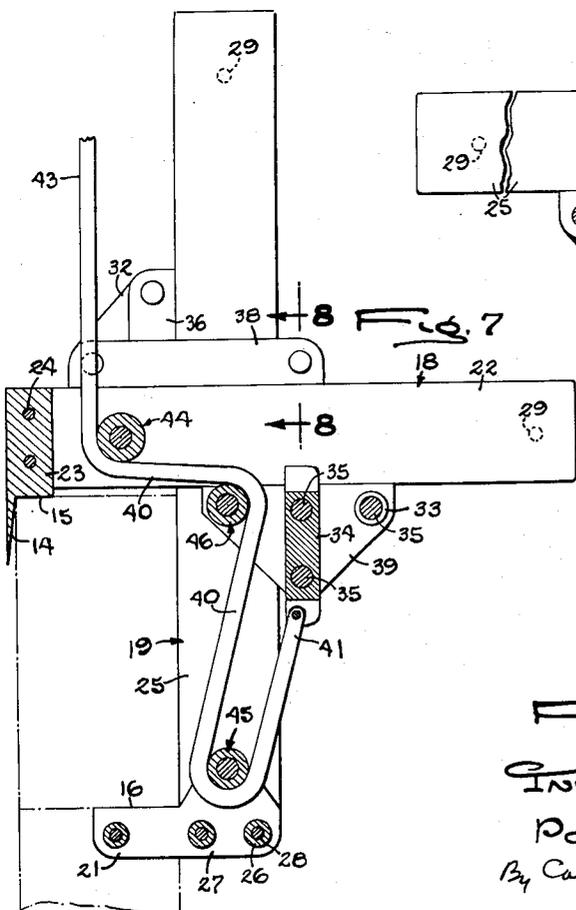


Fig. 7

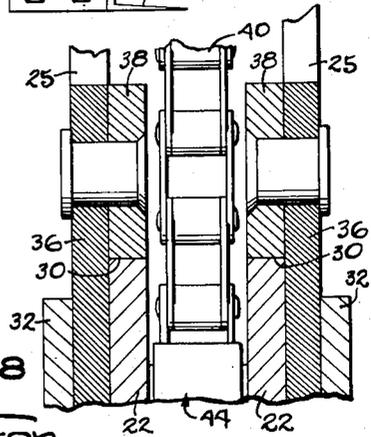


Fig. 8

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2,744,780

CLAMPING DEVICE

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13 Claims. (Cl. 294—115)

This invention relates to a device for facilitating the picking up and transportation of heavy and unwieldy articles such for example as coils of strip material of widely variable dimensions.

One object is to provide a new and improved clamping device or grab which may be applied manually to the article to be handled while the latter is in one position and then actuated to grip the article along two dimensions so that the article may be tipped angularly into another position in which it is held securely while being transported.

Another object is to provide a device of the above character which grips the article along two dimensions by two clamps which open and close in perpendicular directions and which operate differentially according to the two dimensions of the article to be handled.

A more detailed object is to provide a simple construction of the two perpendicularly acting clamps by mounting one jaw of each clamp in right angular relation on one member and the other jaws in a similar relation on a second member, which members are mounted on a common support to slide along perpendicular paths.

Another object is to actuate the two clamps differentially by applying tension to a flexible line operatively connected to the sliding members.

The invention also resides in the novel construction of the support to increase the rigidity of the jaws and in the construction and arrangement of the clamps to facilitate the placing of the device in clamping position around the article to be lifted.

Other objects and advantages of the invention will become apparent from the following detailed description taken in connection with the accompanying drawings, in which

Figures 1 and 2 are perspective views of the improved clamping device and an article with the latter disposed in different positions.

Fig. 3 is a side elevation of the clamping device.

Fig. 4 is an end elevation.

Figs. 5, 6, and 7 are sectional views taken respectively along the lines 5—5, 6—6, and 7—7 in Fig. 4.

Fig. 8 is a sectional view taken along the line 8—8 in Fig. 7.

While the improved clamping device may be used to handle various articles having a generally rectangular cross section, it is especially useful in handling coils of metal strip material and is therefore described herein in connection with such a usage. It will be understood, however, that such disclosure is merely for the purpose of illustrating the invention and is not intended to limit the scope of the appended claims.

As shown in Fig. 1, coils 10 of strip material are usually stored by stacking horizontally one on top of the other. In moving the top coil by a crane, the usual procedure is to tip the coil upwardly and apply the hook 11 of the crane to the inner edge of the coil so that the latter will be suspended vertically from the hook while being transported to a point of use. Such tilting of the coil is a laborious and time consuming operation, and the inner or

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outer edges of the metal strip are frequently bent and damaged during handling of the coil.

In accordance with the present invention, these difficulties are overcome through the provision of two clamps respectively operable to grip the top coil of the stack both radially and axially and movably mounted on a common support 12 which is adapted to be picked up by the crane hook 11 first to tilt the coil through a quarter revolution and then to suspend it in the vertical position shown in Fig. 2.

Generally stated, the axial clamp comprises opposed inner and outer jaws 13 and 14 movable toward each other to grip the opposite end surfaces of the coil while the radial clamp comprises jaws 15 and 16 movable toward each other in a perpendicular direction to engage the inner and outer peripheries of the coil. Opening and closing of the two clamps is effected by moving the outer jaws 14 and 16 which cooperate to define an outwardly opening recess 17 (Fig. 6) for receiving the radial section of the coil 10 so that the outer jaw 14 may be inserted under the coil with the opposing jaw 13 lying on top of the coil, the jaws 14 and 16 of the other clamp facing the inner and outer peripheries of the coil section. The jaws of each clamp then may be drawn together to grip the coil both axially and radially.

Preferably, the jaws of the two clamps are supported on two elongated members 18 and 19 which cross each other and are mounted on the support 12 for endwise sliding movement in perpendicular directions, one jaw of each clamp being formed as a part of each member. Accordingly, the outer jaw 14 of the axial clamp is supported on and projects laterally from the member or slide 18 whose side edge forms the inner jaw 15 of the radial clamp. Similarly, the outer jaw 16 of the radial clamp is rigid with and projects laterally from the end of the slide member 19 whose edge carries the inner jaw 13 of the other clamp.

The slide 18 comprises two parallel flat bars 22 which are spaced apart, for a purpose to appear later, by a block 23 inserted between them at the end of the slide adjacent the outer jaw 14 and are fastened together by suitable bolts 24 extending through the bars and the block. At the inside of the slide 18, the block 23 extends beyond the edges of the bars 22 to form the clamping surface of the jaw 15 and, if desired, this surface may be increased in area by widening the extended portion of the block as at 23^a (Fig. 4). The jaw 14 is integral with the block 23 and is made in the shape of a thin wedge which is inclined gradually to a sharp edge at the end, the inner side of the wedge being disposed nearly at right angles to the jaw 15 to form the clamping surface of the outer jaw 14. With this construction, the outer jaw 14 may be inserted easily under the top coil and into the narrow space by which the coils are separated by the bands 20.

Similarly, the other slide 19 is formed by two parallel bars 25 which slide endwise on the support 12 in a direction perpendicular to the path of the slide 18 and which are spaced apart a distance equal to the space between the bars 22 plus the combined thickness of the latter so that the slide member 18 may project through the member 19 to slide between the bars 25. The bars 25 are held apart by spacers 26 (Fig. 6) inserted between the bars at the ends adjacent the jaw 16. Between each bar 25 and the corresponding ends of the spacers 26 is a small plate 27 with a lateral projection 21, the projections on the two plates forming the outer jaw 16. The bars 25, the plates 27, and the spacers 26 may be suitably fastened together as by bolts 28. Since the edges of the projections 21 are at right angles to the edges of the bars 25, the jaws 13 and 16 on the slide 19 face respectively the jaws 14 and 15 on the slide 18.

With this arrangement, sliding the member 18 back

and forth, opens and closes the clamp jaws 13 and 14, and the jaws 15 and 16 of the other clamp are moved toward and away from each other by sliding the member 19. Since the member 18 slides within the member 19, the opposing jaws of each clamp are in substantially the same plane. To prevent the slidable members from being removed accidentally from the support 12, their endwise movement in the clamp opening direction is limited by stops 29 which project from the sides of the bars 22 and 25 near the ends remote from the jaws 14 and 16 and are adapted to abut against the support when the clamps are fully open as shown in Fig. 5.

To guide the members 18 and 19 in their endwise sliding and to hold the latter against lateral and sidewise shifting, the support 12 is formed with a pair of perpendicular guideways in which the members slide. The guideway for the sliding member 18 comprises a pair of inner opposed channels 30 (Figs. 6 and 8) and, similarly, opposed channels 31 (Figs. 4 and 5) spaced outwardly from and at right angles to the inner channels define the guideway for the sliding member 19. For the purpose of forming the channels 30 and 31, the support includes two parallel rectangular plates 32 spaced apart and disposed diagonally across the slides 18 and 19 where the latter cross, the end portions of the diagonal plates overhanging the slides behind the jaws 13 and 15. Between the end portions and behind the jaw 13 are inserted a spacer 33 and a spacer block 34 (Fig. 7) fastened in place by suitable rivets 35 to hold the diagonal plates 32 in spaced relation. Lying against the inner side of each diagonal plate 32 and suitably riveted thereto are two guide bars 36 and 37 of generally the same thickness as the bars 25 and having opposed parallel edges spaced apart a distance equal to the width of the bars 25. Similarly, two guide plates 38 and 39 lie against and are riveted to the inside of the guide bars 36 and 37 and have opposed parallel edges perpendicular to the guiding edges of the bars 36 and 37. Thus, the inner sides of the diagonal plates 32 and the parallel edges of the guide bars 36 and 37 define the outer channels 31 and, in the same manner, the inner surfaces of the guide bars and the edges of the guide plates 38 and 39 define the inner channels 30.

The guide bars 36 and the guide plates 38 are disposed behind and extend outwardly along the slides 19 and 18 to provide a backing for the jaws 13 and 15 while the guide bars 37 and the guide plates 39 support the slides adjacent these jaws. With this construction, the slides are held rigidly against lateral movement so that the clamps may grip the coil 10 securely.

Means is provided to close the clamps differentially according to the two dimensions of the coil 10. Preferably this means is operable as an incident to the lifting of the article by the crane hook 11 whereby the clamp 15, 16 is collapsed about a radial section of the coil and the clamp 13, 14 is closed against the ends of the coil during initial upward movement of the hook 11. In the preferred embodiment, this differential means is connected to the clamps in such a manner that the continued upward movement of the crane hook after the coil is clamped is effective first to tilt the coil to the vertical position shown in Fig. 2 and then to lift the coil. While this means may take various forms, herein it comprises a flexible line 40 which is anchored at one end 41 to the support 12 and extends outwardly of the support where an eye 42 on the free end 43 of the line may be hooked to the crane, the intermediate portion of the line being connected to the movable jaws of the clamps to close the latter about the coil in response to outward pulling of the line.

As shown in the drawings, the flexible line 40 comprises a chain the end 41 of which is secured to the spacer block 34. The chain is connected to the jaws 14 and 16 through studs 44 and 45 rigid with and projecting laterally from the slides 18 and 19 respectively, the stud 44 spanning the bars 22 adjacent the outer jaw 14 and the stud 45

similarly spanning the bars 25 near the jaw 16. A third stud 46 is secured to the support 12 and spans the guide plates 39. The chain 41 extends from the block 34 outwardly along the slide 19 between the bars 25, around the outer side of the stud 45, back along the slide 19, around the stud 46, outwardly along the slide 18 between the bars 22, around the outer side of the stud 44 and outwardly of the clamping device. The stud 46 confines the chain 40 within the slides 18 and 19 where it does not interfere with the clamping of the coil 10 and guides the chain so that it approaches the stud 44 in a direction parallel to the slide 18. Preferably the studs 44, 45, and 46 are rollers to reduce the friction between them and the chain.

When the clamping device is placed around the coil 10 as shown in Fig. 3, upward pulling of the free end 43 of the chain 40 tends to shorten the intermediate part of the chain between the block 34 and the roller 44 thus urging the rollers 44 and 45 inwardly toward the support 12 and resulting in endwise sliding of the members 18 and 19 to move the outer jaws inwardly relative to the support 12. Since one of the rollers 44 and 45 may move while the other remains stationary, the rollers serve to connect the chain 40 differentially to the outer jaws 14 and 16 and, therefore, although one clamp may close first, the intermediate portion of the chain continues to shorten to collapse the other clamp. After both of the clamps have been closed, continued pulling of the chain end 43 exerts a lifting force adjacent the outer periphery of the coil raising one side of the coil and tilting the latter through a right angle until the coil hangs vertically, as shown in Fig. 7, in which position the free end 43 of the chain extends upwardly approximately over the center of gravity of the coil. When the coil is hanging vertically, substantially the entire weight of the coil is supported by the jaw 16 and thus the line 40 is tensioned to hold the clamps closed. Relieving the tension in the line by transferring the weight of the coil to another support automatically loosens the clamps for easy removal of the device from the coil.

In operation, the clamping device is expanded to a size larger than the axial and radial dimensions of the coil 10 so that the latter may be received within the recess 17 between the two outer clamp jaws. The tip of the wedge-shaped jaw 14 then is inserted into the narrow space under the coil as shown in Figs. 1 and 3 with the slide 19 resting on top of the coil and the jaw 16 projecting loosely into the central opening of the coil. The hook 11 of the crane is lowered and inserted through the eye 42 and the free end 43 of the chain 40 is lifted vertically. Since the chain is doubled around each of the rollers 44 and 45 through substantially 180 degrees, further pulling or lifting of the free end of the chain results in endwise sliding of the members 18 and 19 on the support 12 wedging the jaw 14 under the coil and closing both clamps 13, 14 and 15, 16 against the coil. Once the coil is clamped, the continued lifting action of the crane tilts the coil from the horizontal position shown in Fig. 1 to the vertical position illustrated in Fig. 2. During this tilting, the coil is held securely in the recess 17 by the jaws 13 and 14. When the vertical position is reached, further lifting of the free chain end 43 raises the coil which then is ready for transporting or other handling.

It will be apparent that a clamping device of the above character grips the coil 10 along two dimensions so that the coil is clamped securely when it is picked up, as it is tilted from one position to another and while it is being transported. With the coil hanging vertically, it may be placed readily on a spindle or other support in which position the clamping device may be removed easily by slipping the jaw 16 out from under the inner periphery of the coil. The recess 17 and the wedge shape of the jaw 14 facilitate placing the device around the coil and the clamps 13, 14 and 15, 16 are adjusted easily to the

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size of the coil by sliding the members 18 and 19. By utilizing the tension in the lifting chain 40 to move the slides 18 and 19, the jaws clamp the coil automatically when the crane hook 11 is raised and release the coil when the latter is laid down.

I claim as my invention:

1. A device for clamping a coil comprising, in combination, a support, a first elongated member mounted on said support for endwise sliding and having a longitudinal clamping surface adapted to engage the coil at the outer periphery thereof, a second elongated member perpendicular to said first member and slidably mounted on said support for endwise movement, said second member having a longitudinal clamping surface adapted to engage one end of the coil along a radius thereof, a thin jaw projecting laterally from said first member and having a face on one side opposing the clamping surface on said second member, said one side and the opposite side of said jaw being inclined relative to each other to form a sharpened end adapted to be wedged under said coil, a second jaw projecting laterally from said second member to be inserted in the central opening of said coil and having a face opposing the clamping surface on said first member, a pair of studs, one rigid with and projecting laterally from each of said members adjacent said jaws, and a flexible line having one end anchored to said support and bent around said studs thereby to slide said members and to urge said jaws toward said opposing clamping surfaces when the other end of said line is pulled to lift the coil.

2. A device of the character described comprising, in combination, a support including a first set of guide elements having opposed edges to define a first guideway and a second set of guide elements having opposed edges to define a second guideway perpendicular to the first, a first elongated member mounted on said support for endwise sliding in said first guideway, a second elongated member slidably mounted in said second guideway for endwise movement, said members having clamping surfaces along crossing edges thereof to provide two jaws, the guide elements of each set respectively supporting the associated member adjacent said jaws and extending along the opposite edges of said members to provide a backing for said jaws, a lateral projection on said first member and having a clamping face opposing the jaw on said second member, a lateral projection on said second member and having a clamping face opposing the jaw on said first member, and mechanism connected to said members and said support and operable to slide said members thereby to move said faces toward and away from the jaws.

3. A device of the character described comprising, in combination, a support including a first set of guide elements having opposed edges to define a first guideway and a second set of guide elements having opposed edges to define a second guideway perpendicular to the first, a first elongated member mounted on said support for endwise sliding in said first guideway, a second elongated member slidably mounted in said second guideway for endwise movement, said members having clamping surfaces along crossing edges thereof to provide two jaws, said guide elements supporting said members adjacent said jaws, a lateral projection on said first member and having a clamping face opposing the jaw on said second member, a lateral projection on said second member and having a clamping face opposing the jaw on said first member, and mechanism connected to each of said members and operable to slide said members thereby to move said faces toward and away from said jaws.

4. A device of the character described comprising, in combination, a support, a first elongated member mounted on said support for endwise sliding and having a clamping surface along one side edge thereof, a second elongated member perpendicular to said first member and slidably mounted on said support for endwise movement, said second member having a clamping surface along one of

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its side edges, two jaws, one projecting laterally from the outer ends of each of said members and having a face opposing the clamping surface on the other of said members, a first stud rigidly mounted on said first member outwardly of said support and projecting laterally from the member, a second stud similarly mounted on said second member, a third stud rigid with and projecting laterally from said support, and a flexible line anchored at one end to said support and extending outwardly along said first member, around the outer side of said first stud, reversely along said first member, around said third stud, outwardly along said second member, around the outer side of said second stud and outwardly of said device thereby to slide said members differentially and to clamp an article along two of its dimensions in response to outward pulling of said line.

5. A clamping device of the character described comprising, in combination, a support, an inner jaw and an outer jaw opposing each other and mounted on said support for relative movement toward and away from each other to open and close thereby to clamp an article along one of its dimensions, a second pair of opposed jaws similarly mounted on said support to open and close in a direction perpendicular to the movement of said first mentioned jaws and to clamp said article along another dimension, a first stud rigidly connected to the outer jaw of said first pair, a second stud rigidly connected to the outer jaw of said second pair, a third stud rigid with said support, and a flexible line anchored at one end to said support and wound around the outer side of said first stud, back around said third stud, around the outer side of said second stud and extending outwardly of said device thereby to close said pairs of jaws differentially according to the two dimensions of the article in response to outward pulling of said line.

6. A device of the character described comprising, in combination, a support, a first elongated member mounted on said support for endwise sliding and having a clamping surface along one side edge thereof, a second elongated member perpendicular to said first member and slidably mounted on said support for endwise movement, said second member having a clamping surface along one of its side edges, two jaws, one projecting laterally from each of said members and having a face opposing the clamping surface on the other of said members, a pair of guide rollers, one mounted on and projecting laterally from each of said members, and a flexible line having one end anchored to said support and bent around each of said rollers thereby to slide said members and to urge said jaws toward said opposing clamping surfaces when the other end of said line is pulled.

7. A clamping device of the character described comprising, in combination, a support, an inner jaw and an outer jaw opposing each other and mounted on said support for relative movement toward and away from each other to open and close thereby to clamp an article along one of its dimensions, a second pair of opposed jaws similarly mounted on said support to open and close in a direction angularly related to the movement of said first mentioned jaws and to clamp said article along another dimension, said outer jaws cooperating to define a recess to receive the article, a pair of studs, one for each of said pairs, rigidly connected to said outer jaws, and a flexible line having one end anchored to said support and wound around said studs thereby to close said jaws to the size of said article when the other end of said line is pulled.

8. A clamping device of the character described comprising, in combination, a support, a first clamp comprising a pair of opposed jaws mounted on said support for relative movement toward and away from each other to open and close thereby to grip an article along one of its dimensions, a second and similar clamp mounted on said support to open and close in a direction perpendicular to said first clamp and to grip said article along an-

other dimension, a flexible line extending outwardly from said support and movable relative thereto, and mechanism connecting said line and the movable jaws of said clamps and operable in response to outward pulling of the line to close said clamps differentially according to the two dimensions of the article.

9. A clamping device of the character described comprising, in combination, a support, an inner jaw and an outer jaw opposing each other and mounted on said support for relative movement toward and away from each other to open and close thereby to clamp an article along one of its dimensions, a second pair of opposed jaws similarly mounted on said support to open and close in a direction angularly related to the movement of said first mentioned jaws and to clamp said article along another dimension, said outer jaws cooperating to define a recess to receive the article, an element joined to said support and movable back and forth, and mechanism differentially connecting said element to said pairs of jaws and operable in response to movement of said element in one direction to close both pairs of said jaws and clamp the article along each of said dimensions.

10. A device for clamping an article comprising, in combination, a support, a first elongated member mounted on said support for endwise sliding and having a clamping surface along one side edge thereof, a jaw projecting laterally from said first member and having a clamping face perpendicular to said surface, a second elongated member perpendicular to said first member and slidably mounted on said support for endwise movement, said second member having a clamping surface extending along one of its side edges and opposing the face of said jaw, a thin jaw projecting laterally from said second member and having a clamping face on one side opposing the clamping surface on said first member, said one side and the opposite side of said thin jaw being inclined relative to each other to form a sharpened end adapted to be wedged under the article to be clamped, and means to engage said members to slide the same thereby to clamp the article between said surfaces and said faces.

11. A device of the character described comprising, in combination, a support defining a pair of perpendicular guideways, a first elongated member mounted on said support for endwise sliding in one of said guideways and having a clamping surface along one side edge thereof,

a second elongated member slidably mounted in the other of said guideways for endwise movement and having a clamping surface along one of its side edges, two jaws, one projecting laterally from each of said members and having a face opposing the clamping surface on the other of said members, and means connected to said members and operable to slide said members thereby to clamp an article between said surfaces and said faces.

12. A device of the character described comprising, in combination, a support, a first elongated member mounted on said support for endwise sliding and having a clamping surface along one side edge thereof, a second elongated member perpendicular to said first member and slidably mounted on said support for endwise movement, said second member having a clamping surface along one of its side edges, two jaws, one projecting laterally from each of said members and having a face opposing the clamping surface on the other of said members, and means connected to said members and operable to slide said members thereby to clamp an article between said surfaces and said faces.

13. A clamping device of the character described comprising, in combination, a support, an inner jaw and an outer jaw opposing each other and mounted on said support for relative movement toward and away from each other to open and close thereby to clamp an article along one of its dimensions, a second pair of opposed jaws similarly mounted on said support to open and close in a direction angularly related to the movement of said first mentioned jaws and to clamp said article along another dimension, said outer jaws being spaced apart and cooperating to define a recess in which the article may be received by moving sidewise in the plane of said jaws, and mechanism connected to said jaws and operable to close said pairs of jaws thereby adjusting said clamping device to the size of said article.

References Cited in the file of this patent

UNITED STATES PATENTS

2,642,307 Olson ----- June 16, 1953.

FOREIGN PATENTS

470,130 England ----- Aug. 10, 1937

470,572 Germany ----- Jan. 21, 1929

679,790 Germany ----- Aug. 12, 1939