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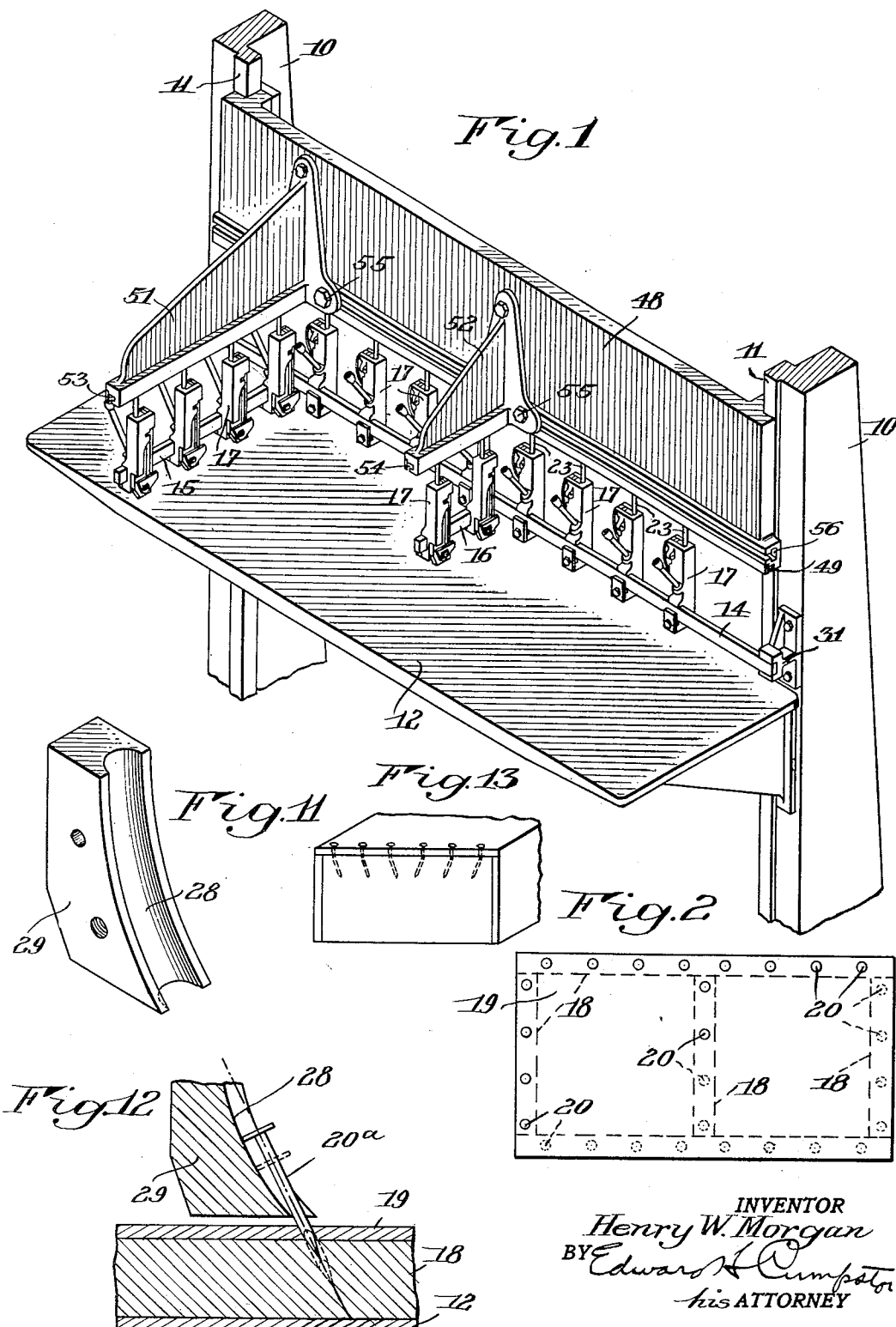
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METHOD AND MACHINE FOR DRIVING NAILS

Filed Sept. 16, 1932

3 Sheets-Sheet 1



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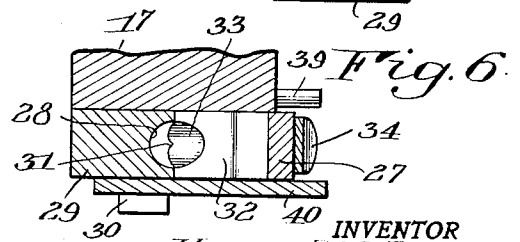
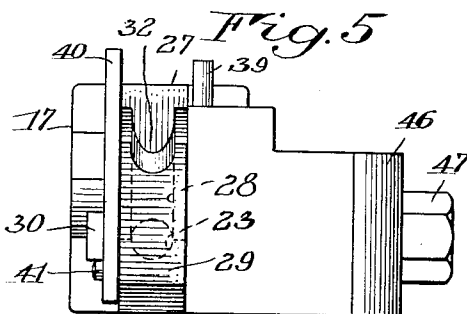
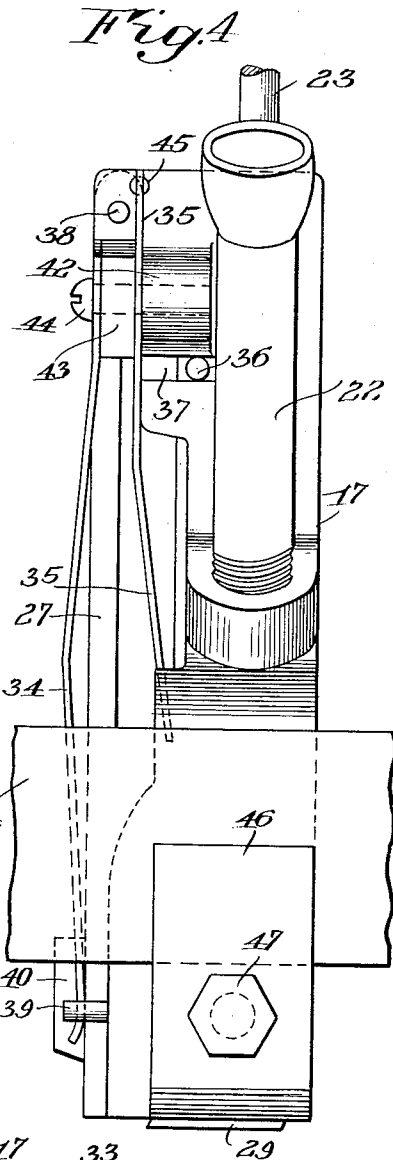
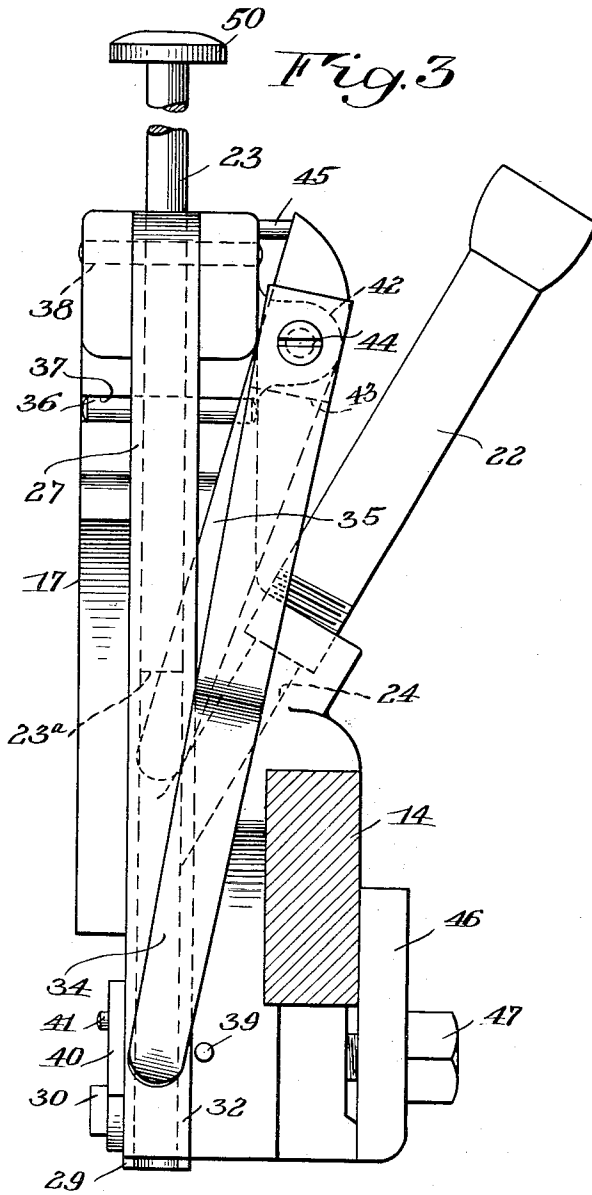
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METHOD AND MACHINE FOR DRIVING NAILS

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3 Sheets-Sheet 2



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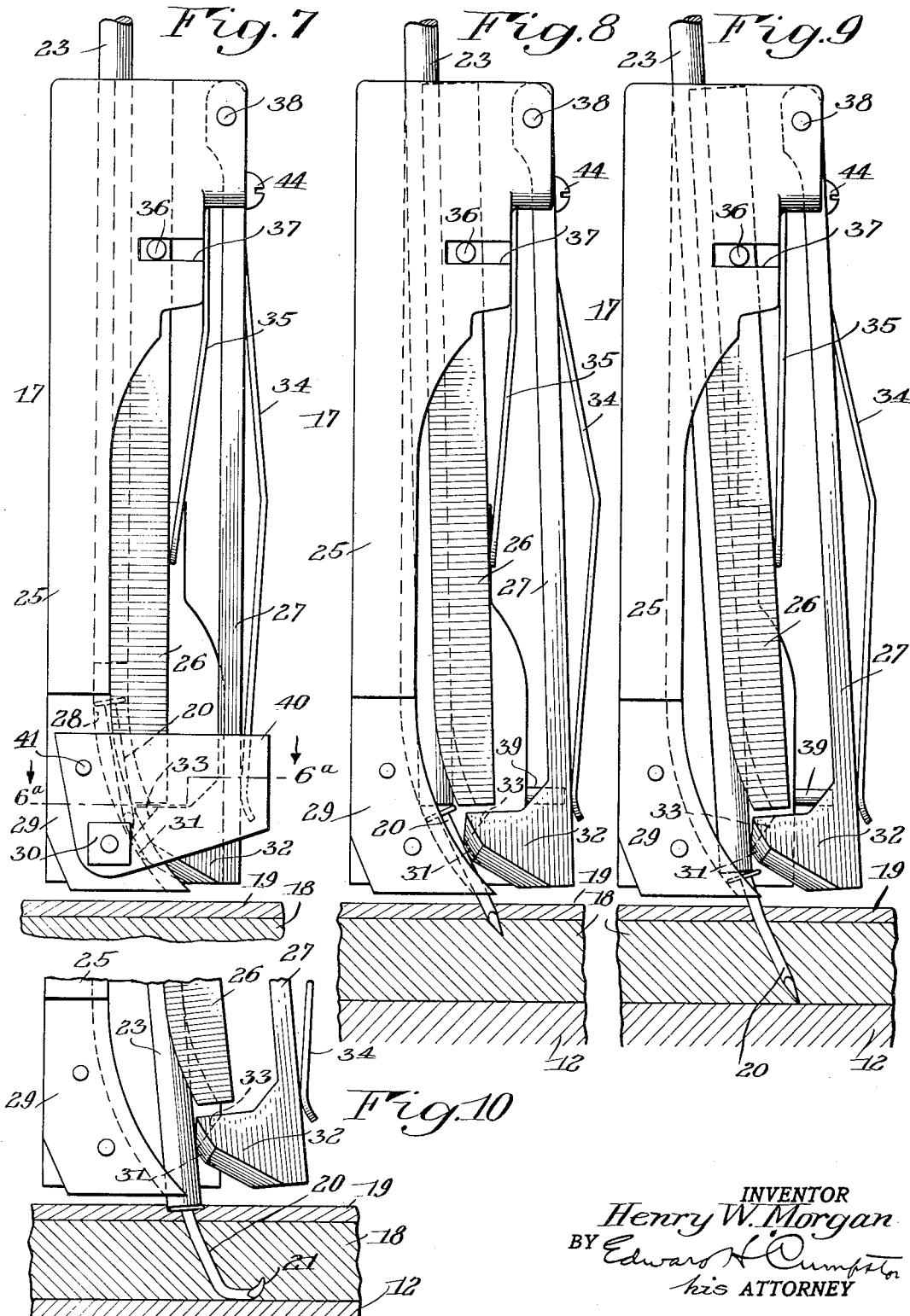
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METHOD AND MACHINE FOR DRIVING NAILS

Filed Sept. 16, 1932

3 Sheets-Sheet 3



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METHOD AND MACHINE FOR DRIVING
NAILS

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Application September 16, 1932, Serial No. 633,474

34 Claims. (Cl. 1—10)

The present invention relates to methods and means for nailing together the parts of crates, boxes and the like, and, more particularly, to methods and means of the varieties in which the nails are both driven and clinched in the work, one object of the invention being to provide a more simple, effective and inexpensive method of accomplishing such work.

Another object is to provide a method of nailing of the character described in which the nails are driven obliquely with respect to the work and to a clinching surface on which the work is positioned and in which the said surface operates to progressively bend and turn back the advancing point of the nail into the work during the driving operations, to accomplish and accurately control a more uniform and effective clinching of the nail in the work.

Another object is to provide such a method in which both the head of the nail and its advancing point are forced into the work substantially flush with its respective faces, so as to afford a more uniform, simple and finished operation.

Another object is the provision of improvements in machines for carrying out the prescribed method so as to reduce the cost of manufacture and of operation of such machines, while at the same time increasing their efficiency and improving the character of the work.

Another object is to provide a nail driving and clinching machine in which both the driving and clinching operations are performed at the same time, without requiring the usual additional moving parts for effecting the clinching operations.

Another object is to provide such a machine arranged to drive the nails at an oblique inclination to the work and to a clinching surface on which the work is supported and employing the said surface to progressively bend, turn back and embed the advancing point of the nail into the work by the driving operation itself, so as to uniformly and accurately control the clinching operation and increase its holding effect.

Another object is to provide such a machine arranged to sink both the head of the nail and its clinching portion substantially flush with the respective faces of the work so as to effect a more uniform, smooth and finished operation.

Another object is to provide an improved chuck for driving the nails obliquely with respect to the drive the nail into the work while maintaining it at a predetermined angle with respect thereto.

Another object is to provide an improved chuck for driving the nails obliquely with respect to the work and to a clinching surface on which the work

is positioned, and to right the head of the nail as the latter approaches the work so that, on completion of the driving operation, the head will be located substantially parallel and level with the face of the work.

A further object of the invention is to provide the combination of a plurality of chucks, and a combined work holding and nail clinching surface so arranged that a relatively large number of nails may be driven and clinched in one portion of the work at one operation, after which the work may be shifted upon the said surface and the nailing operations repeated to rapidly complete the nailing of the work in a minimum number of operations.

To these and other ends the invention resides in certain improvements and combinations of parts, all as will be hereinafter more fully described, the novel features being pointed out in the claims at the end of the specification.

In the drawings:

Fig. 1 is a perspective view illustrating one method of mounting the chucks for operation upon the work;

Fig. 2 is a face view of a section of work into which the nails have been driven by the chucks, the heads of the nails for one operation being shown in full lines, the work then being shifted and the second operation performed to drive the nails, as indicated by the dotted lines;

Fig. 3 is a side elevation of one of the chucks;

Fig. 4 is an elevation of the chuck shown in Fig. 3 as viewed from the right thereof;

Fig. 5 is a bottom plan view of the chuck shown in Fig. 3;

Fig. 6 is a fragmentary horizontal section taken on the line 6a—6a of Fig. 7;

Fig. 7 is a view in elevation showing the relation of the chuck to the work and the position assumed by the nail within the chuck before moving the driver in engagement with the head of the nail;

Fig. 8 is a similar view with the driver in a lowered driving position and showing the inclination of the nail with respect to the work when partially driven therein;

Fig. 9 is a view similar to Fig. 8 showing the nail driven to the position at which its point is in contact with the clinching table;

Fig. 10 is a fragmentary view in elevation showing the driver in its lowermost position with the nail turned back into the work by the clinching face of the table;

Fig. 11 is a perspective view of the nail guiding

and positioning block shown in Figs. 7 to 10 inclusive;

Fig. 12 is a fragmentary sectional elevation of a portion of the nail guiding means showing the nail advanced to different positions within the work, and

Fig. 13 is a view showing the manner of securing the different sides of a box or other work pieces one upon another by employing the chucks to position and drive the nails, without clinching, obliquely with respect to the work face and to bend the shanks at points slightly below the heads so that the heads are moved substantially into parallel relation to the work face, the nails being preferably slanted in opposite directions to more firmly secure the parts.

The same reference numerals throughout the several views indicate the same parts.

Heretofore the usual method employed in the driving and clinching of the nails has been to first completely drive the nail through the work and thereafter advance some form of clinching means, such as a clincher bar, into position to engage and bend down the protruding portions of the nails upon the work. This is not, for all purposes, an ideal method, since it increases not only the number of operations, but also the number of operating parts, as well as the time required to complete the nailing operations for a given piece of work. This method has also been found objectionable for the reason that practically all of the bent portion of the nail is left exposed to view on the outer surface of the work, and often projects therefrom in a rough and unsightly manner. This method is also open to the objection that the clinching force is applied in a direction opposite to that of the driving force, which tends to upset the nail, or drive it back through the board so as to cause it to bend under the head. In such a method the clinching or bending of the nail is uncontrolled and to a degree haphazard, and at times not fully effective.

In the present method the disadvantages pointed out above have been overcome by slanting the nail with respect to a clinching surface at the lower work face, driving and at the same time progressively turning back the point of the nail into the work while the nail is being advanced, and positioning the head of the nail in parallel relation to or flush with the upper work face while completing the driving stroke, all of which is done at one operation without having to employ any separate clinching steps. Furthermore, with the present method the clinching force is applied in a predetermined direction transverse to or at any oblique angle to the axis of the nail, rather than in a direction directly opposed to the driving force, with the result that the bending is controlled in direction and more easily and accurately accomplished, and the clinched end of the nail is formed substantially into a hook embedded within the work and extending in a plane substantially perpendicular to the clinching surface and containing the nail axis, which insures not only a better clinching effect, but also results in greatly improving the appearance of the work by reason of the fact that the exposed portion of the nail is reduced to a minimum.

This method may be carried out, for example, by means of a chuck which is preferably arranged substantially at a right angle to the face of the work with a nail passage having an inclined delivery end, the nail driving element moving substantially perpendicular to the work face in engagement with the head of the nail which is laid

flush with the surface of the work when the driving operation is completed as described hereinafter.

The present application forms a continuation in part of my copending application for Nailing machine, Serial No. 568,359, filed October 12, 1931.

Referring to the drawings, the frame of the present machine comprises suitably connected upright standards 10, the standards being provided with vertical crosshead guides 11, as shown in Fig. 1. A work support 12 such for example as a metal table is suitably supported preferably by the standards and may be raised or lowered thereon as required, by suitable means not shown. The standards are provided with brackets 31 or other suitable supports with which are connected one or more chuck supporting bars or rails 14 overlying the table as shown in Fig. 1. Additional chuck holding bars or rails 15 and 16 are shown extended at an angle to the rail 14, the rails 15 and 16 being supported above the table by suitable bracket means not shown. Any desired number of chucks 17 may be placed upon the rails, depending upon the character of the work and the number of nails to be driven therein. While the arrangement of chucks and supporting rails shown in Fig. 1 is highly desirable for certain kinds of work it will be understood that the number and the arrangement of these parts may be varied according to the requirements of different classes of work.

The particular arrangement of chucks shown in Fig. 1 is desirable in what is known as cleating work when the cleats are to be connected with veneering, ply board, or boards of any desired thickness to complete, for example the sides of various types of crates, boxes, or other forms of work in which it is desired to clinch the nails within the parts to be connected, the advantage of this arrangement being pointed out hereinafter.

The parts to be secured by nailing are by way of example shown in the present disclosure in the form of cleats 18 and an overlying board 19 which in advance of the nailing operations are positioned upon the table in engagement with suitable guides or stops not shown.

The nails 20 are of a selected length determined by the thickness of the parts through which they are to be driven and clinched as indicated at 21 in Fig. 10, the head of the nail being shown flush with the top of the work piece 19 and substantially paralleling the face thereof. The nails 20 are supplied to the chucks through the delivery tubes 22 which are connected with suitable overhead nail carrying hoppers or containers not shown, the nails, on entering the chucks, moving downwardly through the inclined passage 24 thereof from which they pass under the driver 23 when the bottom of the driver is in the position shown by the dotted line at 23a in Fig. 3, as when the driver is raised to its uppermost position by the crosshead. The drivers are reciprocated within the chucks by means described hereinafter, the chuck and the driver being disposed substantially perpendicular to the work although the driver is slightly inclined during the driving operation to cause it to follow the head of the nail. The driver is guided by the stationary and movable jaws 25 and 26 of the chuck, said movable jaw being yieldably supported for a swinging movement upon the stationary jaw and a second yieldably mounted jaw carrying member 27 being arranged to guide the driver and to swing

upon the stationary jaw 25 in a manner described hereinafter.

The jaw 25 of the chuck is provided at its lower end with an inclined or curved surface 28 for guiding both the nail and the driver, this surface being preferably formed by grooving a block 29 as shown in Fig. 11, and detachably securing the block upon the chuck jaw 25 as by means of one or more bolts or studs 30, although said curved surface may constitute an integral part of the chuck jaw if preferred.

The purpose of the grooved surface 28 is to maintain the nail at an inclination to the work and to the clinching surface while at the same time causing it to move in a substantially straight path as it continues to advance within the work. In other words, the nail is so guided by the surface 28 that it will move from the full line position shown in Fig. 12 downwardly along the axis 20a without substantial deviation therefrom while passing through the work or approaching the clinching surface of the table. In fact, it has been found that by giving the nail guiding surface 28 a suitable curvature the nail can be made to travel through the work along a selected or predetermined path, the angle of which with respect to the work can be varied if desired by varying the curve. It has also been found that with a nail of the size and proportions shown, which is to be driven into the work at approximately the angle indicated in Fig. 9, a curve for guiding the head of the nail will be required corresponding substantially to one the radius of which is approximately two and one half to three inches.

By the time the point of the nail reaches the face of the work the shank will have assumed the angle at which the nail is to be driven within the work. The nail at this time has a three point support since its end is in engagement with the work while its shank engages the curve of the stationary jaw at one point and its head at another. The angle assumed by the nail at this time is maintained by the travel of the head on the curve 28.

The curvature of the guiding surface of the chuck is of such a radius and direction of extent, depending somewhat upon the characteristics of the nail to be driven, as to substantially maintain the three point support of the nail while it is being firmly driven into the work, so that the main portion of the nail shank moves substantially in a straight line until the head of the nail approaches the end of the chuck curve. Just before the head leaves the curve, the latter is arranged to press against the head and thus bend the nail at a point slightly below the head, whereby that portion of the nail yet to be driven will be righted so that the head is moved down substantially parallel to and flush with the face of the work to complete the nailing operation in a smooth and slightly manner at that face of the work. Such bending of the nail adjacent the head is effected without interfering with or changing the course of the main portion of the shank of the nail since at the time of such bending the shank has become firmly embedded within the work by which it is maintained in alignment.

As the nail reaches the position shown in Fig. 9, its advancing end impinges upon the clinching surface of the table which progressively turns the point and the adjacent portion of the nail back into the work and causes it to become embedded therein, substantially in the form of a hook, as shown in Fig. 10, so that but little of

the nail is exposed to view at the clinching face of the work. The chuck, therefore, not only operates to initially position and maintain the nail at an oblique inclination to the clinching surface, but in conjunction with the latter, and the driver, serves to both drive and clinch the nail and drive the head home parallel to and in flush relation with the work, all at one operation.

It will be understood that while the chuck may be formed with a straight guiding surface obliquely inclined to the clinching surface, a curved guiding surface, as described, is preferred for the reason that it compensates for the approach of the edge of the head of the nail toward the end of the chuck curve and so maintains the three point support of the nail during the advance of the main portion of the shank into the work, without changing the direction of the axis of the shank during such advance. As the head approaches the work, and while the latter firmly holds the shank, the curvature of the guiding surfaces of the chuck smoothly and progressively bends and rights the shank adjacent the head, as described, to set the head flush with the face of the work. A further advantage of the curved surface of the chuck is that it affords smooth guiding control of the nail and the driver with a minimum of wear.

The nails when delivered to the chuck below the end of the driver are guided downwardly to the position shown in Fig. 7 by the fixed and movable jaws 25 and 26 of the chuck. The point of the nail in this position rests on the inclined surface 33 of the movably mounted jaw 32 while the head of the nail is in contact with the curved surface 28 of the fixed jaw. When the plunger is moved downwardly it will engage the nail to force the latter downwardly in the direction of the work and the pressure exerted by the point of the nail on the surface 33 of the movable jaw 32 will cause the latter to swing outwardly thus permitting the nail to enter the groove 31 in said jaw by which the nail is guided. After the nail has entered the groove the pressure of the spring 34 on the jaw 32 will cause the latter to hold the nail in contact with the curved face 28 of the fixed jaw until the nail has been driven well into the work. At about the time the point of the nail begins to move the jaw 32 outwardly the driver, which is then moving in contact with the curved surface 28, will cause the movable jaw 26 to swing outwardly against the action of the spring 35 whereby the driver is maintained in contact with the curved surface 28. As the driver continues to move downwardly the nail will continue to advance into the work and subsequently when the end of the driver engages the inclined surface 33 of the jaw 32 the latter will be swung outwardly to the position shown in Fig. 9 thus permitting the driver to continue downwardly until it is finally moved to the position shown in Fig. 10, at which the driving operation is completed. Upon again raising the driver to the elevated position shown in Fig. 7, the springs will return the movable chuck jaws to the normal position shown in said figure.

The jaw 26 is provided with trunnions 36 received within slots 37 of the fixed jaw 25 of the chuck whereby the movable jaw 26 is permitted to swing outwardly against the yielding action of the spring 35 when pressure is exerted by the driver upon the jaw 26 when the lower end of the driver is moved to the right as viewed in Fig. 8 through contact of said end with the surface 28 of the block 29.

The member 27 carrying the jaw 32 is pivotally connected at 38 with the stationary jaw 25 and is guided at its lower end on one side by a pin 39 anchored within the jaw 25 and on the other side by a plate 40 secured upon the block 29 by a nut on the stud 30 as shown in Fig. 7. The plate is prevented from turning upon the stud by a pin 41 anchored within the block 29 on the jaw 25.

The upper end of the spring 35 is seated upon a lug 42 on the stationary jaw 25 and is provided with a spacing element 43 for receiving the upper end of the spring 34, a screw 44 being extended through the ends of said springs and spacing element and threaded within the lug 42 to connect the springs therewith. The spring 35 is prevented from turning in one direction about the axis of the screw by a pin 45 engaging the edge portion of the spring as shown in Fig. 3, the pin being anchored within the wall of the chuck jaw 25 at the upper extremity thereof. The lower end of the spring 34 is extended between the guides 39 and 40 for the jaw 32 on the pivoted member 27 as shown in Fig. 3.

The chucks are recessed at their lower ends to receive the supporting rails on which they are mounted for longitudinal adjustment to the desired positions in which they are held by clamping members 46 secured to the jaw 25 by stud bolts 47 as shown in Fig. 3.

The nail drivers are reciprocated within the chucks upon operation of the crosshead 48 by suitable means not shown. The crosshead is provided at its lower edge with a slot 49 within which the heads 50 of the drivers for the chucks carried by the rail 14 are fitted in a manner to permit the drivers to assume inclined positions with respect to the chucks.

Relatively long and short arms 51 and 52 are extended laterally from the crosshead as shown in Fig. 1 and these arms are provided with slots or guideways 53 and 54 for receiving the heads of the drivers carried by the rails 15 and 16 respectively, the heads being positioned in the slots in a manner to permit the drivers to assume inclined positions with respect to the chucks when moving in contact with the curves 28 of the chucks.

The arms 51 and 52 are adjustable longitudinally of the crosshead and are secured thereto by bolts 55 having their heads disposed within the T-shaped slot 56 formed within the lower portion of the crosshead. From this construction it will be seen that the chucks may be shifted longitudinally of the different rails on which they are mounted to afford the desired spacings between the nails and that the arms 51 and 52 may be moved closer together or farther apart as desired to accommodate the chucks to work pieces of different proportions.

In the operation of connecting the work pieces 18 and 19 as shown in Fig. 2 the parts are positioned upon the clinching surface of the table 12 in proper alignment beneath the different chucks carried by the rails 14, 15, and 16. The crosshead is then lowered to force the drivers 23 downwardly through the chucks and the nails through the work whereby the nails 20, the heads of which are shown by full lines in Fig. 2, are driven and clinched as shown in Fig. 10.

Upon raising the crosshead the work is shifted to reverse position upon the table so that the unsecured portions of the work will be presented beneath the chucks, after which the crosshead is again moved downwardly to operate the drivers

and to repeat the nailing operation. The positions of the nail heads for this operation are indicated by the dotted circles in Fig. 2.

It will be seen therefore that by this method a relatively large number of nails can be driven and clinched at one operation to connect the work pieces at various points, the nail ends being so embedded within the work that but very little is left exposed to view. The nailing operations are thus quickly accomplished in a simple and efficient manner without disfiguring the work. The nailing along the edges of the work at the ends and sides thereof and at one or more intermediate points at one operation and the subsequent reversal of the position of the work and the repeating of the nailing operation constitutes a method by which a given amount of work can be turned out in a minimum of time.

While the machine is well adapted for what is known as cleating work, it will be understood that it is not limited in its use to this class of work but can readily be employed for nailing work pieces of various shapes and sizes through which the nails may be driven and clinched to firmly secure the parts together.

The chucks can, of course, be constructed to deflect or incline the nails relative to the work in any direction desired and if necessary can be so formed or arranged as to incline certain of the nails in one direction and others in a different or opposite direction, to effect better holding, and may be employed to drive nails in a relatively deep work piece without clinching as shown in Fig. 13.

I claim:

1. In nail driving apparatus, the combination of a support for holding work, said support having a clinching surface located substantially at a face of the work, a nail guide arranged to hold the nail at an oblique inclination to said clinching surface and to maintain it at said inclination while being driven within the work, and driving means for the nail associated with the guide and inclined relative to the nail during the driving operation, said clinching surface operating to progressively bend the advancing end of the nail back into the working during the driving operation.

2. In nail driving apparatus, the combination of a support for holding work, said support having a clinching surface located substantially at a face of the work, means for obliquely inclining the nail relative to said clinching surface, a driver for the nail associated with said means and moved thereby during a portion of the driving operation relative to the axis of the nail, said clinching surface serving while the nail is being driven to bend the advancing end thereof into the work, and driving means for the driver.

3. In nail driving apparatus, the combination of a frame, a support thereon for holding work having a clinching surface located adjacent one face of the work relatively movable cooperating devices for guiding and driving the nail through the work substantially on an axis at an oblique inclination to said clinching surface, one of the devices operating during a portion of the driving operation to vary the inclination of the driving device relative to the axis of the nail, said surface serving while the nail is being driven to progressively deflect the advancing end of the nail into the work, and means movable upon the frame for operating one of said devices to drive the nail within the work.

4. In nail driving apparatus, the combination of a support for holding work, said support having a clinching surface located adjacent one face of the work, guide means for obliquely inclining the nail relative to said clinching surface, and a reciprocally mounted driving element for the nail inclined relative to the latter in advance of its entrance into the work and during the driving operation and having a substantially vertical movement for driving the nail head down flush with the face of the work.

5. In nail driving apparatus, the combination of a support for holding work, said support having a clinching surface located adjacent one face of the work, a nail guide arranged to hold a nail at an oblique inclination to said clinching surface, and a driver for the nail associated with the guide and relative to which the nail is inclined in advance of its entrance into the work, the driver, having a substantially vertical movement for cooperation with said clinching surface to progressively clinch the nail back into the work and drive the head of the nail down substantially flush with another face of the work when the driver reaches the end of its driving stroke.

6. In nail driving apparatus, the combination of a support for holding work, said support having a clinching surface adjacent one face of the work and relatively inclined cooperating devices for guiding and driving the nail at an oblique inclination to said clinching surface, said surface operating while the nail is being driven to bend the advancing end of the nail into the work and the driving device engaging and being arranged to drive the head of the nail down substantially flush with another face of the work when completing the driving operation.

7. In nail driving apparatus, the combination of a support for holding work, said support having a clinching surface located adjacent one face of the work, a vertically disposed nail chuck arranged to obliquely incline a nail relative to said clinching surface, a driver associated with the chuck for driving the nail, said clinching surface operating to progressively bend the advancing end of the nail into the work during the driving operation, and operating means for the driver upon which the latter is arranged to rock during the driving operation whereby the driver is caused to follow the head of the nail during advancement thereof.

8. In nail driving apparatus, the combination of a support for holding work provided with a clinching surface adjacent one face of the work, guide means for the nail operating to maintain it substantially at a predetermined oblique angle relative to the clinching surface while being driven within the work, a driver for the nail associated with the guide means, the axes of the driver and nail being inclined one relative to another during the driving operation, said clinching surface operating during a portion of the driving stroke to progressively bend the advancing end of the nail back into the work, and means for reciprocating the driver.

9. In nail driving apparatus, the combination of a support for holding work provided with a clinching surface adjacent one face of the work, a chuck arranged to incline the nail at a predetermined angle relative to the work in advance of the driving operation and to maintain the nail substantially at said angle while it is being driven within the work, a driver for the nail associated with the chuck and having its axis inclined relative to the axis of the nail, said clinching surface

operating to bend the advancing end of the nail back into the work during the driving operation, and means for reciprocating the driver.

10. In nail driving apparatus, the combination of a frame, a support thereon for holding work provided with a clinching surface, a chuck carried by the frame comprising opposed sections one being fixed and another mounted to swing relative thereto, spring means for returning the last mentioned section to normal position, said sections cooperating to form a nail receiving guide-way for holding the nail at an oblique inclination to said clinching surface, a nail driver operable between said sections and moved by one of the sections relative thereto during a portion of the driving operation whereby to shift the driver relative to the axis of the nail, said clinching surface operating to progressively bend the advancing end of the nail back into the work during the driving operation, and means movable upon the frame for reciprocating the driver.

11. A nailing machine chuck, comprising a fixed section and a relatively movable section, said sections being constructed to form a receiving passage for a nail and nail driver, one of the sections having a relatively inclined portion at the nail discharging end of the chuck operating to incline the nail relative to a work piece extending transversely of and adjacent said discharging end of the chuck, a driver reciprocating in said passage, and means yieldably securing said movable section to said fixed section to permit said driver to move therebetween at a constantly varying inclination with respect to said work piece while moving through said passage.

12. A nail guiding chuck, comprising relatively movable sections pivotally connected adjacent one end and cooperating to form a nail and driver receiving passage, the discharge end of the passage being inclined relative to the remaining portion thereof whereby to guide and hold the nail inclined relative to the work during the driving operation, a spring associated with said sections arranged to urge one section into engagement with the other, and a nail driver operable within said passage to drive the nail.

13. In nail driving apparatus, the combination of a support for the work, said support having a clinching surface located substantially at a face of the work, a nailing chuck comprising a fixed section and a movable section, said sections being formed to provide therebetween a nail passage inclined relative to said clinching surface and adapted to maintain the nail while being driven within the work substantially on an axis inclined relative to said surface, a driver for the nail arranged to operate in said passage and being moved by the fixed section relative thereto and to the axis of the nail during a portion of the driving operation, and means yieldably holding said sections together to permit said driver to follow a nail through said discharge portion.

14. A nailing machine chuck, comprising a section arranged to be fixed relative to the work and having a nail guiding surface for positioning the nail in advance of the driving operation at an oblique angle relative to a face of the work and for maintaining the nail substantially at said angle while it is being driven into the work, a driver for the nail arranged to be guided by said surface to maintain it in contact with the head of the nail during the driving operation, the nail being inclined relative to the axis of the driver during a portion of the driving operation, and

guide means for the driver associated with said section.

15 A nailing machine chuck, comprising a section arranged to be fixed relative to the work and having a curved nail guiding surface for positioning the nail at an oblique angle relative to a face of the work and for maintaining the nail substantially at said angle while it is being driven within the work, a driver for the nail arranged to engage the head thereof and operating through contact with said curved surface to slightly bend the nail after it has been driven a predetermined distance within the work whereby to position said nail head in substantially parallel relation to said work face, and guide means for the driver associated with said chuck section.

16 A nailing machine chuck, comprising a fixed section and relatively movable sections, the fixed section having a portion at the nail discharging end of the chuck operating to incline the nail relative to a work piece extending transversely of and adjacent said chuck, said relatively movable sections being yieldably mounted and serving as guide means for a driving element for the nail, one of said relatively movable sections forming a guide for the nail.

17 A nailing machine chuck, comprising fixed and relatively movable yieldably mounted sections, the fixed section having a portion at the nail discharging end of the chuck shaped to incline and guide the nail at an inclination to a work piece extending transversely of and adjacent said chuck, said fixed section and one of said relatively movable sections cooperating to form guide means for a driving element and for the nail, another of said relatively movable sections extending between the last mentioned section and said fixed section and forming guide means for the driver.

18 A nailing machine chuck, comprising a fixed section and a pair of yieldably mounted relatively movable sections, and a nail driver movable between said fixed section and said relatively movable sections and guided thereby, said fixed section having a portion at the nail discharging end of the chuck shaped to guide and to incline the nail relative to the axis of the driver, one of said relatively movable sections serving to guide the nail during a portion of the driving operation.

19 A nailing machine chuck, comprising a fixed section arranged to extend substantially perpendicular to the face of a work piece, a yieldably mounted section connected with said fixed section, and a driver for said nail guided by said sections, said fixed section having a portion shaped to guide and to incline the nail relative to the work piece in advance of its engagement with the latter, said driver engaging the head of the nail and being inclined relative to the shank of the nail during the driving operation.

20 The method of nailing, comprising driving the nail through the work and at the same time guiding it exteriorly of the work to maintain it at an oblique angle to a combined work supporting and clinching surface, for progressively bending and clinching the advancing end of said nail back from said surface into the work in a controlled direction by a force applied in a predetermined direction transversely to the nail axis.

21 The method of nailing, comprising guiding and driving a nail through the work at an oblique inclination to a clinching surface located substantially at a face of said work to progres-

sively bend the advancing end of said nail from said face back into said work, and bending the shank of the nail adjacent the head to right the latter on approaching another surface of the work and subsequently driving the head down substantially flush with said face of the work so as to lie substantially level therewith.

22 The method of nailing, comprising positioning a nail at an oblique inclination to a work piece, driving the nail into the work piece while at said inclination by means moving at an inclination to the axis of the nail during the driving operation and at the same time guiding the nail exteriorly of the work piece to maintain it substantially on an axis while passing through the work piece, and operating upon the advancing end of the nail to maintain it within the work piece and at the same time bending it therein to clinching position.

23 The method of nailing, comprising positioning a work piece upon a support having a clinching surface substantially at a face of the work piece, inclining a nail relative to said surface, driving the nail through the work piece, and employing said clinching surface to progressively bend the advancing end of the nail back from said surface into clinching position within the work piece during the driving operation and righting the head of the nail on approaching the work to position it in substantially parallel relation to the face of the work.

24 The method of nailing, comprising guiding a nail exteriorly of the work on an axis at an oblique inclination to a clinching surface located substantially at a face of the work for progressively bending the advancing end of the nail back into the work during the driving operation, and moving a driving element in engagement with the head of the nail and deflecting said element during the driving operation to maintain it in contact with the head.

25 In a nailing machine, the combination of a plurality of nailing chucks, means for supporting the work adjacent the nail discharging ends of the chucks, said supporting means having a clinching surface at the opposite face of the work from that nearest the chucks, the chucks being constructed to position the nails at an oblique angle with respect to the work and to said clinching surface, drivers associated with the chucks for driving the nails through the work, the drivers and the nails being inclined one relative to another during the driving operations and the nails upon contacting with said clinching surface being progressively turned back into the work and clinched therein, and means for simultaneously operating the drivers.

26 In a nailing machine, the combination of a plurality of nailing chucks arranged in different rows disposed one at an angle to another, means for supporting the work adjacent the nail discharging ends of the chucks, said supporting means having a clinching surface at the opposite face of the work from that nearest the chuck, the chucks being constructed to guide the nails on an axis at an inclination to one face of the work and drivers associated with the chucks for driving the nails and operating at an inclination to the axes of the nails, the latter upon contacting with said clinching surface being progressively turned back into the work and clinched therein.

27 In a nailing machine, the combination of a plurality of nailing chucks arranged in different rows disposed one at an angle to another,

means for supporting the work adjacent the nail discharging ends of the chucks, said supporting means having a clinching surface at the opposite face of the work from that nearest the chucks, the chucks being constructed to position and guide the nails at an oblique angle with respect to the work and to said clinching surface in advance of the driving of the nails into the work, drivers associated with the chucks inclined relative to the nails and operating to engage and drive the nails through the work at said oblique angle, the nails upon contacting with said clinching surface being turned back into the work and clinched therein, and means for simultaneously operating the drivers.

28. In a nailing machine, the combination of a plurality of chucks arranged in different rows disposed one at an angle to another, means for supporting the nails adjacent the nail discharging ends of the chucks, said supporting means having a clinching surface at the opposite face of the work from that nearest the chucks, said chucks being constructed to position the nails at an oblique angle with respect to the work and to said clinching surface, drivers associated with the chucks inclined relative to the nails and operating to engage and drive the nails through the work at said oblique angle, the nails upon contacting with said clinching surface being progressively turned back into the work and clinched therein, and a reciprocally mounted operating head for the drivers having angularly disposed portions engaging the drivers of the different rows of chucks to effect simultaneous operation of the same.

29. In nail driving apparatus, the combination of a support for holding work, said support having a clinching surface adjacent one face of the work and relatively inclined cooperating devices for guiding and driving the nail at an oblique inclination to said clinching surface, said surface operating while the nail is being driven to bend the advancing end of the nail into the work and the driving device engaging and moving relative to the nail head and being arranged to drive the head of the nail down substantially flush with another face of the work when completing the driving operation.

30. In nail driving apparatus, the combination of a support for holding work, said support having a clinching surface located adjacent one face of the work, a vertically disposed nail chuck arranged to obliquely incline a nail relative to said clinching surface, a driver associated with the chuck for driving the nail, said clinching surface operating to progressively bend the advancing end of the nail into the work during the driv-

ing operation, and operating means for the driver permitting the latter to rock thereon during the driving operation whereby the driver is free to follow the head of the nail and to move relative thereto during advancement thereof.

31. In nail driving apparatus, the combination of a support for holding work, said support having a clinching surface located adjacent one face of the work, a vertically disposed nail chuck arranged to obliquely incline the nail relative to said surface, a driver associated with the chuck for driving the nail, operating means for the driver permitting the latter to move relative thereto, and means associated with the chuck for moving the driver relative to the operating means and to the nail during the driving operation whereby to maintain proper relation between the driver and the head of the nail.

32. A nail guiding chuck, comprising relatively movable sections pivotally connected adjacent one end and cooperating to form a nail and driver receiving passage, the discharge end of the passage being inclined relative to the remaining portion thereof whereby to guide and hold the nail inclined relative to the work during the driving operation without bending the nail, a spring associated with said sections arranged to urge one section into engagement with the other, and a nail driver operable within said passage to drive the nail.

33. A nailing machine chuck comprising a nail driver and cooperating nail guiding sections constructed to form a receiving passage for a nail and the driver, one of the sections having a relatively inclined portion at the nail discharging end of the chuck operating to incline the nail relative to a work piece positioned adjacent said discharging end of the chuck and also operating during the driving of the nail within the work piece to maintain it substantially on an axis at a predetermined inclination to a clinching face at one side of said work piece, said inclined portion operating to deflect the driver during the driving operation to vary its inclination relative to the axis of the nail and to maintain it in contact with the head of the nail.

34. The method of nailing, comprising driving the nail through the work at an inclination to the direction of the driving force and at the same time guiding the nail exteriorly of the work to maintain it substantially on an axis at an oblique inclination to a clinching surface located substantially at a face of said work, for progressively bending the advancing end of the nail back from said face into the work to clinch the nail during the driving operation.

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