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A. A. CAVANAUGH

2,806,219

NAILING MACHINE

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3 Sheets-Sheet 1

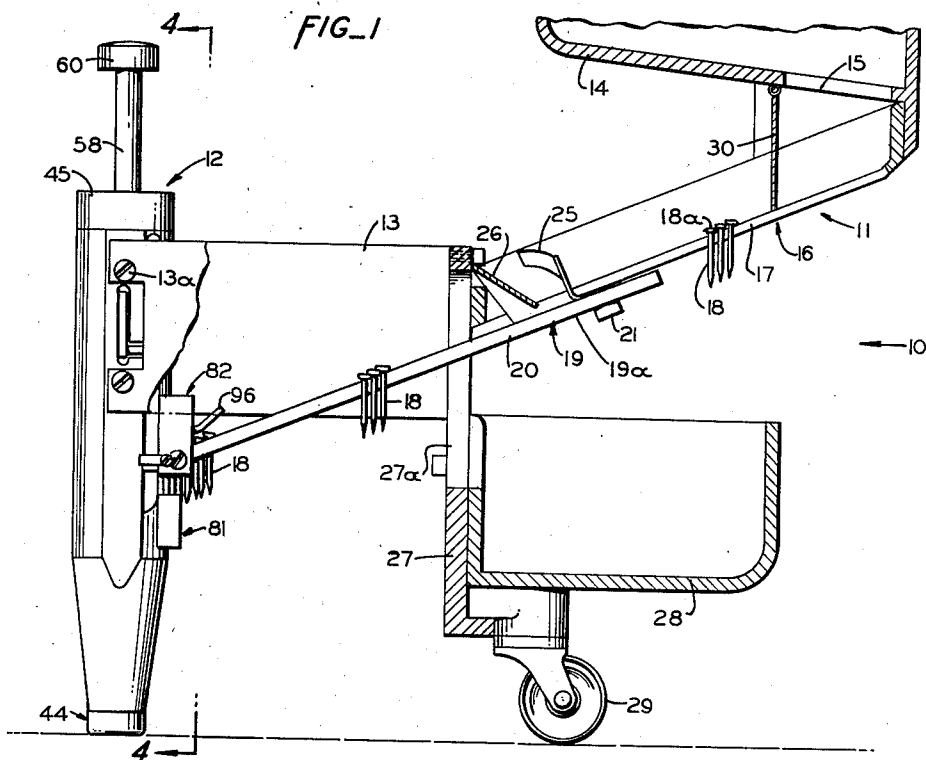
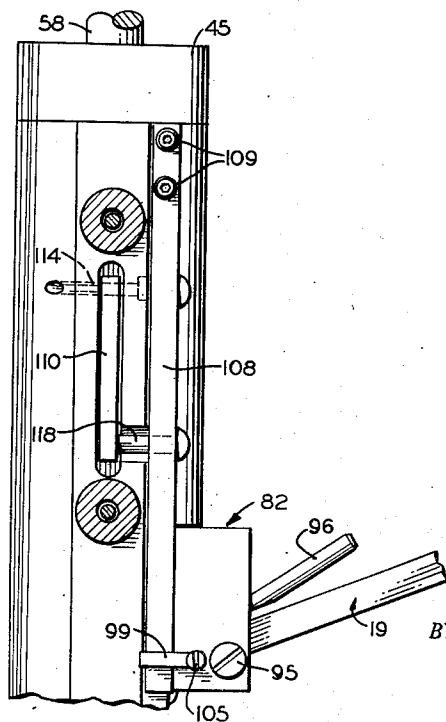


FIG. 8



INVENTOR.
ARTHUR A. CAVANAUGH

BY

Edward B. Flegg

ATTORNEY

Sept. 17, 1957

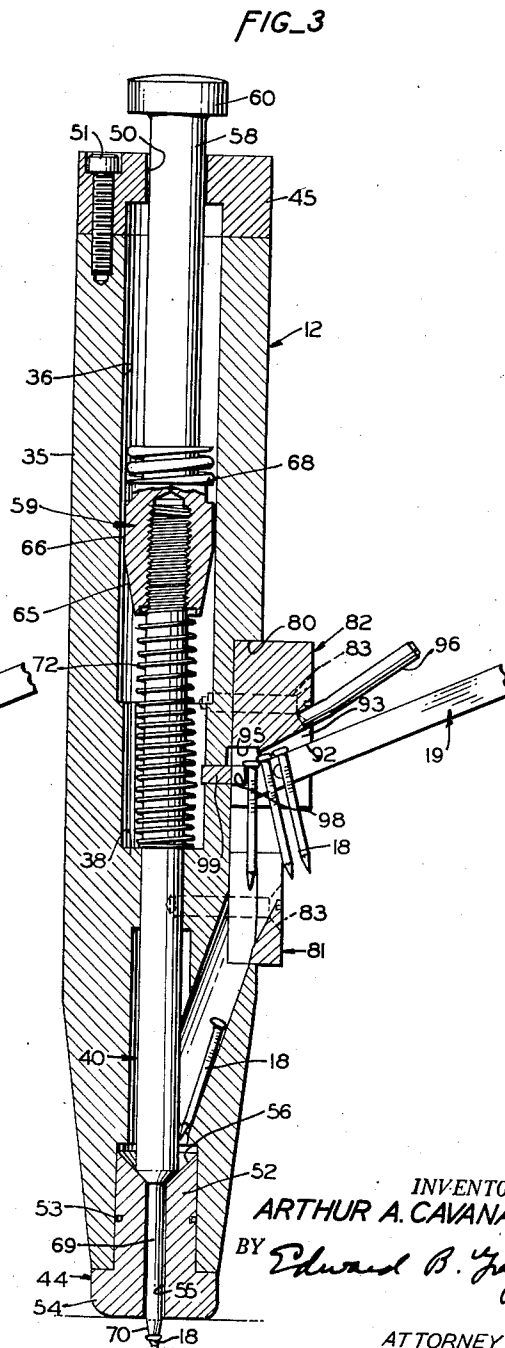
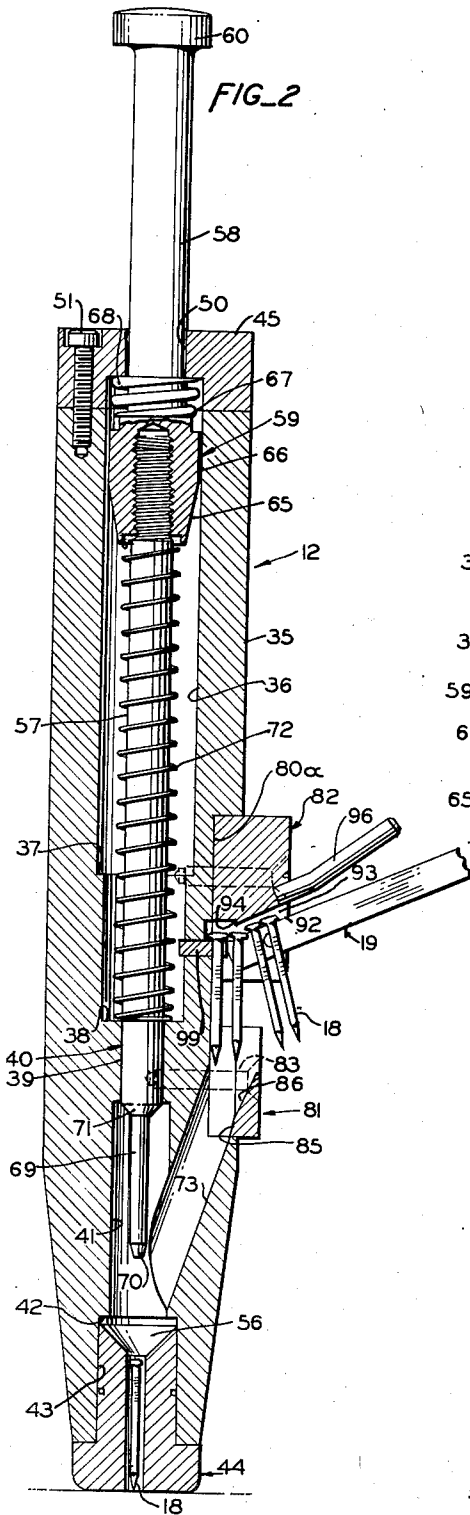
A. A. CAVANAUGH

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3 Sheets-Sheet 2



INVENTOR.
ARTHUR A. CAVANAUGH

BY *Edward B. Gegg*

ATTORNEY

2,806,219

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NAILING MACHINE

Arthur A. Cavanaugh, Alameda, Calif.

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2 Claims. (Cl. 1—46)

This invention relates to a nailing machine. More particularly, it relates to certain improvements on prior nailing machines, particularly that described and claimed in my prior Patent No. 2,573,540, granted October 30, 1951, and entitled Nailing Machine.

In a nailing machine intended for nailing floors, such as that described in my prior patent above referred to, it is important that nails be supplied to a nail driving or nail set passage in the driving mechanism in such manner that, whenever the driving plunger is moved downwardly, as by means of a blow of a hammer, there is always one nail but only one nail in the nail set passage. It is exceedingly important that the nail feed means provided for this purpose operate in such a manner as to eliminate as completely as possible, the likelihood that a second nail will be supplied to the nail set passage before the preceding nail has been completely driven into the floor.

The nailing machine of my prior patent has achieved considerable success in this and other respects and constitutes a very substantial improvement over prior nailing machines. However, it is subject to certain disadvantages under certain conditions. Thus, the last nail in the nail feed mechanism, which is the next nail to be delivered to the nail set passage and to be driven into a floor, is preferably held in position by magnetic means and is released mechanically. Sometimes this nail is dislodged prematurely from the magnetic nail-holding means by reason of vibration and shock resulting from operation of the machine. At other times the nail held by the magnetic holding means is dislodged prematurely by the mechanical release means, by reason of the fact that the preceding nail is driven into a floor by degrees with more than one stroke of a hammer rather than by a single stroke of the hammer. If the machine is used with long nails, e. g., with eight-penny finishing nails, two or more blows of a hammer are required to drive a single nail into a floor, and the mechanical nail release means may be actuated prematurely, before the preceding nail has been completely driven into a floor.

Another, and a very serious difficulty with prior nailing machines is that the recoil of the nail driving plunger frequently actuates the nail release means prematurely.

It is an object of the present invention to provide an improved form of the nailing machine.

Another object of the invention is to provide a nailing machine for driving nails into floors, which eliminates or minimizes disadvantages which have occurred in practice in connection with prior nailing machines such as that of my prior patent above-identified.

Another object of the invention is to provide a nailing machine which employs a positive, mechanical nail-holding means from which a nail cannot be prematurely dislodged by shock and vibration.

A still further object of the invention is to provide a nailing machine of the general character and for the general purpose described which employs means for se-

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curely holding the next nail to be driven until the preceding nail has been completely driven into a floor.

A further object of the invention is to provide a nail driving machine which can be used with relatively long nails such as eight-penny nails, without the disadvantage of premature release of nails.

Yet another object is to provide a nail driving machine in which the recoil of the nail driving plunger does not actuate the nail release means prematurely.

These and other objects of the invention will be apparent from the ensuing description and the appended claims.

One form of the present invention is illustrated by way of example in the accompanying drawings, in which—

Figure 1 is a view, partly in side elevation and partly in vertical section, of the nailing machine of the present invention.

Figure 2 is a view in vertical midsection of the nail driving mechanism of my nailing machine, such view being in the plane of nail delivery chutes and showing the nail driving plunger in its normal, up position.

Figure 3 is a view similar to that shown in Figure 2, but showing the nail driving plunger in its down position, showing a nail completely driven into a floor and showing the next succeeding nail released by the nail feed means.

Figure 4 is a view in front elevation of the nail driving mechanism, as seen along the line 4—4 of Figure 1, but shown on a larger scale.

Figure 5 is a fragmentary view similar to that shown in Figure 4, but partly broken away to reveal more clearly the operation of the nail-holding and release mechanism, and showing the latter in the release position.

Figure 6 is a horizontal section taken along the line 6—6 of Figure 4.

Figure 7 is a horizontal section taken along the line 7—7 of Figure 5.

Figure 8 is a fragmentary view in side elevation as seen from the left of Figure 4 but with the side plates removed.

Referring now to the drawings and more particularly to Figure 1, the nail driving machine of the present invention is there illustrated and is generally designated by the reference numeral 10. It comprises a nail supply means 11 and a nail driving mechanism 12 which is continuously supplied with nails by the supply assembly 11. Spaced, parallel side plates 13 are provided which are detachably secured, as by means of screws 13a, to the nail driving mechanism 12 and to the nail supply assembly 11, such plates serving to hold together the nail supply assembly 11 and the nail driving mechanism 12 and to provide a sturdy, rigid unitary structure.

The nail supply assembly 11 may be generally the same as that described and illustrated in my prior Patent No. 2,573,540, and it is so shown in Figure 1 of the present application. It includes a nail hopper 14 for holding a supply of nails which is formed at the lower edge of its sloping bottom with a slot 15 to allow nails to drop into an upper nail chute 16. The latter is formed with a longitudinal slot 17 of a width to allow the bodies of finishing nails 18 to pass but to hold their heads 18a and suspend them in the manner illustrated. However, other types of nails than finishing nails may also be used in the machine of the present invention.

A lower chute 19 is provided which is formed of two bars 19a spaced apart to provide a longitudinal slot 20, and it is secured to the upper chute 16, as by means of screws 21. The lower chute 19 and its slot 20 constitute a continuation of the upper chute 16 and its slot 17, respectively. A U-shaped shingle nail guard 25 and a deflector 26 are also provided, which are of the same construction and serve the same purpose as the correspond-

ing elements in the nail supply assembly of my prior patent. Very briefly, it is the function of the nail guard 25 to prevent passage of nails, such as shingle nails, having larger heads than desired, to the lower chute 19, and it is the purpose of the deflector plate 26 to deflect nails which lie transversely in the chute 16.

A vertical frame bracket or plate 27 is provided to which the side plates 13 are affixed, and a bin 28 is fixed to the plate 27 beneath and in registry with the shingle nail guard 25 and the deflector plate 26, so as to receive nails which are deflected or removed by the latter elements. Casters are provided, one of which is shown at 29, to render the machine more easily mobile. A hinged retarding plate is provided at 30 which serves the purpose of retarding somewhat the flow of nails from the hopper 14 into the upper chute 16 to prevent piling up and jamming of nails in the chute 16.

Referring now more particularly to Figures 2 to 5, the nail driving mechanism 12 comprises a tubular barrel 35 of sturdy, thick-walled steel construction and formed with a longitudinal, axial passage 36. The latter is best shown in Figures 2 and 3 and is formed with internal shoulders at 37 and 38, and with an accurately machined throat portion at 39, to slidably receive a nail driving plunger 44, which is described in detail hereafter and is referred to as the driver. Beneath the throat portion 29, the passage 36 is of wider diameter at 41 and provides a section to which nails are delivered in the manner hereinafter described. At its lower end, the passage 36 is formed with a shoulder 42, and with a widened portion 43 which receives a detachable nail set plug 44, which is described in detail hereinafter. At its open upper end, the barrel 35 is provided with a detachable cap 45 which is formed with an opening 50 to slidably receive the upper end of the driver 40, and which is secured to the barrel 35 by means of countersunk cap screws 51.

The nail-set plug 44 has a body portion 52 of cylindrical shape and of a diameter to form a sliding fit within the lower end portion 43 of the axial passage 36, and it is formed with an annular groove to receive a compressible friction ring 53 which frictionally engages the side walls of the cavity 43 to hold the cup 54 in place and to prevent it from dropping out by gravity but which nevertheless permits ready detachment of the plug by hand when so desired.

The plug 44 is formed at its lower end with a widened head 54 which abuts the bottom surface of the barrel 35, and it is also formed with an axial passage 55 to receive a nail as shown at 18 in Figure 2, and at its upper end it is formed with conical seating cavity 56.

The driver 40 is constructed in two parts, including a lower portion 57 of cylindrical shape and of a diameter to be slidably received in the throat 39 of passage 36, and an upper portion 58 which is also of cylindrical shape and of a diameter to be slidably received in the opening 50 in cap 45. At its upper end, the lower portion 57 of driver 40 is threaded as illustrated, and is in threaded engagement with a cam member 59 which is integral with and at the lower end of the upper portion of 58 of driver 40. As illustrated, the cam portion 59 has a frusto-conical lower end 65 which constitutes a cam rise and a cylindrical upper end of a diameter somewhat less than the inside diameter of the passage 36. The cam member 59 is also formed with a shoulder 67 which provides a seat for a strong spring 68, which serves as a shock absorber during operation of the machine.

At its extreme lower end, the driver 40 is formed with a nail set 69 which is slidable in the nail set passage 55 of the plug 44, and which is tapered at 70 at its lower end, as illustrated, to form a blunt point. At its junction with the nail set 69, the driver 40 has a frusto-conical shape as illustrated at 71, for seating in the frusto-conical seat 56 of plug 44. An expansion spring 72 is provided which is compressed between the lower end of cam

59 and the shoulder 38. The spring 72 urges the driver 40 to and normally holds it in the up position illustrated in Figure 2. As is also shown in Figures 2 and 3, a lateral passage 73 is formed in the lower end of the barrel 35, for supplying nails as they are dislodged from the nail feed mechanism to the nail set passage 55. The nail feed mechanism will now be described in detail.

The barrel 35 is cut away and machined at one side (on the right as viewed in Figures 2 and 3) to provide a cavity 80 which receives a lower block 81 and an upper block 82. These blocks are secured within the cavity 80 against its vertical face 80a, by means of countersunk cap screws 83. The lower block 81 has a slot 84 formed therein, which is best shown in Figures 4 and 5 and which serves to receive and pass the lower ends of nails 18 as they reach the bottom of the lower chute 19, and it is also formed with a passageway 85 formed with a slanting groove 86, which communicate with the lateral passage 73 in the barrel 35.

The upper block 82 has a guide rod 96 fixed thereto, extending upwardly and forwardly therefrom and overlying the chute 19, the purpose of which is to guide nails into the nail holding and release mechanism. The block 82 is formed with a U-shaped recess 91 (Fig. 4), having a slanting top portion 92, against which the lower end of the chute 19 bears and to which the chute is fixed by any suitable means, such as the screws shown. A groove 93 is formed in the slanting top portion 92 for clearance of nail heads 18a, and at its lower edge the slanting top portion 92 terminates in a semi-circular shoulder 94, and rearwardly thereof or to the left as viewed in Figures 2 and 3, the recess 91 has a horizontal top portion 94. The block 82 is also formed with a horizontal slot which slidably receives a nail-holding bar 99.

The nail-holding bar 99 has a nail-holding notch 100 formed therein at its center. The notch 100 is of sufficient width to receive the shank of the nail but less than the diameter of the head 18a of the nail. Hence the notch 100 will hold and suspend a nail as illustrated in Figures 3 and 4. The nail-holding bar 99 slides in the slot 98 in block 82, as explained above, and it also slides in a companion slot 101 (Fig. 6) formed in the vertical face 80a of the cavity 80. Immediately above and adjacent the slot 101 is a cam groove 102 which is formed in the face 80a and which has a rise 102a shown in Figures 6 and 7 located to the left of slot 20 in chute 19. The face 80a is also provided with a ball bearing 103 which is press-fitted into and protrudes from the face 80a. As shown in Figures 6 and 7, the ball bearing 103 is in registry with a notch 103a formed in the left-hand bar 19a.

The nail-holding bar 99 has a head portion 104 at its left-hand end, as viewed in Figures 4 to 7, and a set screw 105 is threaded through the head portion so as to bear against the block 82 as illustrated in Figures 4 and 6. A lock nut 106 is provided to lock the set screw 105 in adjusted position. The head portion 104 is notched at 107 to slidably receive the lower end of a leaf spring 108 which is fixed to the adjacent, flat side of the barrel 35, as by screws 109. The spring 108 normally holds the nail-holding bar 99 in and at all times urges it to the position illustrated in Figures 4 and 6 wherein the notch 100 coincides with the groove 20 in lower chute 19. The notch 100 is, therefore, normally in a position to receive a nail 18 and to hold and suspend it as illustrated in Figure 4.

A lever 110 is provided which is pivoted at 114 in a slot 115 formed in the side wall of the barrel 35, such lever having a curved inner edge 116 which slopes to a high point 117 at its lower end. The lever 110 is also provided with a projecting stud 118 which contacts or lies closely adjacent to the leaf spring 108, and is normally seated in a notch 119 formed in the barrel 35.

In operation, the nailing machine above described and illustrated functions as follows:

Referring now more particularly to Figure 1, a supply

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of finishing nails such as shown at 18, are provided in the hopper 14 and are fed automatically by the nail supply assembly 11, including the upper chute 16 and the lower chute 19 to the nail driving mechanism 12. The moving parts of the nail driving mechanism 12 are normally maintained in the positions shown in Figures 2, 4 and 6. That is, the expansion spring 72 holds the driver 40 in the up position illustrated in Figure 2, and the leaf spring 108 holds the nail-holding bar 99 in the position shown in Figures 4 and 6. It will, therefore, be apparent that, at all times, and until the driver 40 is struck a blow by a hammer or is otherwise moved downwardly from the position shown in Figure 2, a nail 18 will be suspended from the bar 99 in the manner illustrated in Figure 4, but such nail will be prevented from dropping into the lateral passage 73 (see Figure 2) by reason of the fact that the head 18a of the nail is of greater diameter than the width of the notch 100 in the slide bar 99. It will, therefore, be apparent that the next nail to be driven is held by positive, mechanical means until it is ready for release, and that it cannot be shaken loose.

Assuming that a nail 18 is in the nail set passage 55 in the plug 44, as illustrated in Figure 2, and that the driver 40 is moved downwardly by a blow from a hammer, the nail set 69 will enter the nail set passage 55 and will drive the nail 18 into a floor as illustrated in Figure 3.

Assuming that a single blow of the hammer drives the nail completely into the floor in the manner illustrated in Figure 3, the expansion spring 72 will, of course, restore the driver 40 to its up position shown in Figure 2. The shock of impact as the plunger reaches the upper limit of its travel will be absorbed by the shock absorbing spring 68. Meanwhile, during the downstroke of the driver 40, the cam member 59 will, during its last increment of movement, contact the high point 117 of lever 110 as illustrated in Figure 5, and will rock the lever 110 to the left or clockwise as viewed in Figure 5. This will force the leaf spring 108 in a like direction, which will carry with it the nail-holding bar 99 to the extreme left-hand position shown in Figures 5 and 7. This movement of the bar 99 will carry with it the next nail 18, i. e., the nail lodged in the notch 100. During such movement, the nail 18 will be forced outwardly, or to the right as viewed in Figures 2 and 3, by reason of the rise 102a in cam groove 102 and by reason of the ball bearing 103. The nail 18 is, therefore, located in registry with the notch 103a in bar 19a (see Figures 6 and 7), it is dislodged from the notch 100 in bar 99, and it is free to drop into, and does in fact drop into the passage 86 in the lower block 81 and the lateral passage 73 in the barrel 35, to the position shown in Figure 3. The nail is, therefore, in readiness to drop into the nail set passage 55 when the driver 40 returns to its up position illustrated in Figure 2. The nail-holding bar 99 returns to its normal position shown in Figures 4 and 6, as the driver 40 returns to its up position and receives the next nail in the chute 19. Any tendency of the preceding nail to re-lodge in the notch 100 and to return with the bar 99, is prevented by the ball bearing 103, which traps the preceding nail. Thus, "misses" are prevented, and a nail is delivered to the nail set passage 55 every time that passage is cleared by driving the preceding nail into a floor.

Another consideration of great importance is that a nail lodged in the notch 100 of bar 99 be released and delivered to the barrel 35, when but only when the preceding nail has been completely driven into the floor, and only when the driver 40 has been driven to the bottom of its downstroke. Two sources of difficulty exist in this connection:

First, the recoil of the nail driving plunger (i. e., the driver 40 in this instance) causes it to undergo a partial downstroke, which may actuate the nail-holding and release mechanism prematurely. Second, when longer nails are used than conventional hardwood floor nails (e. g., two inch, eight-penny finishing nails instead of the con-

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ventional one inch hardwood floor nails), several strokes of the hammer may be required to drive each of the longer nails into a floor, and the nail-holding and release means may be actuated after, say, the first or second blow of the hammer and before the preceding nail has been driven completely into a floor. In either case—i. e., premature release of the next nail because of recoil, or because of the necessity of driving a nail by increments with more than one hammer blow—jamming of two or more nails in the nail set passage will result.

These difficulties, which are real and important in practice, are obviated by the nail release mechanism of the present invention. As will be apparent from an inspection of Figure 5, the lever 110 is rocked to actuate the nail-holding bar 99, when but only when the nail driver 40 has traveled downwardly substantially to the limit of its downstroke. The driver 40 cannot, of course, travel close to the limit of its downstroke, unless the nail which it is driving has been completely, or nearly completely driven into a floor. Nor will the driver 40 "bounce" down close to the limit of its downstroke owing to recoil. As a consequence, recoil of the driver 40 will not actuate the nail-release mechanism. And, if a nail is only partially driven into a floor, e. g., half-way or two-thirds of the way into a floor, the nail-holding bar 99 is not actuated, or it is moved insufficiently to dislodge the next succeeding nail 18 from the notch 100. The bar 99 can be moved sufficiently to release a nail from the notch 100, only when the nail set passage 55 has been cleared and the driver 40 is positively driven substantially completely to the limit of its downstroke.

For purposes of fine adjustment, the set screw 105 above referred to may be employed. As is best shown in Figure 6, by loosening the lock nut 106 the set screw 105 may be adjusted inwardly or outwardly. As will be seen, its inner end bears against the adjacent side of the upper block 82, and by adjusting the set screw 105 inwardly or outwardly, the notch 100 in bar 99 can be accurately aligned with the slot 20 in chute 19.

It will, therefore, be apparent that a nail driving mechanism has been provided which is relatively simple in its construction and operation, which has desirable features of adjustability, and which has the very important advantage that, when a nail has been delivered to the nail set passage in readiness for driving into a floor, the next nail is held securely in place by the nail-holding and release mechanism and is not released prematurely by reason of recoil of the driver or the need for several blows of a hammer to drive a single nail. By this means the likelihood of jamming is greatly diminished.

Among other advantageous features of the machine may be mentioned the following:

It is relatively small in size and is easily mobile. It can be taken apart with ease for inspection, lubrication, adjustment, repair and replacement purposes. Fine adjustments can be made. Nails can be driven at high speed with an assurance of accurate, straight nailing.

I claim:

1. In a nailing machine of the type comprising a barrel having a longitudinal driving passage and terminating at its lower end in a nail set passage for receiving and holding a nail in position for driving into a floor, a driver and nail set reciprocable in said driving passage and nail set passage, respectively, a nail feed bar reciprocable laterally of said barrel between a normal position for receiving a nail from a nail feed and a release position for releasing such nail and dropping it into said nail set passage, and resilient means for normally holding said bar in said normal position, the improvement which comprises cam means operated by said driver at approximately the limit of the downstroke of the driver to move the nail feed bar to its release position, and adjustment means for adjusting the normal position of said bar relatively to said release position.

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2. In a nailing machine of the type comprising a barrel having a longitudinal driving passage and terminating at its lower end in a nail set passage for receiving and holding a nail in position for driving into a floor, a driver and nail set reciprocable in said driving passage and nail set passage, respectively, a nail feed bar reciprocable laterally of said barrel between a normal position for receiving a nail from a nail feed and a release position for releasing such nail and dropping it into said nail set passage, the improvement which comprises a leaf spring 10 attached at its upper end to said barrel and at its lower end to one end of said feed bar to hold said bar in its normal position, cam means operated by said driver at

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approximately the limit of its downstroke to move the nail feed bar to its release position, and a set screw threaded through said one end of the feed bar and bearing at its inner end against said barrel, said set screw being adjustable to vary and adjust the normal position of said feed bar.

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