(No Model.) 2 Sheets—Sheet 1.

J. P. BURNHAM.

BORING MACHINE.

No. 354,179. Patented Dec. 14, 1886.

Fig. 1.

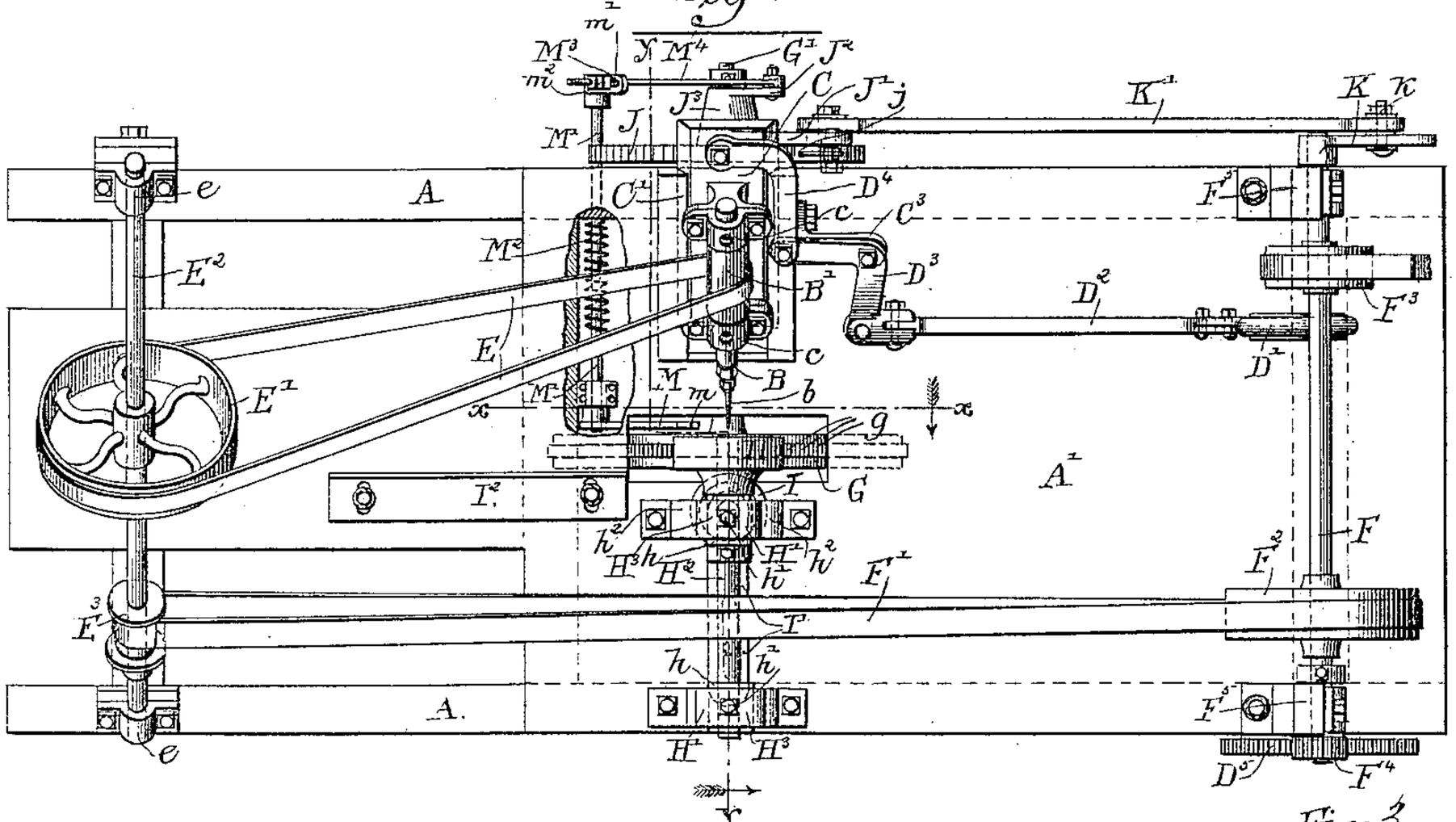


Fig. 2.

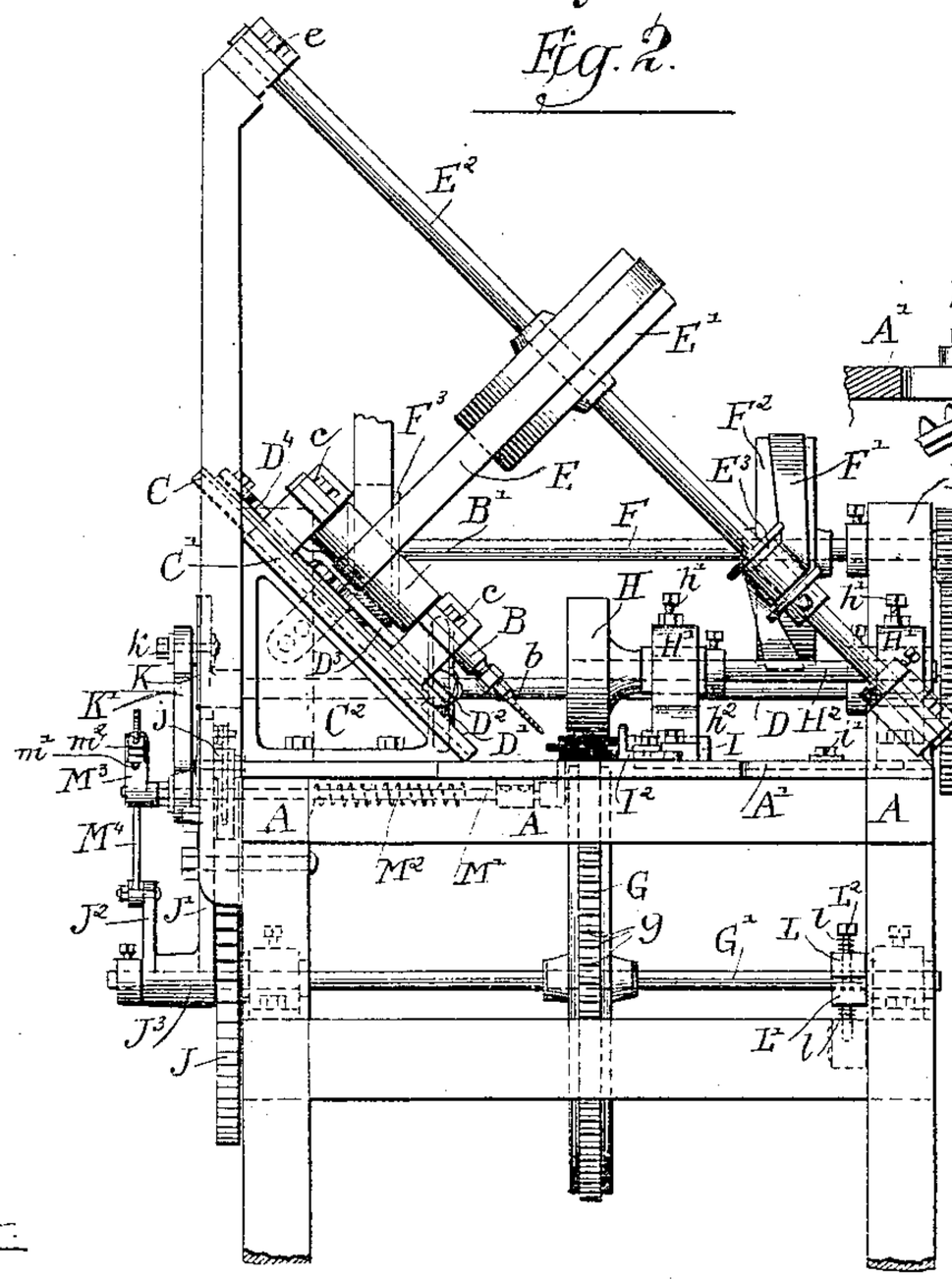
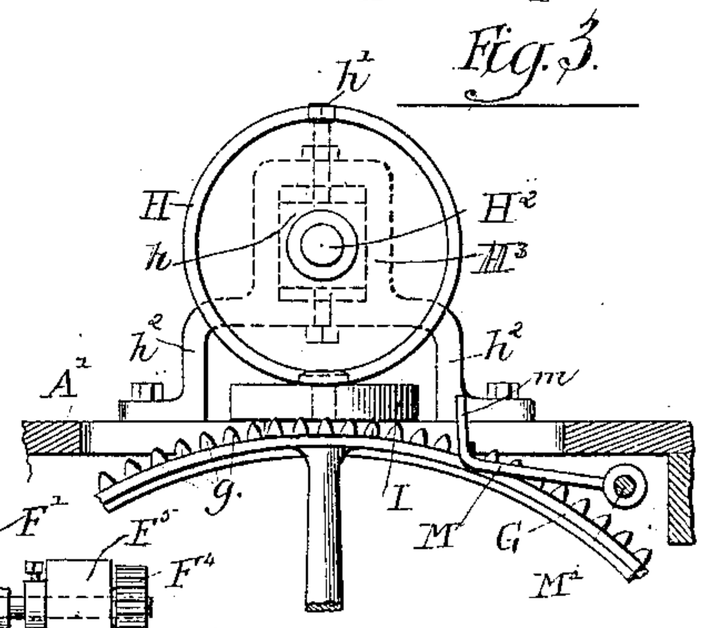


Fig. 3.



Witnesses.—
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C. Clarence Poole

Inventor.—
John. P. Burnham.

by: W. E. Dayton
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(No Model.) 2 Sheets—Sheet 2.

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BORING MACHINE.

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Fig. 4

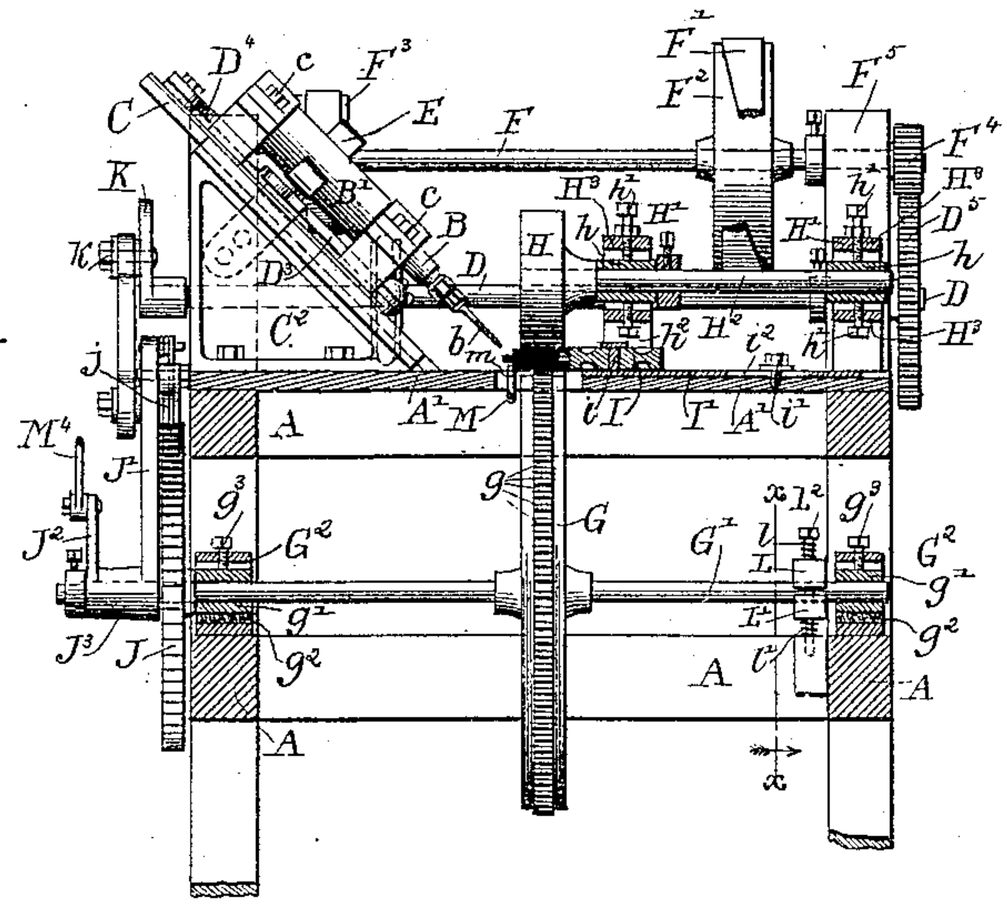
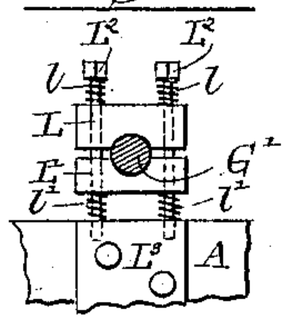


Fig. 7.

Fig. 6.



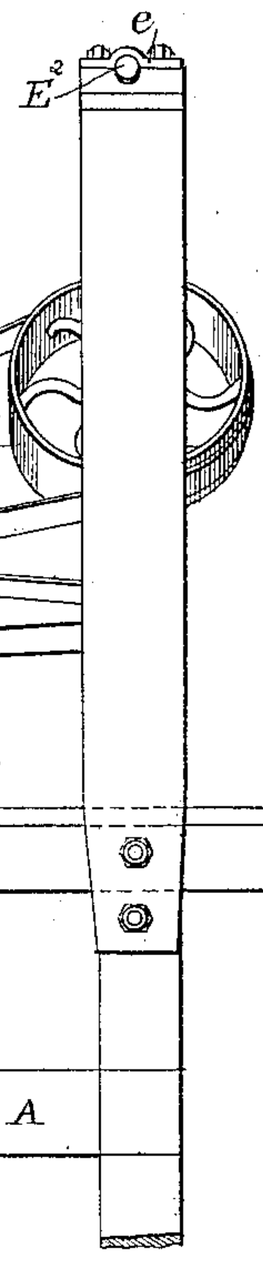
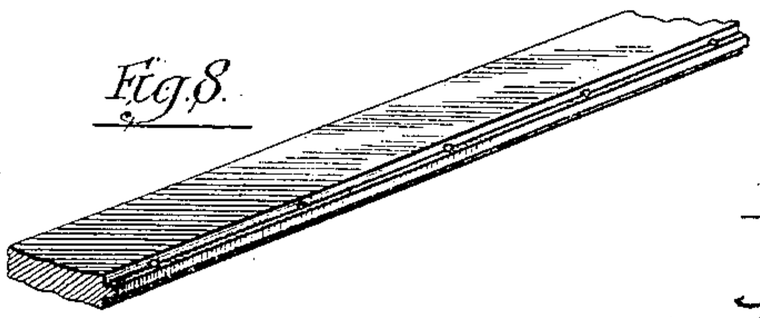


Fig. 5.

Fig. 8.



Witnesses:-

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UNITED STATES PATENT OFFICE.

JOHN P. BURNHAM, OF CHICAGO, ILLINOIS.

BORING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 354,179, dated December 14, 1886.

Application filed April 10, 1886. Serial No. 198,435. (No model.)

To all whom it may concern:

Be it known that I, JOHN P. BURNHAM, of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Boring-Machines; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

The object of this invention is to provide a means for boring a series of equidistant holes in strips of lumber, such, for instance, as may be required in hard lumber for the convenient insertion of nails or screws. The particular machine herein shown is more especially adapted for boring inclined nail-holes in hard-wood tongued and grooved flooring-strips, in which, on account of the hardness of the wood, it is difficult to drive nails in the usual manner, the said machine being adapted to bore inclined or oblique holes from a point in the side edge of the board adjacent to and above the tongue toward the bottom surface of the board or strip and at the distance apart at which floor-joists are usually placed, so that the flooring boards or strips thus prepared may be rapidly and easily secured by nails. The main features of the machine herein shown may, however, be applied for boring holes at desired distances apart in wooden strips of other kinds, and in cases where the holes are bored otherwise than obliquely.

The machine herein shown as embodying one practical form of my invention consists, in its essential features, of a rotating boring-tool having a reciprocatory movement toward and from the strips to be bored, an intermittently-acting roller-feeding device, which is actuated by suitable devices to give an intermittent forward feed-motion to the board or strip being operated upon, and suitable driving mechanism for the feeding device and the boring-tool, so connected that the boring-tool will be advanced and retracted in the intervals between the intermittent advance movements of the board or strip. Said machine also includes adjusting devices for varying or changing the distance through which the board or strip is advanced at each forward movement thereof, whereby the spaces between the holes may be varied as desired, and also a stop device, whereby the series of holes in a board may be made to bear a definite relation to the end of the board first inserted into the machine, as will hereinafter fully appear.

My invention may be more readily understood by reference to the accompanying drawings, in which—

Figure 1 is a plan view of a boring-machine embodying my invention. Fig. 2 is an end view thereof. Fig. 3 is a detail vertical section of the same, taken upon line *x x* of Fig. 1. Fig. 4 is a central transverse section of the machine, taken upon line *y y* of Fig. 1. Fig. 5 is an exterior elevation of the rear side of the machine. Fig. 6 is a detail sectional view taken upon line *x x* of Fig. 4, illustrating a friction device for checking the rotary movement of the feed-wheel. Fig. 7 is an enlarged detail section of a tongued and grooved flooring board or strip, illustrating the aperture formed therein by the operation of the machine shown. Fig. 8 is a perspective view of the same.

As illustrated in the said drawings, A indicates the main frame of the machine, consisting of suitable longitudinal, vertical, and transverse pieces constructed to sustain the several operative parts of the machine, and desirably provided with a horizontal top or table, A′.

B is a shaft or arbor carrying a boring-tool, *b*, and provided with a belt-pulley, B′, and mounted in bearings *c*, fixed upon a sliding or reciprocating plate, C, having bearings C′ upon a bracket or standard, C^2, fixed to the top of the said frame A. The plate C is constructed to slide in a direction parallel with the central axis of the arbor B, to enable the boring-tool to be moved in the direction of its axis toward and from the work, the said arbor and the supporting-plate being herein shown as inclined at an angle of forty-five degrees, to enable an inclined hole to be bored in a board or strip placed upon the table A′.

The means herein shown for giving a reciprocatory movement to the plate C consists of an eccentric, D′, mounted on a shaft, D, and connected by means of an eccentric-rod, D^2, with a bell-crank lever, D^3, having operative connection with the said plate C through the

medium of a connecting-bar, D^4. In the particular construction of these parts herein illustrated the bell-crank lever D^3 is pivoted upon an arm, C^3, fixed to the bracket C^2, and the connecting rod or bar D^4 is provided with an angular bend to avoid interference with the upper bearing, *c*, of the boring-tool arbor, and is pivoted to the plate C near the upper end of the latter.

In the machine illustrated in the drawings motion is given to the boring-tool arbor by means of a belt, E, trained over the pulley B′ upon the arbor, and over a belt-pulley, E′, fixed to a shaft, E^2, arranged parallel with the inclined arbor B, said shaft E^2 being actuated from a suitably-located driving-shaft, F, upon the machine, as hereinafter described. Provision is made for the longitudinally-reciprocating movement of the arbor B by making the pulley B′ upon said arbor of greater width than the extent of movement of the boring-tool, so that the driving-belt may move or slide endwise upon the said pulley as the arbor is reciprocated, in a well-known manner.

It will of course be understood that as far as the general operation of the machine is concerned other well-known forms of driving-connection adapted to allow the free longitudinal movement of the arbor B, while at the same time giving a desired rotary motion thereto, may be employed. The device shown, however, affords a simple and desirable device for the purpose, and one which will preferably be used in practice.

In the particular construction of the parts illustrated the shaft E^2 is mounted in bearings *e*, sustained upon the machine-frame at the end of the latter opposite that at which the shaft D, before referred to, is located, and said shaft E^2 is provided with a second belt-pulley, E^3, whereby the said shaft is actuated by means of a belt, F′, passing over a pulley, F^2, fixed upon the driving-shaft F, which latter is mounted upon the machine-frame over and parallel with the shaft D, the said shaft F being provided with a belt-pulley, F^3, over which passes a belt through which motion is transmitted to the machine. Said shaft F is provided, also, with a gear-wheel, F^4, intermeshing with a gear-wheel, D^5, upon the shaft D, whereby the said shaft last mentioned is actuated from the shaft F. The shafts D and F are shown in the drawings as mounted in standards F^5, bolted to the top of the frame A of the machine, one at each side of the said frame.

It will of course be understood that the driving-connections herein illustrated are shown as one convenient form thereof, and that other suitable driving-connections, mounted upon the machine-frame or otherwise arranged, may be used in carrying out the invention, as found convenient or desirable.

The feed device for advancing the strip or board being operated upon to the boring-tool is made as follows: G is a feed-wheel mounted upon a horizontal shaft, G′, located below the table A′ of the machine, and provided with peripheral points or spurs *g*, adapted to engage the board or strip, which latter is usually placed with its unfinished surface downward, so that the planed or dressed suface will not be marred by the said points or spurs.

Mounted in suitable bearings, H′, over the table-top A′, is a horizontal shaft, H^2, provided upon one end with a bearing or guide roller, H, arranged over and in opposition to the feed-wheel G, so as to hold the strip or board being operated upon in engagement with the said feed-wheel and to retain said board or strip in proper position with relation to the boring-tool.

In order to provide for differences in thickness of the strips or boards operated upon by the machine, the bearings H′ are preferably provided with vertically-movable bearing-boxes *h* for the shaft H^2, said bearing-boxes being held in position vertically by means of set-screws *h′ h′*, inserted through the horizontal parts H^3 of the bearings and abutting against the upper and lower surfaces of the said boxes *h′*. By this means the said boxes may be adjusted vertically to bring the bearing-roller H in proper position relatively to the boring-tool and the feed-wheel G, and also for adjusting the ends of the shaft with relation to each other.

The feed-wheel G is intended to remain practically in the same vertical position in operating upon all kinds of lumber; but in order to allow said feed-wheel to yield downwardly, to prevent undue strain upon the parts when the teeth or spurs *g* encounter knots in the lumber, or under other circumstances, the shaft G′ of the said feed-wheel is mounted in bearings G^2, which are provided with vertically-movable bearing-boxes *g′*, which rest upon compressible layers, cushions, or springs g^2, of rubber or other suitable material. Set-screws g^3 are desirably provided in the bearings G^2, for pressing downwardly upon the bearing-boxes *g′* for the purpose of adjusting the feed-wheel to the work. By adjusting the presser-roller H and the feed-wheel G in the manner described the board or strip being operated upon may obviously be brought accurately into a desired position with relation to the boring-tool.

In a machine of the particular form shown, in which the boring-tool operates obliquely upon the strip or board, means for holding the board or strip from horizontal movement under the pressure of the boring-tool are required, and for this purpose I have herein shown a bearing-roller, I, which is mounted upon a vertical axis in position to engage the edge of the strip or board at a point opposite the boring-tool. Said roller I is preferably mounted upon a bearing-pin, which is adjustably supported in the machine-frame, whereby said roller may be moved toward and from the tool, as may be required in operating upon strips of different widths and for accurately adjusting the position of the strip with relation to the tool.

For these purposes the roller I (shown in the drawings) is mounted upon a pin or stud, *i*, fixed in a horizontally-sliding bar, I′, which is adjustably held upon the table-top A′ by means of a screw-bolt, *i*′, inserted through a longitudinal slot, i^2, in the bar I, Fig. 4, and entering the said top A′.

By adjusting the position of the presser roller H and guide-roller I the edge of the board or strip to be operated upon may obviously be accurately located with relation to the boring-tool. To permit the location of the said roller I and the parts supporting it beneath the shaft H, the bearings H′ of said shaft are desirably sustained above the top A′ by means of standards h^2, herein shown as cast integral with the bearings, so as to afford space beneath the said bearings for the said roller I, as clearly shown in Figs. 3 and 4.

The means shown for giving an intermittent rotative movement to the feed-wheel G consist of a ratchet-wheel, J, fixed upon the feed-wheel shaft G′, an oscillating arm, J′, mounted to swing freely about the axis of the said shaft, and provided with a spring pawl, *j*, engaging the teeth of the ratchet-wheel, and a crank, K, affixed to the shaft D, and provided with a crank-pin, *k*, which latter is connected by a pitman, K′, with the oscillating arm J′, whereby in the rotary movement of the said crank and pin the arm J′ will be oscillated through an arc depending upon the throw of the crank, with the obvious effect of giving a forward rotative movement to the ratchet-wheel J and the feed-wheel G at each movement of the oscillating arm in a direction to cause the engagement of the pawl with the ratchet-teeth of the wheel. The crank-pin *k*, instead of being fixed in the crank-arm, is preferably adjustably secured in a slot, *k*′, in said arm, so that the throw of the crank and the extent of the oscillatory movement of the arm J′ may be varied as desired, to give a greater or less rotative movement to the feed-wheel, and thereby vary the distance through which the work is advanced at each forward movement thereof, as desired.

By adjusting the feed-wheel in the manner described the distance apart of the holes bored in the strip may be changed as desired—as, for instance, in boring flooring boards or strips the holes will be bored at a distance apart equal to the distance apart of the floor joists, whatever this distance may be in any particular case.

A stationary guide, I^2, is shown as secured in position for guiding the boards or strips to the feed-wheel, said guide being held in place by bolts inserted through slots in the guide and entering the top A′ in a familiar manner.

In order to check the momentum of the feed-wheel and connected parts at the end of each forward rotative movement thereof, so as to prevent the board or strip being carried past the point at which the hole should be bored, I preferably apply to one of the moving parts a friction device, tending to retard the movement of the said wheel. In the particular construction illustrated said friction device consists of two blocks, L L′, provided with concave bearing-surfaces fitted to the shaft G′, and held in contact therewith by springs. As a simple and convenient way of arranging these parts, the blocks L L′ are held by sliding engagement with two bolts, L^2 L^2, which are secured at their lower ends in a block, L^3, bolted to one of the frame-pieces A of the machine, springs *l l* and *l*′ *l*′ being interposed between the bolt-heads and the upper bearing-block, L, and between the lower bearing-block, L′, and the supporting-block L^3, so as to force said blocks L and L′ toward the shaft. A spring support for both of the said bearing-blocks is necessary in the construction shown, in order to allow for a slight vertical movement of the shaft G′, as hereinbefore set forth.

In the operation of a machine of the character above described it is desirable that the first hole or aperture formed in such flooring-board should be located at a definite distance from the end of the board which is first introduced into the machine, so that in securing the boards in place upon a floor or elsewhere one end of each board may be suitably located with reference to one of the side walls of the room without loss in cutting the boards. For this purpose I have herein shown a stop device adapted to engage the end of the board in such manner as to prevent the advance of the latter toward and its engagement with the feed-wheel until the latter has reached a certain point in its forward movement, so that the first hole will be bored in every instance when the board has been carried through the same distance by the feed-wheel. The said stop device, as illustrated in the accompanying drawings, comprises an oscillating arm, M, mounted upon a transversely-arranged rock-shaft, M′, and having an upwardly-projecting part or stop, *m*, extending into the path of the board or strip, and in position to encounter the end of the latter.

In the particular construction illustrated the rock-shaft M′ is located below the top A′ of the machine, and the arm M is located at one side of the feed-wheel G, so that the projection *m* may extend upwardly through the table at a point adjacent to the boring-tool. The rock-shaft M′ is normally held in position with the arm M elevated by means of a spring, M^2, suitably applied for the purpose, said spring, as herein shown, being of spiral form and placed around the said rock-shaft, as clearly shown in Fig. 1 of the drawings. Upon the end of the said rock-shaft M′, which extends beyond the machine-frame at the side of the latter adjacent to the ratchet wheel J, is secured an upwardly-extending arm, M^3, and said arm M^3 is connected with an arm, J^2, fixed to the hub J^3 of the oscillating arm J′ by means of the connecting-rod M^4, which is pivoted to the arm J^2, passes through an aperture or slot, *m*′, in the

arm M^3, and is provided upon its end portion with a nut or nuts, m^2, adapted to engage the said arm M^3 at a desired point in the forward movement of the arm J′, by which the ratchet-wheel J is actuated, so as to give a rotative motion to the shaft M′, and thereby depress the arm M and permit the passage of a strip or board over the stop m, the said rod M^4 being adapted to slide freely through the aperture m' in the arm M^3, so that said arm M^3 and the rock-shaft are only moved during the part of the stroke of the arm J′ in which the nut m^2 engages the said arm M^3. By adjusting the position of the nut m^2 upon the rod M^4 the point in the advance movement of the feed-wheel at which the arm M^3 and the rock-shaft will be moved may be changed, as desired, so that by such adjustment of the nut the distance from the end of the strip or board at which the first hole is made may obviously be regulated at will.

It will of course be understood that in a device constructed generally as above set forth the connecting-rod M^4 may have sliding connection with either the arm M^3 or J^2, and that a suitable stop or shoulder upon the said rod for engaging the arm in which it slides may be formed by a nut or nuts, as shown, or otherwise.

The stop m in the operation of the machine will obviously be held in its elevated position by the action of the spring M^2, when there is no board in the machine, except when depressed by the action of the devices described, so that when an attendant attempts to feed a board into the machine the board will encounter the said stop, and will be prevented from engaging the feed-wheel until the stop is depressed, when the board will be allowed to advance and come into engagement with the feed-wheel. After a board or strip has been started through the machine, the stop will be prevented by contact with the under surface of the board or strip from again rising until the rear end of the board has passed over said stop.

It is entirely obvious that a movable stop, operating in the manner described, may be actuated by or from the feed device otherwise than in the particular manner herein shown, and said stop is therefore herein claimed without restriction to its use in connection with the particular devices for operating it shown in the drawings and above described.

In Fig. 7 is shown in sectional view, and in Fig. 8 in perspective, a flooring board or strip provided with oblique holes for the insertion of nails, such as is made by the machine above described.

I am aware that in mortising-machines, such as are used for mortising blind-stiles, a longitudinally-reciprocating boring-tool has been used for cutting mortises in connection with feed devices for intermittingly advancing the work to the boring-tool, consisting of a movable clamp for holding the work, provided with a series of notches or teeth, and a reciprocating pawl operating by its engagement with the notches to feed forward the clamp and the work held therein.

In the operation of a machine thus constructed, it is obviously necessary, after the completion of each piece, to open the work-holding clamp for the purpose of removing the finished work therefrom, to then thrust the said clamp backwardly preparatory to another advance movement thereof, and to then insert and secure a new piece in the clamp.

The device herein shown differs from that above referred to in having a rotating feed wheel or roller constructed to directly engage the strips to be bored, which feed wheel or roller is intermittingly actuated by driving devices connected with these by which the boring-tool is reciprocated, and so arranged as to cause the advance of the tool into the strip in the intervals between the advance movements of the latter. By this construction the boards or strips may be continually fed to the machine, and will be carried past the boring-tool and operated upon automatically, one after the other, without the use of any hand-labor, except that necessary for feeding the strips to the feed-roller.

I claim as my invention—

1. A machine for boring holes in wooden strips, comprising a rotating and longitudinally-reciprocating boring-tool, an intermittingly-acting feed-wheel engaging the strip to be bored and operating to carry the latter in a direction transverse to the axis of the boring-tool, and means for giving a reciprocatory movement to the boring-tool and for actuating the feed-wheel, constructed to advance the said tool toward the strip at times when the feed-wheel is stationary, substantially as described.

2. A machine for boring holes in wooden strips, comprising a revolving arbor carrying a boring-tool, a sliding plate provided with bearings for said arbor, an eccentric, an eccentric-rod, a bell-crank lever connected with the eccentric-rod and the said plate, an intermittingly-acting feed-wheel, and means for actuating the feed-wheel and for giving rotary motion to the eccentric, constructed to advance the boring-tool during the time that the feed-wheel is stationary, substantially as described.

3. The combination, with a rotating and longitudinally-reciprocating boring-tool, of an intermittingly-moving feed-wheel engaging the strip to be bored, a bearing-roller opposed to said feed-wheel and adjustable toward and from the latter, and means for giving a reciprocatory movement to the boring-tool and for actuating the feed-wheel, constructed to move the wheel at times when the tool is retracted, substantially as described.

4. The combination, with a rotating and longitudinally-reciprocating boring-tool, of an intermittingly-moving feed-wheel engaging

the strips to be bored and mounted in yielding bearings, a bearing-roller opposed to the said feed-wheel, and means for giving a reciprocatory movement to the boring-tool and for actuating the feed-wheel, constructed to move the wheel at times when the tool is retracted, substantially as described.

5. The combination, with a rotating and longitudinally-reciprocating boring-tool, and guides for the strip to be bored, sustaining the latter obliquely with reference to the axis of said boring-tool, of an intermittingly-moving feed-wheel engaging the strip to be bored, a bearing-roller opposed to said feed-wheel, a lateral guide, as I, located at the side of the path of the strip opposite the said boring-tool for holding the strip from lateral movement under the action of said tool, and means for giving a reciprocatory movement to the boring-tool and for actuating the feed-wheel, constructed to move the wheel at times when the tool is retracted, substantially as described.

6. The combination, with a rotating and longitudinally-reciprocating boring-tool, and guides for the strip to be operated upon, sustaining said strip obliquely with reference to the central axis of the tool, of an intermittingly-acting feed-roller engaging the said strip, a bearing-roller opposed to said feed-wheel, a laterally-adjustable guide-roller, I, engaging the edge of the strip opposite to that operated upon by the boring-tool, and means for giving a reciprocatory movement to the boring-tool and for actuating the feed-wheel, constructed to advance the said tool toward the strip during the intervals between the advance movements of the latter, substantially as described.

7. The combination, with a reciprocating boring-tool and a feed-wheel, of means for intermittingly actuating the feed-wheel, comprising a ratchet-wheel connected with the said feed-wheel, an oscillating arm adapted to swing about the axis of the ratchet-wheel, a pawl upon the arm engaging the said ratchet-wheel, and means connected with the said oscillating arm for actuating the latter, and means actuating the boring-tool, constructed to advance the latter to the strip during the intervals between the movements of the feed-wheel, substantially as described.

8. The combination, with a reciprocating boring-tool and a feed-wheel, of a ratchet-wheel connected with the feed-wheel, an oscillating arm adapted to swing about the axis of the ratchet-wheel, a pawl upon the said arm engaging the ratchet-wheel, and a shaft provided with a crank-arm, and crank-pin connected with the said oscillating arm, said crank-pin being adjustably attached to the arm, whereby the throw of the crank and the movement of the oscillating arm may be varied, and means actuating the boring-tool, constructed to advance the latter to the work during the intervals between the forward movements of the feed-wheel, substantially as described.

9. The combination, with a reciprocating boring-tool, a feed-wheel, and means for actuating the boring-tool, comprising a shaft, D, and an eccentric, D′, of a ratchet-wheel, J, connected with the feed-wheel, an oscillating arm, J′, constructed to swing about the axis of the ratchet-wheel, a pawl upon the said oscillating arm, engaging the ratchet-wheel, a crank arm, K, provided with an adjustable crank-pin, *k*, and a pitman, K′, connecting the said crank-pin and arm J′, substantially as described.

10. The combination, with a reciprocating tool-carrying arbor, and a reciprocating plate provided with bearings for said arbor, of a shaft, D, an eccentric, D′, upon said shaft, a bell-crank lever, D^3, connected with said eccentric and with the plate C, a feed-wheel, G, mounted upon a shaft, G′, a ratchet-wheel, J, fixed to said shaft G′, an oscillating arm, J′, mounted to swing about the axis of the shaft, a pawl upon the arm J′, engaging the ratchet-wheel, and a crank-arm, K, upon the shaft D, provided with an adjustable crank-pin, *k*, connected with said arm J′, substantially as described.

11. The combination, with a reciprocating boring-tool, means for actuating the latter, and feed devices giving an intermittent advance movement to the work, of a stop, *m*, located in advance of the feed devices and movable into and out of the path of the work, and means for moving said stop, controlled by the devices by which the boring-tool is actuated, substantially as described.

12. The combination, with a reciprocating boring-tool and a feed device, of a movable stop, *m*, operating to prevent the advance of the work to the feeding device, and means actuating the said stop, comprising a rock-shaft, M′, a spring, M^2, applied to throw the stop in one direction, an arm, M^3, upon the rock-shaft, a rod, M^4, having sliding engagement with the arm M^3 and provided with a nut or collar, m^2, said rod M^4 being connected with and actuated by a moving part of the feed device, substantially as described.

13. The combination, with a reciprocating boring-tool and a feeding device, a stop, *m*, a rock-shaft, M′, sustaining said stop, a spring applied to throw said stop and rock-shaft in one direction, an arm, M^3, upon the rock-shaft, a rod, M^4, having sliding engagement with the arm M^3 and provided with a nut or collar, m^2, adjustable upon the said rod, said rod M^4 being connected with and actuated by a moving part of the feed device, substantially as described.

14. The combination, with a reciprocating boring-tool, and a feeding device embracing a feed-wheel, G, a ratchet-wheel, J, and an oscillating arm, J′, provided with a pawl engaging said ratchet-wheel and attached to and moving an arm, J^2, of a stop device consisting of a stop, *m*, a rock-shaft, M′, a spring, M^2, an arm, M^3, and a rod, M^4, attached to said arm J^2, and having sliding engagement with the

arm M^3, said rod M^4 being provided with an adjustable collar or nut, m^2, substantially as described.

15. The combination, with reciprocating boring-tool and a feed device comprising a feed-wheel, and means for giving an intermittent rotary movement to said wheel, of a friction device located upon the machine-frame and bearing upon a rotating part attached to the wheel for checking the momentum of the latter, substantially as described.

In testimony that I claim the foregoing as my invention I affix my signature in presence of two witnesses.

JOHN P. BURNHAM.

Witnesses:

C. CLARENCE POOLE,

THOS. KLU.