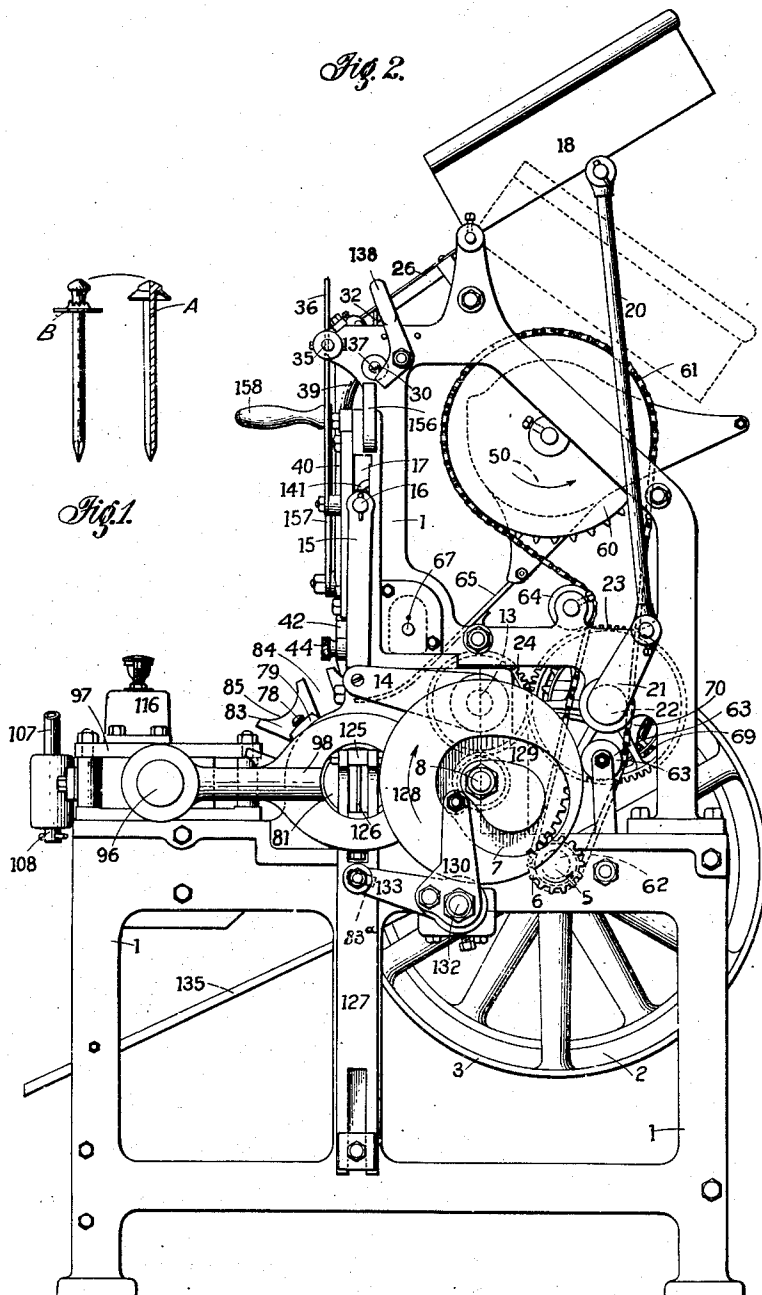


J. B. DAVIES & H. BELL.
MACHINE FOR FORMING ENLARGED OR EXTENDED HEADS UPON NAILS, &c.
APPLICATION FILED SEPT. 5, 1907.

1,009,484.

Patented Nov. 21, 1911.

7 SHEETS—SHEET 1.



WITNESSES:
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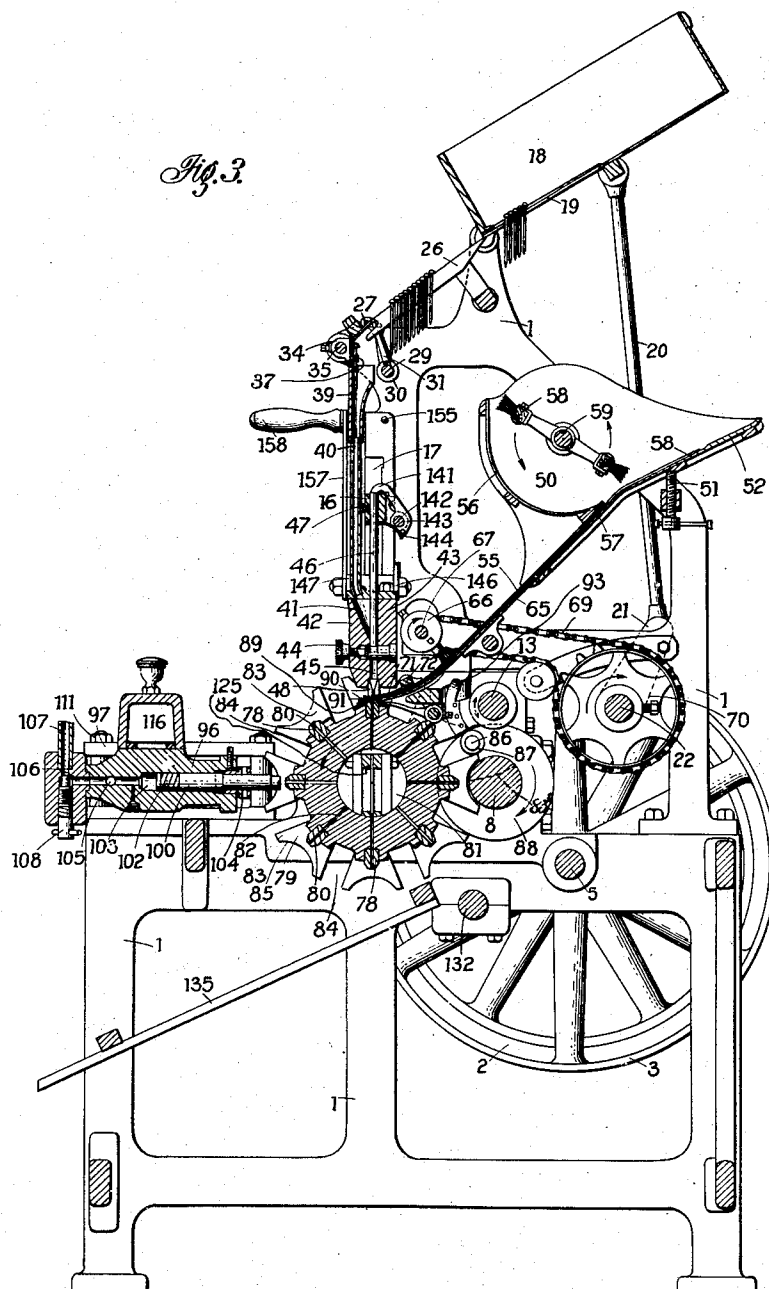
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7 SHEETS—SHEET 2.



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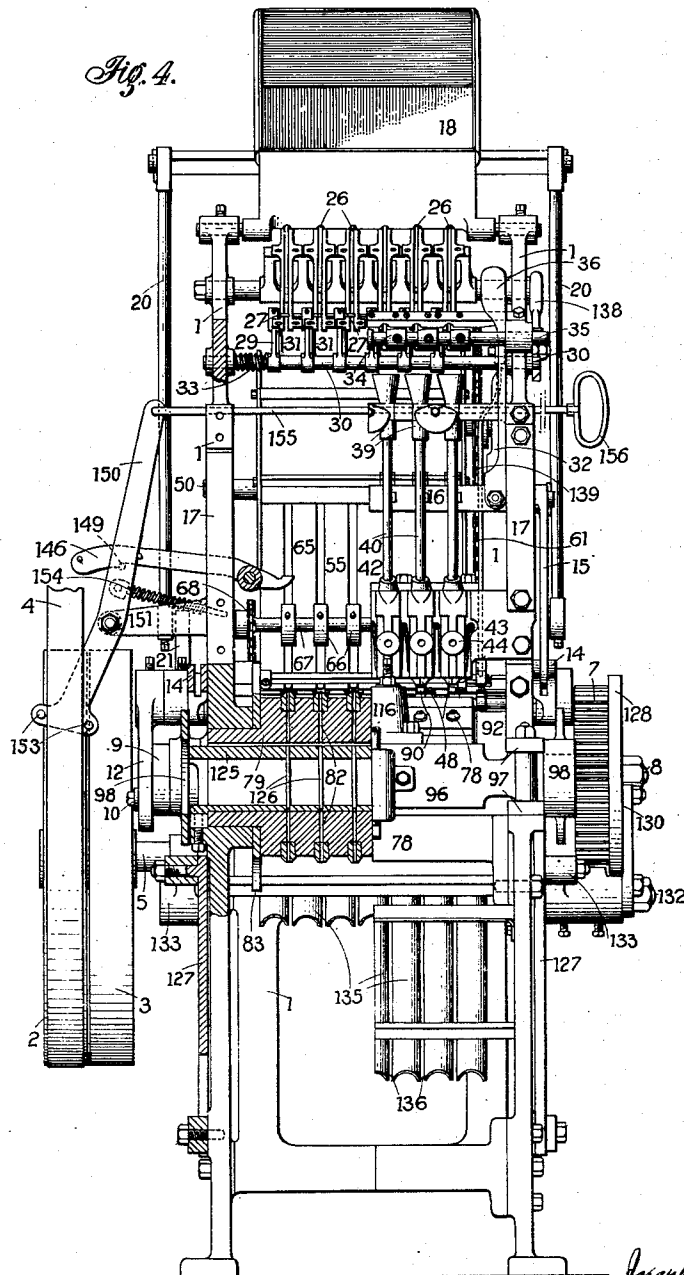
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7 SHEETS—SHEET 3.



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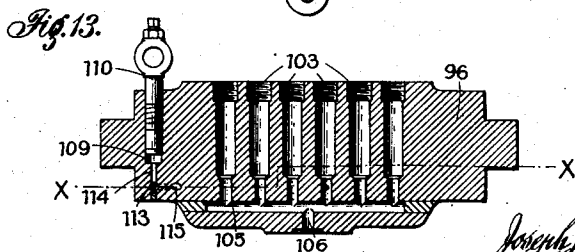
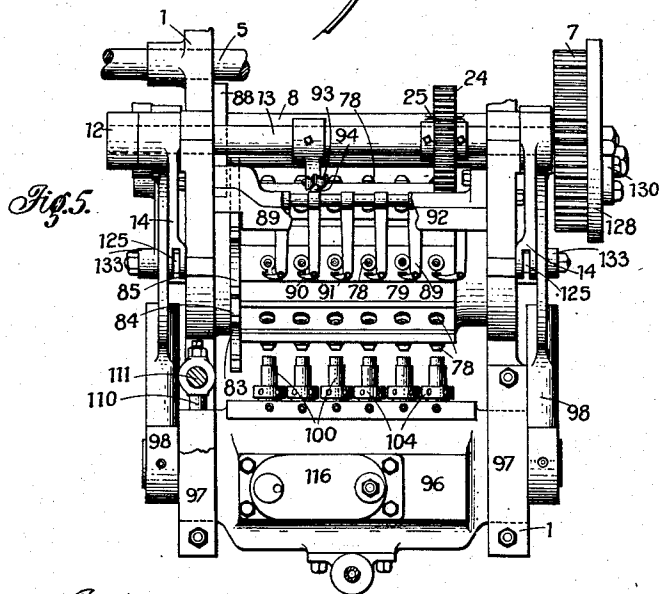
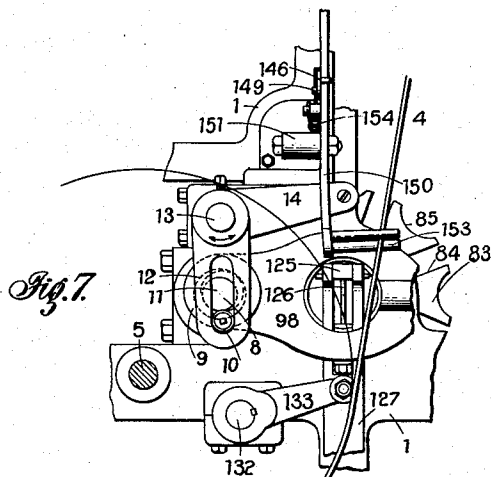
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J. B. DAVIES & H. BELL.
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7 SHEETS—SHEET 4.



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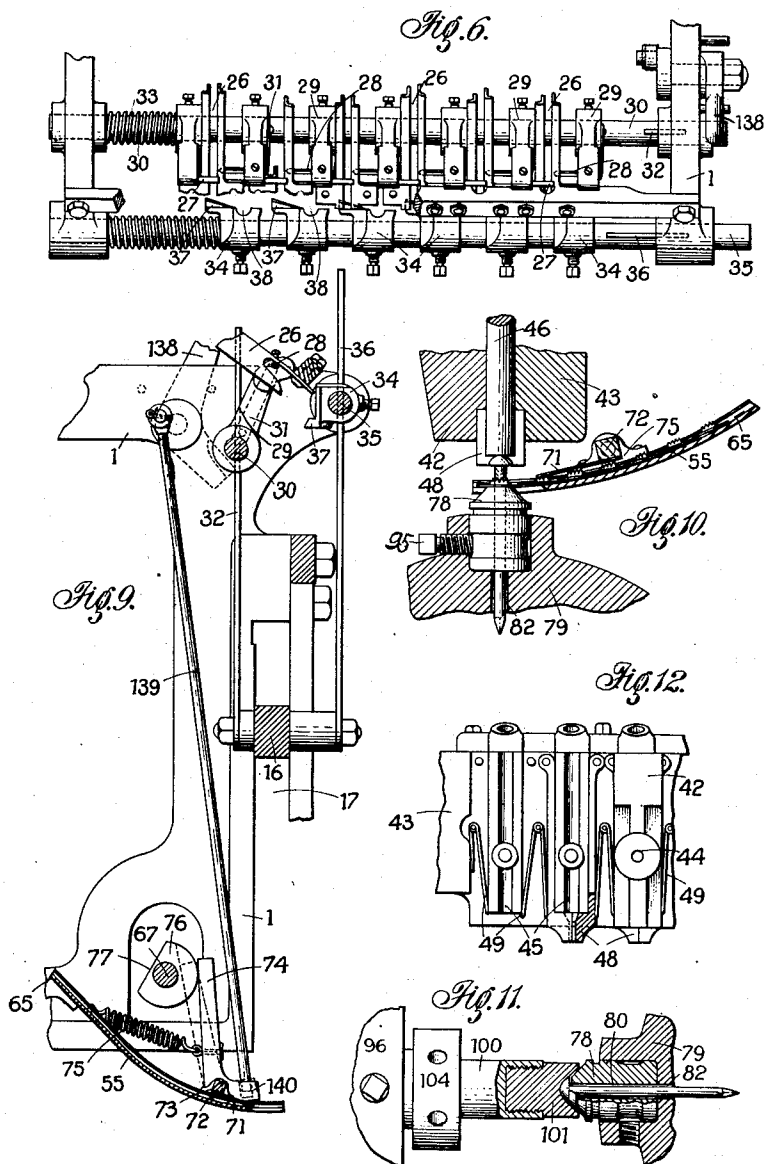
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7 SHEETS—SHEET 5.



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7 SHEETS—SHEET 6.

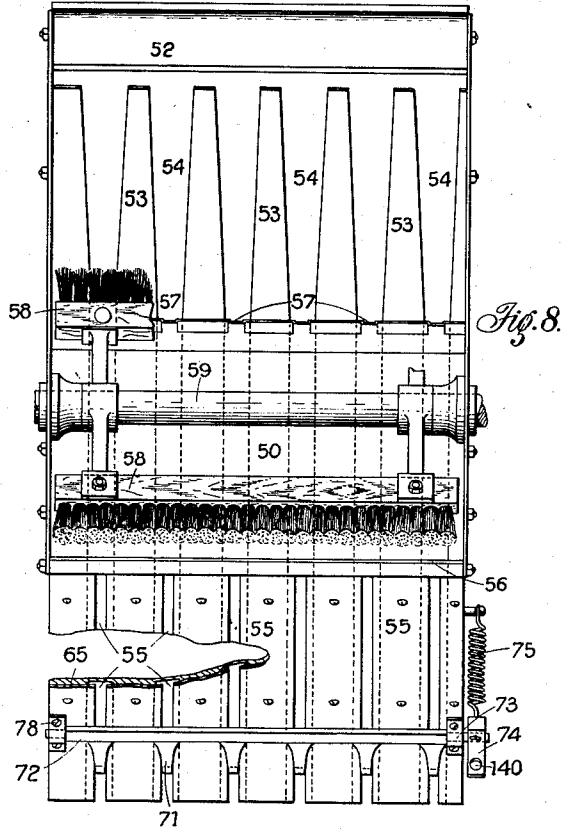


Fig. 8.

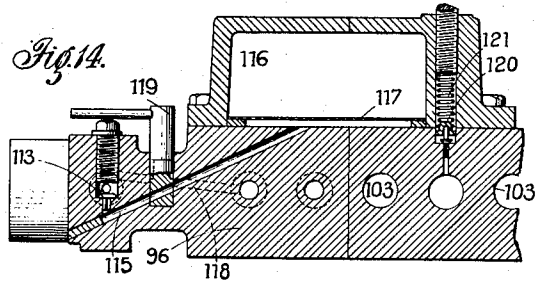


Fig. 14.

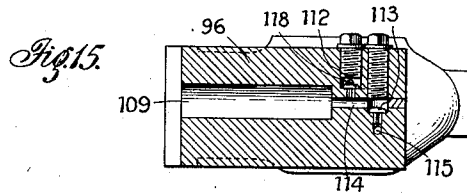


Fig. 15.

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7 SHEETS—SHEET 7.

Fig. 17.

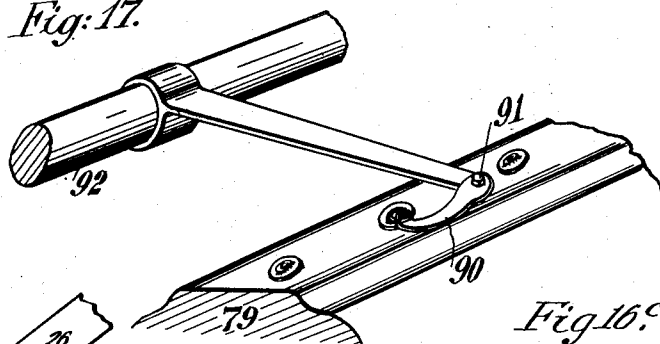


Fig. 16.^a

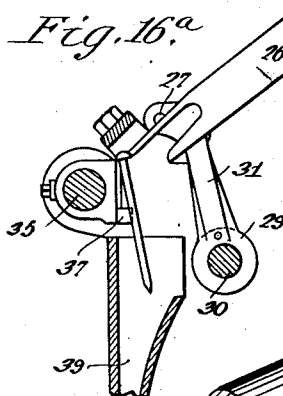


Fig. 16.

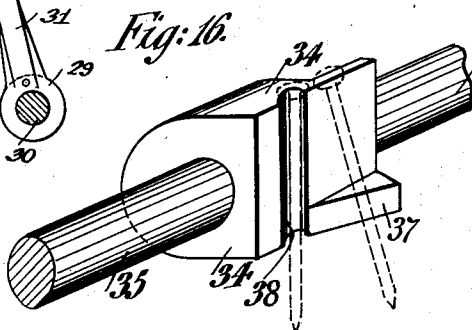


Fig. 16.^c

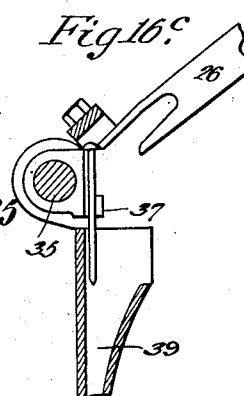


Fig. 16.^b

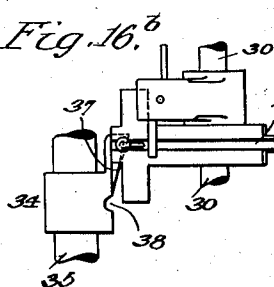


Fig. 18.

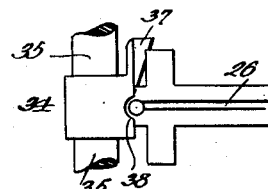
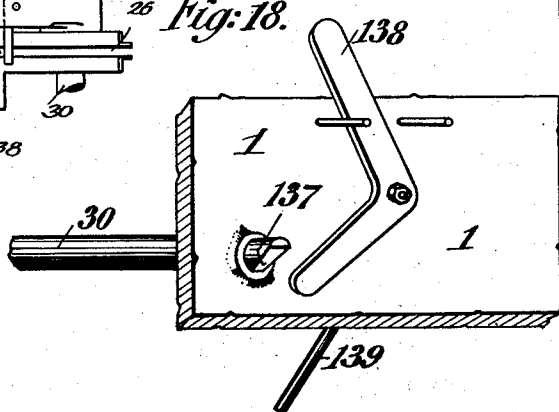


Fig. 16.^d

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UNITED STATES PATENT OFFICE.

JOSEPH BARTLETT DAVIES, OF MELBOURNE, AND HARCOURT BELL, OF SOUTH
MELBOURNE, VICTORIA, AUSTRALIA.

MACHINE FOR FORMING ENLARGED OR EXTENDED HEADS UPON NAILS, &c.

1,009,484.

Specification of Letters Patent.

Patented Nov. 21, 1911.

Application filed September 5, 1907. Serial No. 391,478.

To all whom it may concern:

Be it known that we, JOSEPH BARTLETT DAVIES and HARCOURT BELL, subjects of the King of Great Britain, and residents of No. 330 Flinders Lane, Melbourne, accountant, and No. 12 Sturt street, South Melbourne, engineer, respectively, in the State of Victoria, Commonwealth of Australia, have invented a new and Improved Machine for Forming Enlarged or Extended Heads Upon Nails and the Like, of which the following is a specification.

This invention relates to a new and improved machine for forming enlarged or extended heads upon nails and the like in which such enlargement or extension consists of a separate disk or washer.

This invention refers more particularly to a machine for the manufacture of nails having dome or inverted-cup-shaped heads of sheet metal for use with corrugated iron. Though this invention is hereinafter described as relating more especially to a machine for forming the enlarged or extended heads upon nails of the kind mentioned it will be well understood that it is equally applicable to the formation of enlarged or extended heads upon other cognate articles such as screws, etc., and in this specification the term "nails" will be intended to include all such. Furthermore the term "disks" will be intended to include washers and the like from which such enlarged or extended heads might be formed. These nails with dome or inverted-cup-shaped heads are at present manufactured by hand by passing the shank of a nail through a hole in a disk and then subjecting the same to pressure or percussion between suitable dies. The disk is thus clenched upon the head and made of the required shape and the nail is then dipped in molten zinc and galvanized whereby the enlarged or extended head is rigidly secured.

The object of our invention is to provide a machine in which the operation of affixing the disk to the nail is mechanically effected thereby producing a nail with an enlarged or extended head in a state fit for galvanizing. We accomplish this object by providing a machine comprising three separate

mechanisms:—(a) means for assembling and delivering the nails one at a time, (b) means for assembling and delivering the disks one at a time, (c) means for uniting the said individual nails and disks and subjecting them to pressure between suitable dies. In the machine hereinafter described there are six each of these respective mechanisms (that is to say six nails and six disks being fed at the same time) though the machine may be adapted for any convenient number.

In order that our invention may be the better understood we will now proceed to describe the same by reference to the accompanying drawings, in which:—

Figure 1 comprises two separate views of the nail which this machine as hereinafter described is designed to manufacture it being however understood that our invention is not confined entirely to the manufacture of these particular nails. Fig. 2 is a side elevation of our improved machine complete taken from the right hand side. Fig. 3 is a vertical transverse section through the center of the machine. Fig. 4 is a front view of the machine shown partly in section. Fig. 5 is a detail view in plan of the die cylinder and pressure plungers showing the operating mechanism in conjunction therewith. Fig. 6 is a detail view in plan of the mechanism for assembling and delivering the nails one at a time as discharged from the nail magazine. Fig. 7 is a side elevation of a portion of the left hand side of the machine showing the operation of the tripping or cut off gear. Fig. 8 is a detail view in plan of the disk magazine showing the races with the mechanism for delivering the said disks or washers one at a time. Fig. 9 is a section of a portion of the machine looking from the left hand showing the mechanism for delivering the disks one at a time and also the operation of the cut off gear for stopping the feed of both nails and disks. Fig. 10 is a detail view being a side elevation partly in section of one of the disks and the end of the disk race showing a nail being forced through a disk. Fig. 11 is a similar detail view of a die and pressure plungers. Fig. 12 is a detail view in front

elevation partly in section of three of the channels and jaws through which the nails are forced by reciprocating plungers. Fig. 13 is a horizontal section of the reciprocating beam carrying the pressure plungers showing pump mechanism for maintaining the pressure. Fig. 14 is a longitudinal enlarged section of the said beam taken upon the line $x-x$ of Fig. 13. Fig. 15 is a cross section also enlarged of the said beam taken upon the line of the pump. Fig. 16 is a detail perspective view of one of the gates for taking up the nail from its race and transferring it to the chute, Figs. 16^a and 16^b are respectively a detail vertical section and a plan-view showing the gate with its inclined extension and the nail after being fed to the gate. Figs. 16^c and 16^d are respectively a detail section and a plan-view showing the nail in vertical position after being fed from the race to the gate, and Figs. 17 and 18 are perspective views of other details.

Similar letters of reference indicate corresponding parts in the different figures of the drawings.

Referring to Fig. 1 A represents a nail and B a disk which forms upon the said nail an enlarged or extended head. The nails A are preferably ordinary wire nails having wings upon the under face of the head while the disks B are made preferably from tin plate being stamped out in such a way that a number of burs are formed upon the upper face while the disk itself is preferably slightly domed or dished inversely to assist in the operation of feeding as hereinafter described. As these nails A are forced home the said burs engage with small projecting wings upon the under face of the nail head the securing of the disks being completely effected by the subsequent dipping in molten zinc or galvanizing. This machine will be herein described as relating to the manufacture of these nails as shown in Fig. 1 but it may be modified so that it may be adapted for the formation of enlarged or extended heads of other disks upon other nails.

1 is the main framework of the machine which is constructed of two side frames, one erected upon each side with cross beams and stay rods comprising together a rectangular frame. Upon the left hand side of this framework are mounted a fast pulley 2 and a loose pulley 3 driven by a belt 4, the fast pulley 2 also constituting the fly wheel of the machine. These pulleys 2 and 3 are mounted upon a cross shaft 5 working in suitable bearings upon the framework 1, and carrying upon its other end, on the right hand side of the machine, and upon the outside of the framework, a spur pinion 6 which gears with a spur wheel 7 upon the main shaft 8. This main shaft 8 is mounted

in suitable bearings in the framework 1, and extends across the machine from side to side. Upon the other end of the main shaft 8, that is to say upon the left hand side of the machine, is provided an eccentric 9 having an antifriction roller 10 engaging a slot 11 in a downwardly projecting arm 12. This arm 12 is secured to another cross shaft 13, which also extends across the machine from side to side working in suitable bearings within the framework 1 and is actuated with a reciprocating or rocking motion by means of the eccentric 9 and arm 12. The rocking shaft 13 carries at each end a forwardly projecting arm 14 connected to vertical connecting rods 15, one upon each side attached at their upper ends to a cross beam 16 working in vertical guides 17 one upon each side of the framework 1.

The mechanism for assembling the nails and delivering them one at a time is as follows:—At the top of the framework 1 is a magazine 18 of known construction having in its floor or bottom a series of slots or channels 19. This magazine 18 is hinged at its forward lower edge and is connected by rods 20 to cranks 21 mounted upon each end of a rotating shaft 22. The magazine 18 is thus actuated with a vertical swinging motion by which the nails therein are separated and caused to fall into the said slots or channels 19 suspended from their heads as shown in Fig. 3. The rotating cross shaft 22 is operated from the main shaft 8 by a series of spur wheels and pinions. The shaft 22 carries a toothed wheel 23 gearing with a spur wheel 24 mounted loosely upon the rocking shaft 13 which is driven by a spur pinion upon the shaft 8 preferably formed by a series of teeth 25 (Fig. 5) being cut upon the surface thereof.

The magazine 18 is provided with a series of inclined races 26 extending forward from its lower edge and corresponding with the slots or channels 19. At each upward motion of the magazine 18 the nails hanging in the slots or channels 19 are delivered by gravity into the inclined races 26 down which they pass as shown in Fig. 3. At the lower end of each of these races 26 suitable mechanism is provided for separating out the nails and delivering them one at a time, which is shown more particularly in detail in Fig. 6. For this purpose each race 26 is provided with two fingers 27 and 28, the forward finger 27 working upon the upper face of the said race, and the rearward finger 28 below the same. The fingers 27 and 28 are mounted upon upwardly projecting brackets 29 upon a reciprocating shaft 30. The rearward fingers 28 operating on the under side of the races 26 project from the left hand side of the brackets 29 and are pointed at their ends to enable them to readily pass between the shanks of the nails. These fin-

gers 28 bear against springs 31 upon the side of the brackets 29 whereby they are permitted to give should they at any time engage an uneven shank or other obstruction. The forward fingers 27 working upon the upper faces of the races 26 are mounted upon the right hand side of the brackets 29. The fingers 27 and 28 are so arranged upon the brackets 29 that when the reciprocating shaft 30 moves to the right hand side the fingers 27 extend across the face of the races 26 while the fingers 28 are withdrawn from the same and as the shaft 30 is moved across to the left hand side of the machine the fingers 27 are withdrawn from the races 26 while the fingers 28 extend across the same. The fingers 27 and 28 thus alternately cross the races 26 and subject the nails to intermittent rests cutting them off one at a time and delivering them in regular consecutive order as required. The shaft 30 is given reciprocating motion by means of a vertical sliding plate 32 of variable width which engages a slot in the said shaft 30. The sliding plate 32 is connected at its lower end to the beam 16 before described and works against a spring 33 upon the shaft 30. The width of the sliding plate 32 is less at its upper end so that it operates the shaft 30 and the brackets 29 and fingers 27 and 28 toward the left hand side of the machine upon the upward motion of the beam 16.

At the bottom of the nail races 26 is provided a series of gates 34 (one for each race) mounted upon a reciprocating shaft 35 (see Fig. 16). This reciprocating shaft 35 receives its cross motion from a vertical sliding plate 36 engaging a slot within the same and attached at its lower end to the beam 16. The sliding plate 36 is also of variable width and being wider at its upper end the shaft 35 is moved to the farthest extent toward the left hand side of the machine when the beam 16 is at its lowermost position. The gates 34 are made of peculiar shape having inclined extensions 37 upon their lowermost edge upon the left hand side which engage the shanks of the nails so as to keep their points back just as the nails leave the races and gradually bring the nails into a vertical position to insure that they are fed point foremost. These gates 34 are provided with recesses 38 which coincide with the lowermost end of each corresponding race 26 when the said gates 34 are moved across to the farthest extent upon the left hand side. Immediately beneath each race 26 is provided a chute 39 having a tube 40 through which the nails pass point foremost without being liable to jam or capsize. These tubes 40 leading from the chutes 39 discharge into inclined recesses 41 formed in covers 42 held upon a stationary cross beam 43 by means of thumb nuts 44. With- in this cross beam 43 are a series of vertical

channels 45 within which work plungers 46 attached to the reciprocating cross beam 16 by set screws 47 while at the bottom of each channel 45 is a pair of jaws 48 having springs 49. The recesses 41 are arranged at the side of the channels 45 and the nails pass therefrom into the said channels 45 as the plungers 46 rise and are then driven through the jaws 48 as the said plungers 46 descend.

The mechanism for assembling and feeding the disks one at a time consists of a disk magazine 50, which is constructed as shown more particularly in Fig. 8. This disk magazine 50 rests upon an adjusting screw 51 at the back, by which its elevation may be regulated and is provided with an inclined floor or bottom 52 at the rear having a series of plates or fingers 53 which divide the said floor or bottom 52 into a number of channels 54 corresponding with the number of nail races previously described. Each of these channels 54 connects with a disk race 55. The front of the disk magazine 50 is formed by a curved plate 56, the lowermost edge of which is formed with a series of vents 57 corresponding with the races 55, and so shaped that the disks can only pass through in one way when lying with the burs projecting upward, and each vent 57 is made of such a size to conveniently accommodate the bur. The magazine 50 is provided with revolving brushes 58 mounted upon a cross shaft 59 and moving in the direction as shown by the arrows. This cross shaft 59 with the brushes 58 is driven by a sprocket wheel 60 actuated by a chain 61 driven from a toothed sprocket 62 upon the cross shaft 5 before described. The chain 61 passes over suitable idlers 63 and 64 mounted in convenient positions upon the machine to keep the chain 61 in a proper position, not to interfere with the other working parts of the machine. The revolving brushes 58 continually agitate the disks and by removing those which do not assemble in the proper position with burs upward to pass through the vents 57 into the races 55 maintains the feed of the said disks. The disks on entering the races 55 through the vents 57 pass downward by gravity, and for this purpose the races 55 are formed upon the upper face of a plate 65 curved at its lower end. These races 55 are formed with an open slot upon the upper side through which the burs project and the disks slide downward therein by gravity each one overlapping that immediately below it, as shown in Fig. 10. Above the plate 65 is mounted a further series of rotating brushes 66 mounted upon the cross shaft 67 driven by a sprocket wheel 68 having a chain 69 actuated by a further sprocket wheel 70, mounted upon the cross shaft 22. The rotating brushes 66 are so positioned upon the shaft 67 that an impetus or acceleration is

given to the disks in the races 55 at the moment when the last disk is to be fed forward on to the dies as hereinafter described. At the lower end of the plate 65 is provided a series of forwardly projecting spring fingers 71 (one for each race 55) mounted upon the under surface of a cross bar 72 working in suitable bearings 73 upon each side of the plate 65. These spring fingers 71 bear upon the last disk in each race and prevent it from being fed forward on to the dies until the requisite time. The cross bar 72 is provided with an upwardly extending arm 74 having a spring 75 attached at its other end to the plate 65. The arm 74 bears against a cam 76 having a flat face 77, which is mounted upon the shaft 67 and is so positioned that when the flat face 77 allows the fingers 71 to rise (as shown in dotted lines in Fig. 9) the disks are allowed to move forward on to the dies which are then in position as hereinafter described.

The dies upon which the nails are shaped are formed upon an intermittently rotating cylinder as shown more particularly in Figs. 10 and 11 and each series or row of dies corresponds with the number of nail and disk races. The dies 78 are mounted in horizontal rows or series upon the face of the cylinder 79, and in the accompanying drawings eight of such rows or series are shown. Each die 78 is provided with an internal hole 80 corresponding with the shank of the nail, and is held in place by a set screw 95 so that they may be at any time removed or adjusted if required. Each die is of a shape corresponding with that of the finished nail head. The cylinder 79 is provided with an internal bore 81 and also with a number of holes 82 corresponding with the central holes 80 of the dies 78, and these holes 82 pass right through to the internal bore 81. Intermittent rotating motion is imparted to the cylinder 79 by means of a star wheel 83 having alternate rectangular recesses 84 and curved recesses 85 one each corresponding with each row or series of dies 78. This star wheel 83 is actuated by pin 86 and roller 87 mounted eccentrically upon a disk 88 upon the main shaft 8 moving in the direction as shown by the arrows in Fig. 3, the main shaft 8 being provided with a recess 83' for the passage of the star wheel. The roller 87 upon the pin 86 engages one rectangular recess 84 in each revolution of the shaft 8, and thereby in each revolution moves it forward one-eighth of a revolution. The shaft 8 is provided with a notch 83' to permit the passage of the corners of the star-wheel. Alternately the curved recesses 85 bear upon the shaft 8 and the cylinder 79 is thereby held at rest in the proper position until it receives its next forward movement by the eccentric roller 87 engaging the next rectangular recess 84.

Immediately above the cylinder 79 is a series of forwardly projecting arms 89 carrying at their outer ends gates 90 which project in front of the uppermost row or series of dies 78 (see Figs. 2 and 18). These gates 90 are attached to the arms 89 by set screws 91 by which they may be accurately adjusted in position. The gates 90 are adapted to remain immediately in front of the dies 78 while the disks are being fed thereon and are then withdrawn while that particular row or series of dies 78 pass forward. For this purpose they reciprocate laterally and to this end the arms 89 are mounted upon a cross shaft 92 which is moved from side to side by a cam or wiper 93 mounted upon the rocking shaft 13 and engaging a projection 94 on the said shaft 92.

A cross beam 96 is provided upon the front of the machine working in suitable slides 97 upon each side actuated with a backward and forward reciprocating motion by means of pitmen 98 connected at their inner ends to eccentric cams upon each end of the main shaft 8. The cross beam 96 is provided with a series of pressure plungers 100 having dies 101 let into the ends thereof, and recessed to a shape corresponding with the dies 78 and the head of the nail as subsequently formed. Each pressure plunger 100 is constructed with packing 102 and works within a recess 103, having a bush 104 in the rear face of the beam 96 so that they may be adjusted when required. Each of the recesses 103 connects with a cross channel 105 by which oil or other liquid under pressure may be supplied to the back of the said pressure plungers 100 and thereby maintain the same all under one constant pressure and causing the same constant pressure to be imparted to all the dies. For this purpose the channel 105 is connected by means of a further channel 106 to a pipe 107 having a stop cock 108 leading to an accumulator or head of liquid by which a constant pressure may be maintained. The pressure of oil or other liquid is also maintained upon the pressure plungers 100 by means of a pump operated by the motion of the machine, and for this purpose the beam 96 is provided with a recess 109 upon one side which engages a fixed piston 110. This piston 110 is attached to one of the bolts 111 upon the framework and the rear end of the said recess 109 is provided with two valves 112 and 113 respectively connecting with a channel 114. This channel 114 connects by means of another channel 115 to a reservoir 116 arranged upon the top of the beam 96 having a perforated plate 117 at the bottom thereof for straining the oil or other liquid. The channel 114 leading from the piston recess 109 connects through the medium of the valve 112 to a channel 118 which connects in its turn with one of the plunger re-

cesses 103 and thereby with all the recesses 103 of the pressure plungers 100. The channel 115 is also provided with a stop cock 119 by which the supply of oil or other liquid may be cut off from the operation of the pump piston 110. The beam 96 is further provided with an escape valve 120 arranged in the recess 121 for relieving any undue pressure which may be obtained while in operation. The utility of this fluid system is that it provides an even pressure, and any strain upon one part is distributed over the whole.

Within the internal bore 81 of the cylinder 79 is a vertically reciprocating beam 125 by which the nails are discharged after the enlarged or extended heads are formed thereon. This reciprocating beam 125 is provided with a series of downwardly projecting rods 126 corresponding with the central holes or recesses in the dies 78. The reciprocating beam 125 is connected at each end to a sliding bar 127 mounted upon the main framework upon either side of the machine. These sliding bars 127 are operated from the main shaft 8 by means of a cam 128 having a slot 129 concentrically shaped for the major portion of its path, and the rest so shaped as to impart a periodic movement to the arm 130 having a roller which gears therewith. This arm 130 is mounted upon a cross shaft 132 which passes across the machine from side to side, and is provided at each end with a forwardly extending arm 133. These arms 133 are provided with slots 83^a by means of which they are pivotally and slidably connected to the sliding bars 127 upon each side whereby an intermittent vertical reciprocation is imparted to the said cross beam 125.

At the bottom of the machine is provided a classifying trough or sieve by which any nails without disks or disks without nails or imperfectly formed nails are separated out. This classifier consists of a series of inverted U-shaped plates 135 having channels 136 between, of such a width that any nails without disks or disks by themselves may pass therethrough, but the nails with the enlarged or extended heads are retained and caused to pass downward, and are discharged into a receptacle provided for the purpose.

Means are also provided for cutting off the operation of the machine when desired by simply stopping the feed of the nails and the disks at the same time. This is effected by mechanism shown more particularly in Fig. 9. For this purpose the cross shaft 30 before described in connection with the nail feeding mechanism is provided on its outer end with an inclined face 137 which is engaged by a tripping lever 138 mounted upon the framework 1 of the machine (see Fig. 2). This tripping lever 138

forces the shaft 30 against the pressure of the spring 33, and the pins 28 pass across the channels 26 and thereby restrict the passage of the nails and at the same time they are held in their extended position on the left hand side they are prevented from reciprocating as operated by the sliding plate 32 and the feed of the nails is thereby prevented. The cutting off of the feed of disks is also effected in the same way by a connecting rod 139 eccentrically attached to the tripping lever 138, and bearing at its lower end upon the forward extension 140 on the arm 74 which is attached to the cross bar 72 carrying the fingers 71. When the tripping lever 138 is thus moved over in engagement with the shaft 30, the connecting rod 139 maintains the fingers 71 in their depressed position thereby preventing feed of disks. Means are also provided in addition for throwing the machine out of gear when any irregularly formed nail or a nail assuming an incorrect position or other obstruction is met with as the nails are fed forward beneath the operation of the plungers 46. These plungers 46 are, as before described, yieldably held upon the reciprocating beam 16 by means of set screws 47 so that should they meet with any undue resistance the beam 16 will descend without them, leaving the said plungers 46 in an elevated position. For the purpose of throwing the machine out of gear upon this contingency the beam 16 is provided with a series of trippers 141 mounted upon a cross shaft 142 supported in brackets 143 attached to the said beam 16. The point of each of these trippers 141 bears upon the upper end of their corresponding plungers 46 (as shown in Fig. 3), and springs 144 are provided upon their under face to hold them in position. A tripping lever 146 is also provided hinged upon a bracket 147 attached to the beam 43, said lever having its inner end so arranged that the lower end of the tripper 141 at that side of the machine just misses the inner end of the tripping lever 146 when the trippers are in their normal position. When, however, any one of the trippers 141 is elevated by its plunger 46, all trippers are forced back as they are mounted on the same shaft 142 so that the lower end of the tripper above the inner end of the tripping lever 146 is engaged by the lever and depresses the same. This lever 146 engages a pin 149 upon the belt fork lever 150. This belt fork lever 150 is pivoted to a bracket 151 on the framework 1 and is provided at its lower end with prongs 153 which engage the driving belt 4. The belt fork lever 150 is pressed outward by means of a spring 154, and consequently when the said lever 150 is released by the tripping lever 146 disengaging the pin 149 the driving belt 4 is moved across by means

of the prongs 153 from the fast pulley 2 to the loose pulley 3. The belt fork lever 150 is also provided with an extension rod 155 having a handle 156 at its outer end upon the right hand side of the machine so that the machine may be thrown into gear from that side when required. Furthermore the tripping lever 146 is also connected to a lever 157 mounted on the bracket 147 upon the front of the machine having a handle 158 by which it may be any time released by the operator should any contingency occur, such operation releasing the belt fork lever 150 in the same manner as the trippers 141 before described.

In describing the operation of the machine we will follow one nail race and its corresponding disk race and die and plungers. The nails A move by gravity down a race 26 from the magazine 18 and are then held at the bottom of the said race 26 first by the finger 27 assuming that the beam 16 is in its lowermost position. As the beam ascends the fingers 27 and 28 as operated by the sliding plate 32 reverse position with regard to the race 26 and the finger 28 passes between the two last nails holding the rest back while the last nail falls down against the gate 34. As the beam 16 descends the fingers 27 and 28 again reverse this position while the gate 34 moves across to the left as operated by the sliding plate 36 the inclined extension 37 bringing the shank of the nail into a vertical position and allowing the nail to pass through the recess 38 into the chute 39 point foremost. The nail passes down the tube 40 into the recess 41 where it lies against the plunger 46. As the plunger 46 rises the nail falls into the channel 45. At the same time the disks B are passing down from the magazine 50 through the race 55 at the bottom of which they are held by the spring finger 71. As the die 78 comes into a vertical position upon the cylinder 79 where it is held in a stationary position by the curved recess 85 bearing on the main shaft 8, the gate 90 assumes a position in front of the said die 78 and the finger 71 then rises and the brush 66 moves the last disk forward to the die 78 and the finger 71 returns into position holding the rest of the disks back. The plunger 46 then descends forcing the nail through the jaws 48 and through the central hole of the disk and into the die 78. The gates 90 then momentarily open by moving to the right and allow of the die passing forward as the cylinder 79 rotates by the operation of the star wheel 83. As the die 78 moves forward the gate 90 resumes its normal position in front of the next die insuring that the disks come into proper position with their central holes corresponding with the central holes 80 of the dies 78. The die 78 then moves around into the horizontal position on the cylinder

79 and while again being held stationary by the curved recess 85 of the star wheel 83 bearing on the main shaft 8 the pressure plunger 100 on the sliding beam 96 exerts pressure on the head of the nail securely clamping the disk to the same. The die cylinder 79 continues to rotate intermittently one-eighth of a revolution at each operation and when the die 78 is in the inverted vertical position the sliding beam 125 and rods 126 discharge the completed nail therefrom on to the classifying plates 135 where those imperfectly formed are separated out.

What we claim as new and desire to secure by Letters Patent of the United States is:—

1. In a machine for forming enlarged or extended heads on nails, the combination of a die-carrying cylinder having an annular series of dies forming parallel rows on the outer curved face of the cylinder, means for feeding disks to said dies, means for forcing nails into and through said dies and the disks thereon, means for shifting the cylinder, coöperating dies adapted to press against said first-named dies after the cylinder has shifted, and means for ejecting the nails from said first-named dies after the operation of the coöperating dies.

2. In a machine for forming enlarged or extended heads upon nails, the combination of an inclined nail-race, a pair of reciprocating fingers adapted to alternately cross said race, a reciprocating gate arranged to alternately open and close the lower end of the race and to feed the nails therefrom one at a time, a receptacle for disks, coöperating dies, means for conducting the nails from said gate to said dies, and means for conducting disks to said dies.

3. In a machine for forming enlarged or extended heads upon nails, the combination, with a nail-race, of shafts extending across said race, a pair of oppositely directed fingers mounted on one shaft and so arranged that they alternately cross the race when said shaft is reciprocated, a gate mounted on the other shaft and arranged at the end of the race to close the same, means for reciprocating said shafts, a receptacle for disks, coöperating dies, means for conducting the nails from said gate to said dies, and means for conducting disks to said dies.

4. In a machine for forming enlarged or extended heads upon nails, the combination, with an inclined nail-race, of two reciprocating fingers adapted to alternately cross the same, a reciprocating gate at the lower end of the race adapted to alternately open and close the same, the said gate having a vertical channel and a rearwardly-projecting inclined lug which engages the shanks of the nails and brings them into upright position, a receptacle for disks, coöperating

dies, means for conducting the nails from said gate to said dies, and means for conducting disks to said dies.

5 5. In a machine for forming enlarged or extended heads upon nails, the combination, with a disk-magazine having an inclined race leading therefrom, of a rotating brush at the lower end of the said race adapted to give an acceleration to such disks at the moment when they are fed forward, a die for receiving the disks from said race, means for forcing nails through said disk and die, and means cooperating with said disk for operating upon said disks and nails.

15 6. In a machine for forming enlarged or extended heads upon nails, a disk-magazine, disk-races leading from said magazine, brushes adapted to move the disks along said races, dies at the outer ends of the races for receiving the disks, means for feeding nails through said disks and dies, and means cooperating with said dies for operating upon the disks.

25 7. In a machine for forming enlarged or extended heads upon nails, a disk-magazine, runways for the disks leading from the magazine, revolving brushes adapted to move the disks along said runways, dies at the outer end of the runways for operating on said disks, means for forcing nails through said disks and dies, and means cooperating with said dies for operating upon said nails and disks.

35 8. In a machine for forming enlarged or extended heads upon nails, the combination of a disk-magazine having an inclined race leading therefrom, a rotating brush within the said magazine, additional rotating brushes at the lower end of the said race adapted to give an acceleration to such disks at the moment when they are fed forward, a spring-finger adapted to bear upon the last disk in the race and to be raised when the said disk is being fed forward, a die for receiving disks from said race, means for forcing nails through said disks and die, and additional means cooperating with said die for operating upon said disks and nails.

50 9. In a machine for forming enlarged or extended heads upon nails, the combination of a disk-magazine, disk-races leading from the magazine, revolving brushes at the lower end of the races and adapted to move the disks along the races, shiftable dies at said lower ends, means for forcing nails through the dies and the disks thereon, and cooperating dies for further acting on said disks and nails.

60 10. In a machine for forming enlarged or extended heads upon nails, the combination of a disk-magazine, disk-races leading from the magazine, revolving brushes at the lower end of the races and adapted to move the disks along the races, shiftable dies at said lower ends, means for forcing nails through

the dies and the disks thereon, cooperating dies for further acting on said disks and nails, and means for ejecting the nails from the first-named dies.

11. In a machine for forming enlarged or extended heads upon nails, the combination of a disk-magazine having an inclined floor provided with channels, revolving brushes over said channels for agitating the disks to cause the same to pass into said channels, races connecting with said channels, additional brushes at the lower end of said races to move the disks along, dies at said lower ends to receive the disks, means for forcing nails into and through said dies and the disks thereon, and additional means for operating on said nails and disks.

12. In a machine for forming enlarged or extended heads upon nails, the combination of a disk-magazine having an inclined floor provided with channels, revolving brushes over said channels for agitating the disks to cause the same to pass into said channels, races connecting with said channels, additional brushes at the lower end of said races to move the disks along, dies at said lower ends to receive the disks, means for forcing nails into and through said dies and the disks thereon, and additional means for operating on said nails and disks, said additional means consisting of plunger-carried dies adapted to cooperate with said first-named dies, and means for ejecting the nails from said first-named dies after the operation of the plunger-carried dies.

13. In a machine such as described, the combination of a member having rows of dies thereon, means to feed disks to the dies, and reciprocating gates arranged to move into position immediately in front of each row of dies while the disks are being fed to the same.

14. In a machine for forming enlarged or extended heads upon nails, the combination of a shiftable die-carrying support having dies, disk-races terminating over the dies when in one position, gates at the discharge-end of the races, means for moving the disks to the discharge-end of the races, means for driving nails into and through the disks and dies, means for shifting the die-carrying support after the nails are driven, means for opening said gates when the support is shifted, and means for operating on the nails and disks after the support is shifted.

15. In a machine for forming enlarged or extended heads upon nails, the combination, with a reciprocating beam and a plurality of plungers carried by the beam adapted to drive the nails through disks, of means for automatically cutting off the operative power from the machine when the plungers meet an obstruction.

16. In a machine such as described, the combination of means for feeding disks,

means for driving nails through the disks, and means for automatically stopping the machine when an obstruction is met with by said nail-driving means.

5 17. In a machine for forming enlarged or extended heads upon nails, the combination of a plurality of dies, means for feeding disks to the dies, channels for directing nails to the dies, means for feeding nails to the
10 channels, plungers in the channels for driving the nails into and through the dies and disks thereon, a reciprocating cross-beam to which said plungers are yieldably secured, and means actuated by vertical movement of
15 the plungers relative to the cross-beam for arresting the feeding of the nails and disks.

18. In a machine for forming enlarged or extended heads upon nails, the combination of a die-carrying cylinder, a plurality of annular series of dies on the outer curved face of said cylinder and placed to form parallel rows, means for substantially simultaneously feeding disks to all of the dies of each row, means for forcing nails into and through
20 said dies and the disks thereon, means for intermittently rotating the cylinder, and additional dies for cooperating with the first-named dies to operate upon said nails and dies.

30 19. In a machine such as described, the combination of a reciprocating beam, a plurality of plungers mounted therein, and means to create fluid pressure acting on said plungers comprising a stationary piston co-operating with said beam, dies carried on
35 said plungers, additional dies adapted to co-operate with the first-named dies, means for feeding disks to the additional dies, and means for forcing nails through said disks and additional dies.

40 20. In a machine for forming enlarged or extended heads upon nails, the combination of a reciprocating cross-beam provided with a row of fluid-containing communicating recesses, plungers received in said recesses and having dies in their outer ends, additional dies adapted to cooperate with said
45 first-named dies, means for feeding disks to said additional dies, means for forcing nails through said disks and additional dies, means for reciprocating said cross-beam to move the plunger-carried dies toward and away from said additional dies, and means
50 for creating fluid pressure in said recesses to cause said plunger-carried dies to engage said additional dies with substantially equal pressure.

21. In a machine for forming enlarged or extended heads upon nails, the combination of a reciprocating cross-beam provided with a row of communicating recesses, die-carrying plungers in certain of said recesses, dies carried by said plungers, a stationary plunger in one of said recesses, a reservoir
60 communicating with the stationary plunger-

receiving recess, check-valves in the passages establishing communication between the stationary plunger-receiving recess and the reservoir and the die-plunger receiving recess, additional dies cooperating with the dies of
70 the plungers, means for feeding disks to the additional dies, means for forcing nails through said disks and additional dies, and means for reciprocating the cross-beam.

22. In a machine such as described, the combination of a frame, a cylinder rotatively mounted on said frame and carrying dies, means for feeding disks to said dies, means for forcing nails through said disks and dies, means cooperating with said dies
75 for further operating upon said nails and disks, and reciprocating non-rotatable means within said cylinder for ejecting said nails.

23. In a machine such as described, the combination of an intermittently rotating cylinder having rows of dies mounted thereon, and an internal bore therein, and a non-rotatable reciprocating beam operating in said bore and carrying a series of rods to discharge the nails from the dies.
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24. In a machine such as described, the combination of a frame, a cylinder rotatively mounted on said frame and carrying dies thereon, means for feeding disks to said dies, means for passing nails through said disks and dies, means cooperating with said disks for further operating upon said disks and nails, a vertically reciprocating beam passed through said cylinder and held against rotation with respect to said frame, and rods carried by said beam for ejecting the nails from said dies.
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25. In a machine such as described, the combination, with a cylinder carrying dies, of a star-wheel composed of a unitary plate for operating said cylinder and having alternate rectangular and curved recesses, a driving shaft which engages the curved recesses and thereby holds the cylinder stationary, and means engaging in the rectangular recesses whereby the cylinder is rotated intermittently.
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26. In a machine for forming enlarged or extended heads upon nails, the combination of means for assembling and feeding the nails one at a time, means for assembling feeding disks having central holes one at a time, means for feeding the shank of the said nails through the central holes in the said disks, and dies of suitable shape for uniting the said nails and disks by subjecting them to pressure between the same.
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27. In a machine for forming enlarged heads on nails, the combination of means for assembling the nails and the enlarged heads, channels for directing nails to the assembling means, a vertically reciprocating cross-beam, plungers adapted to reciprocate in said channels to forcibly feed the nails to the assembling means, said plungers being
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yieldably secured in the cross-beam and adapted to be moved upwardly relative to the cross-beam when the channels become choked, and means for stopping the machine normally unaffected by the plungers, but adapted to be operated by said plungers after the relative movement between the plungers and the cross-beam takes place.

In testimony whereof we affix our signatures, in presence of two subscribing witnesses. 10

JOSEPH BARTLETT DAVIES.

HARCOURT BELL.

Witnesses:

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