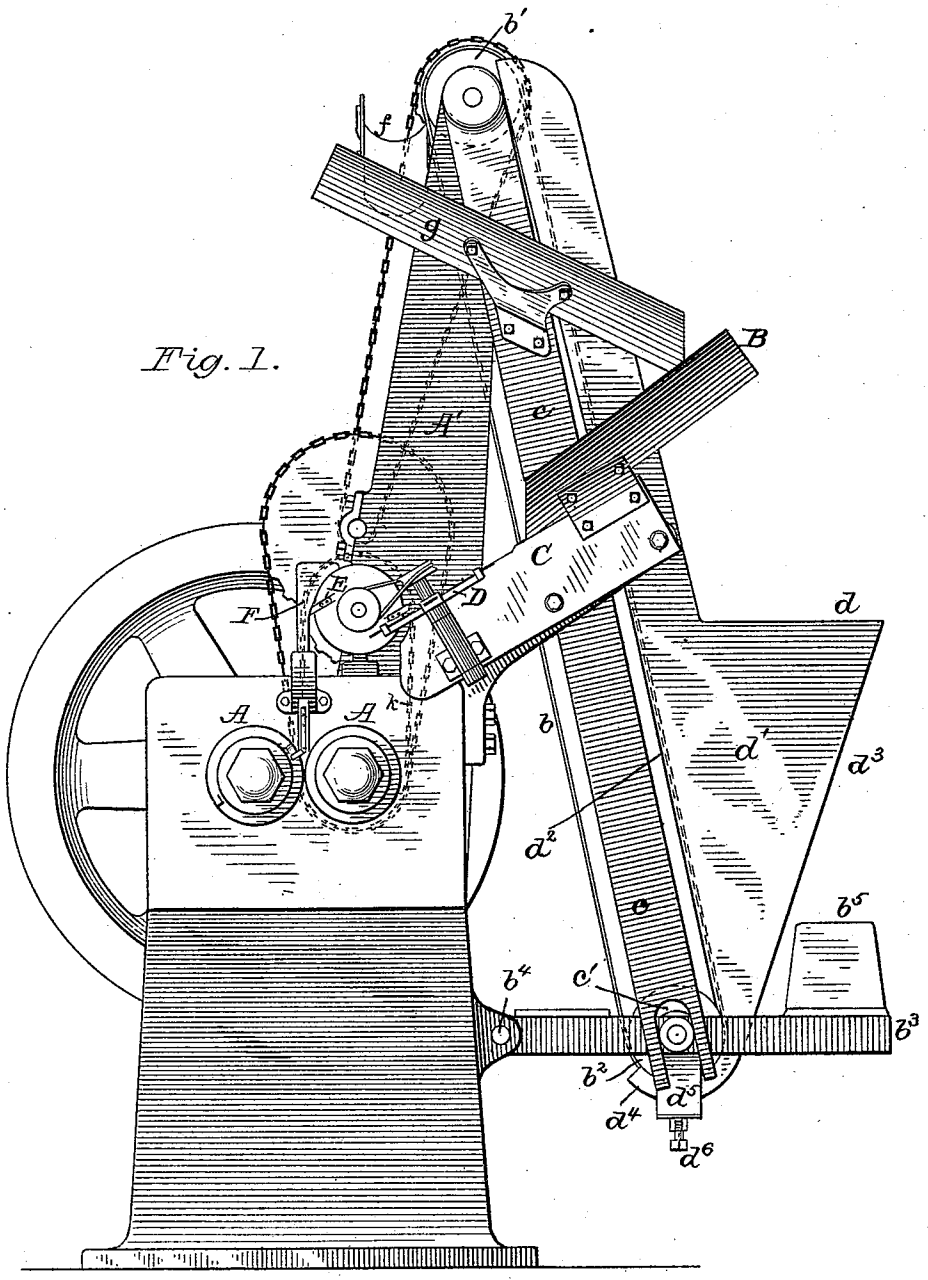
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J. A. COLEMAN.

MACHINE FOR FEEDING HORSESHOE NAILS.

No. 396,467. Patented Jan. 22, 1889.

Fig. 1.



Witnesses,
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By his Attorney
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MACHINE FOR FEEDING HORSESHOE NAILS.

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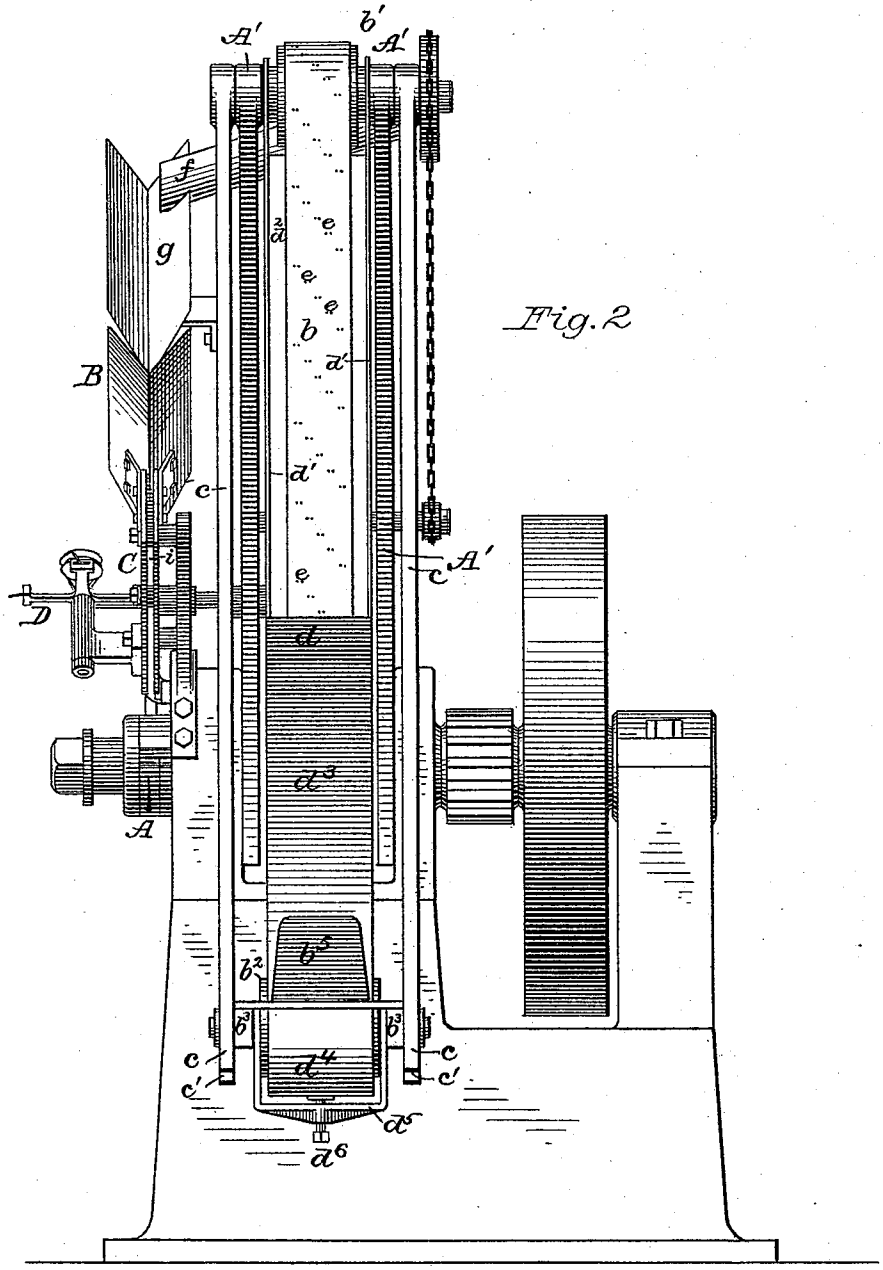


Fig. 2

Witnesses.
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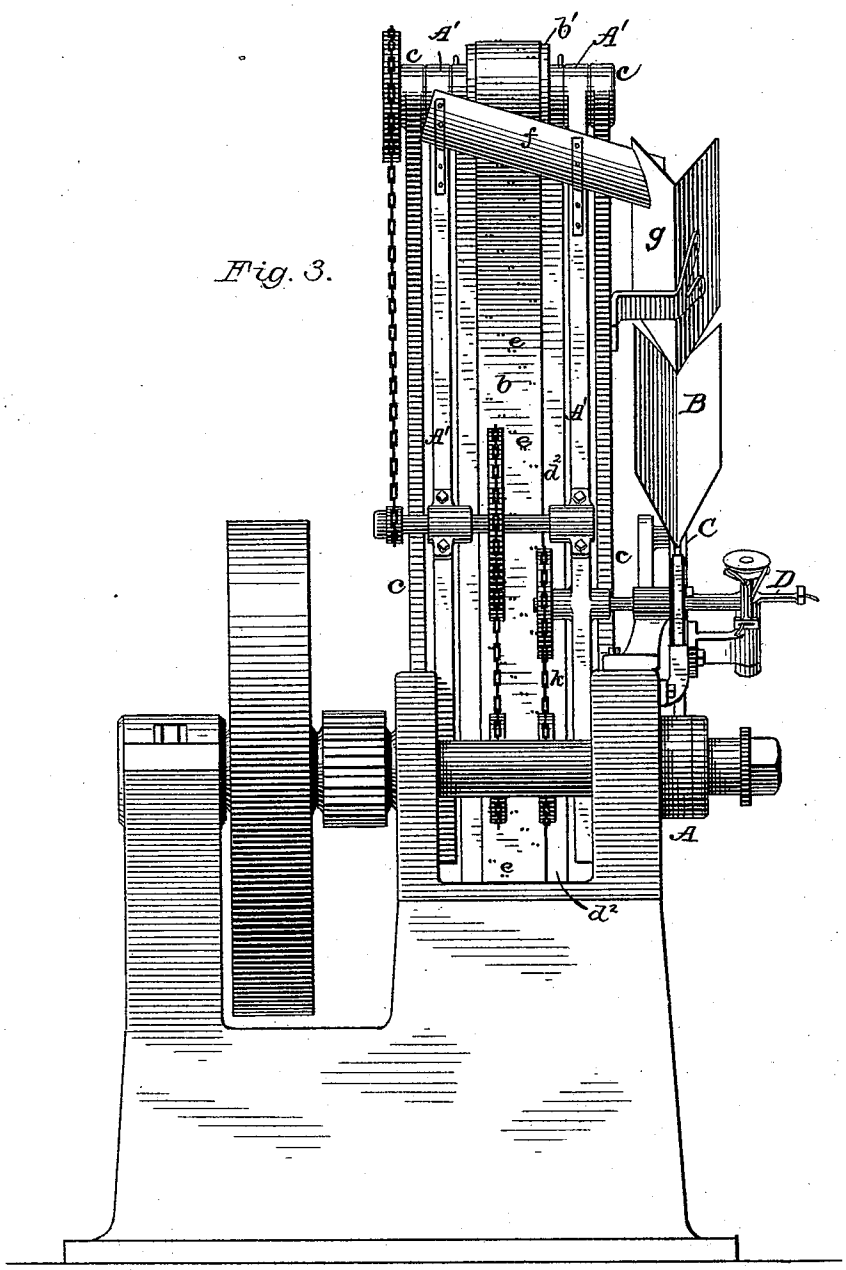
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J. A. COLEMAN.

MACHINE FOR FEEDING HORSESHOE NAILS.

No. 396,467. Patented Jan. 22, 1889.

Fig. 3.



Witnesses.
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J. A. COLEMAN.

MACHINE FOR FEEDING HORSESHOE NAILS.

No. 396,467. Patented Jan. 22, 1889.

Fig. 4.

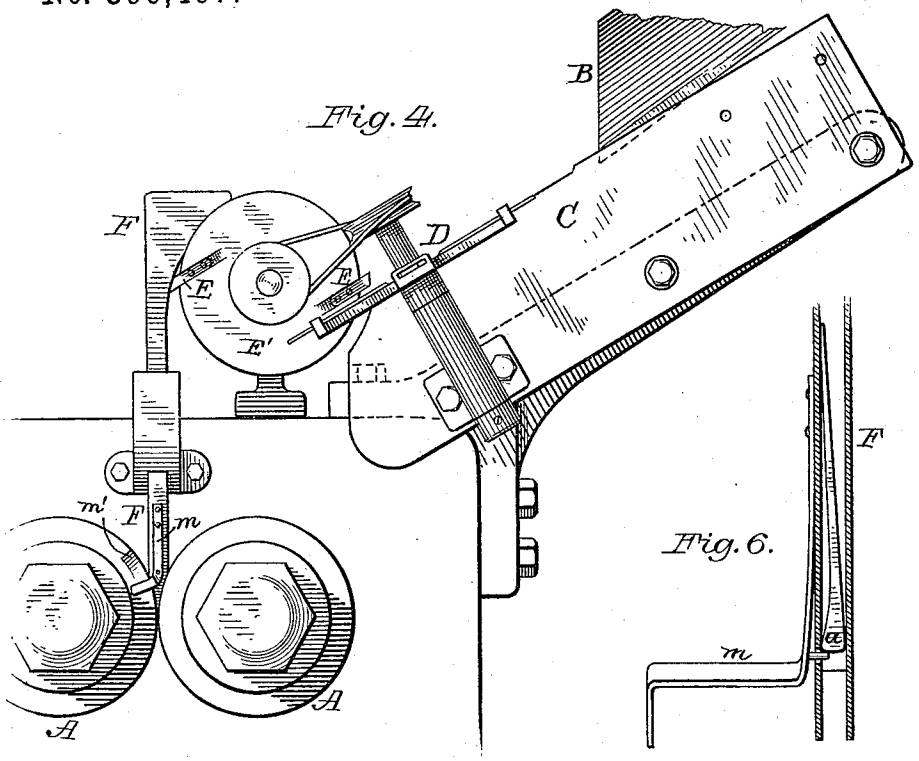


Fig. 6.

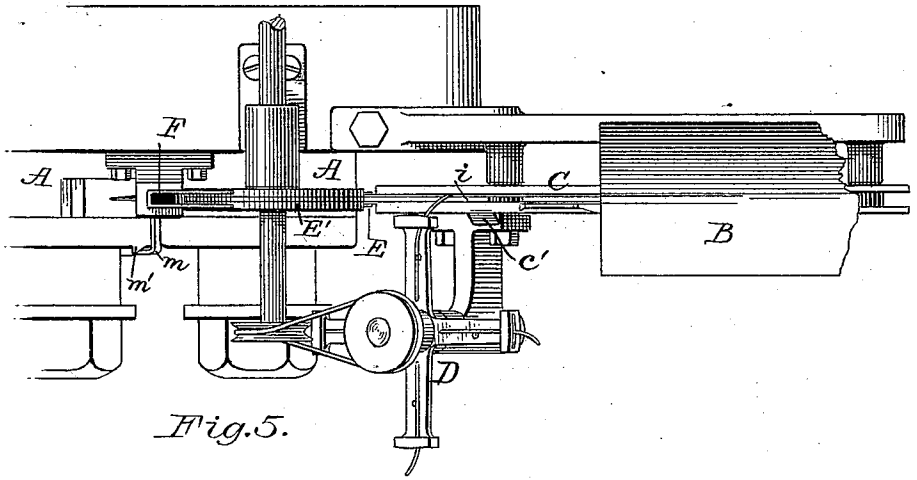


Fig. 5.

Witnesses,
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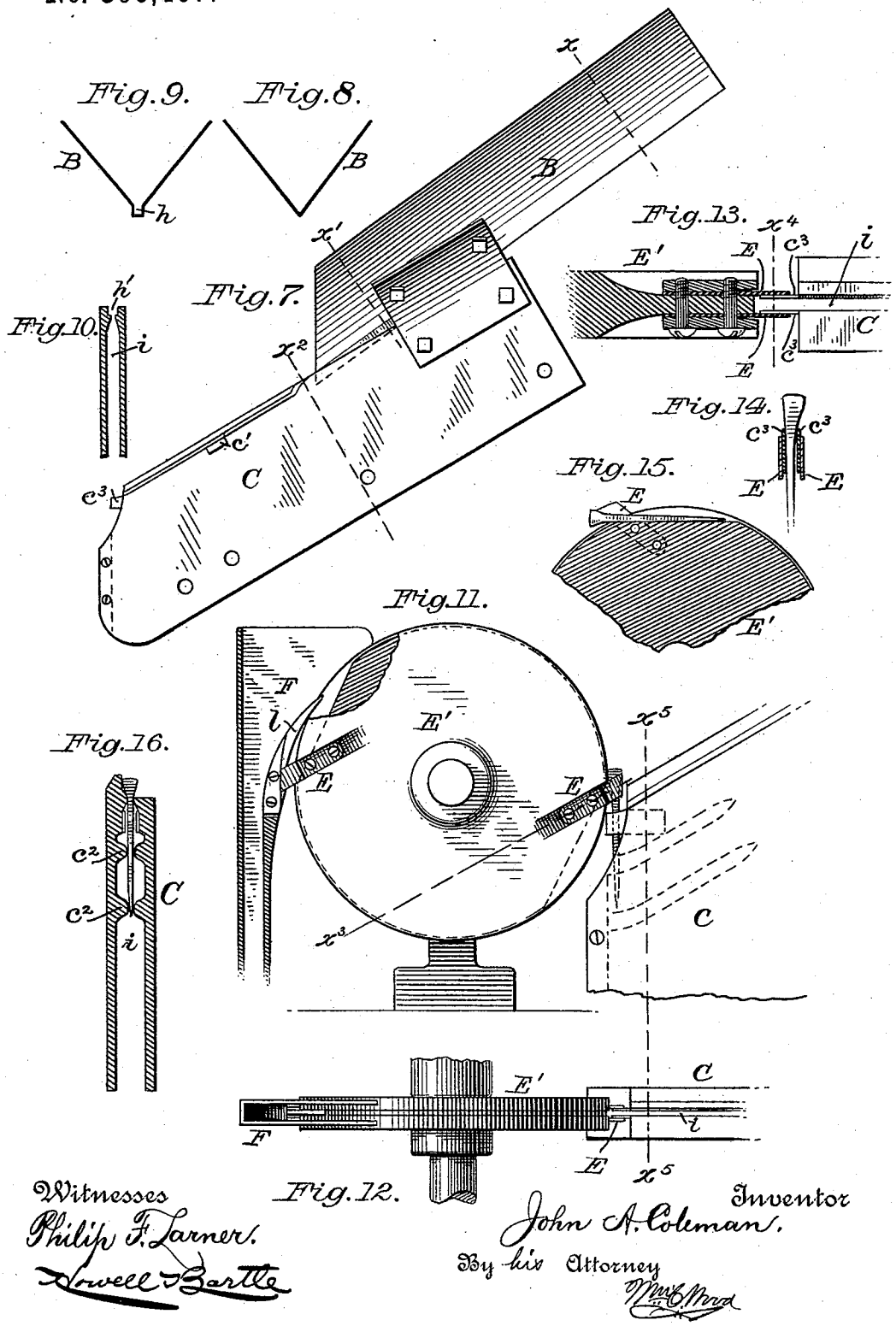
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J. A. COLEMAN.

MACHINE FOR FEEDING HORSESHOE NAILS.

No. 396,467. Patented Jan. 22, 1889.



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J. A. COLEMAN.

MACHINE FOR FEEDING HORSESHOE NAILS.

No. 396,467. Patented Jan. 22, 1889.

Fig. 17.

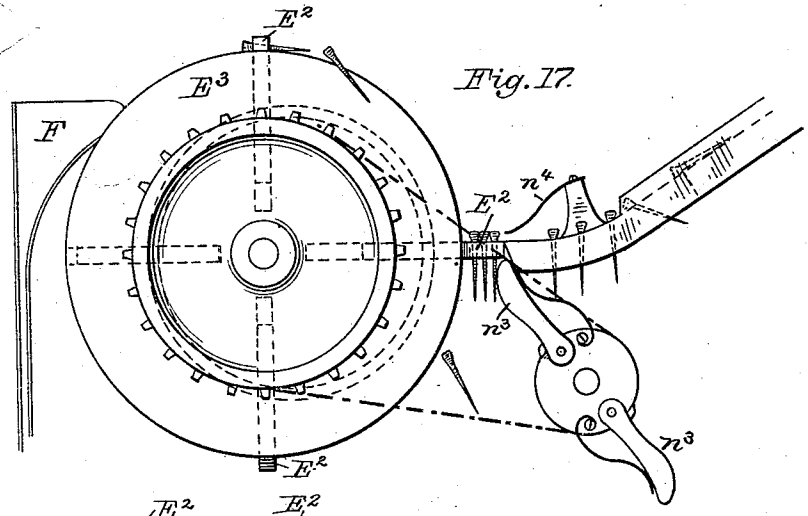


Fig. 18.

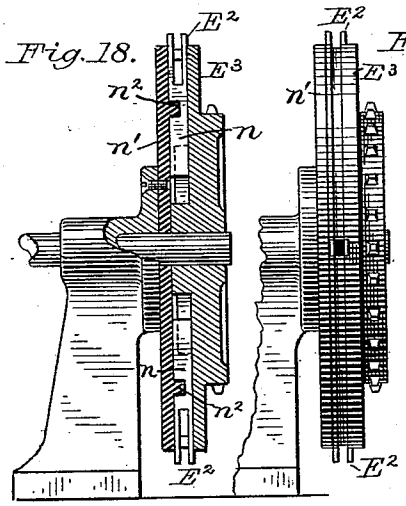
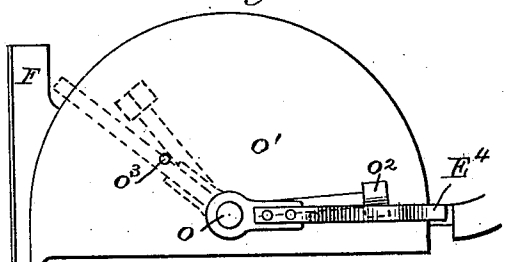


Fig. 19.

Fig. 20.



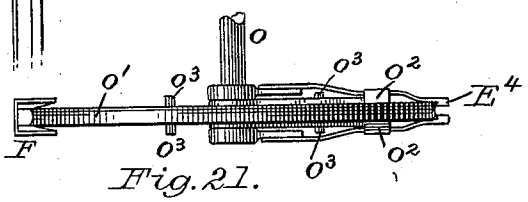


Fig. 21.

Witnesses,
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(No Model.) 8 Sheets—Sheet 7.

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MACHINE FOR FEEDING HORSESHOE NAILS.

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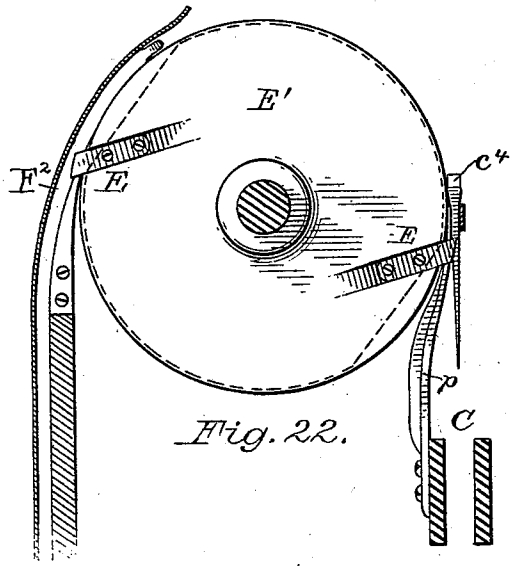


Fig. 22.

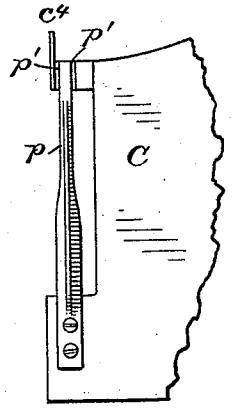


Fig. 24.

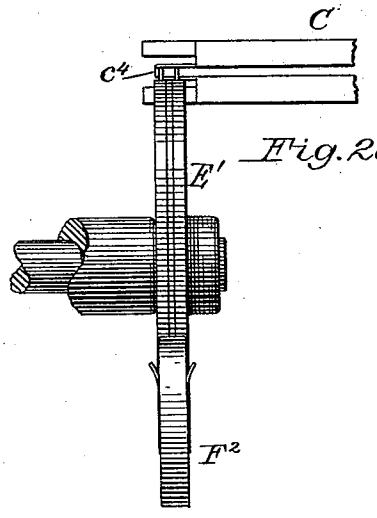


Fig. 23.

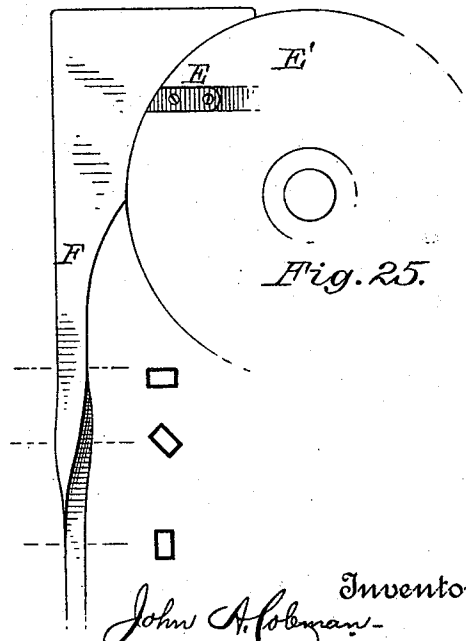


Fig. 25.

Witnesses,
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(No Model.) 8 Sheets—Sheet 8.

J. A. COLEMAN.

MACHINE FOR FEEDING HORSESHOE NAILS.

No. 396,467. Patented Jan. 22, 1889.

Fig. 26.

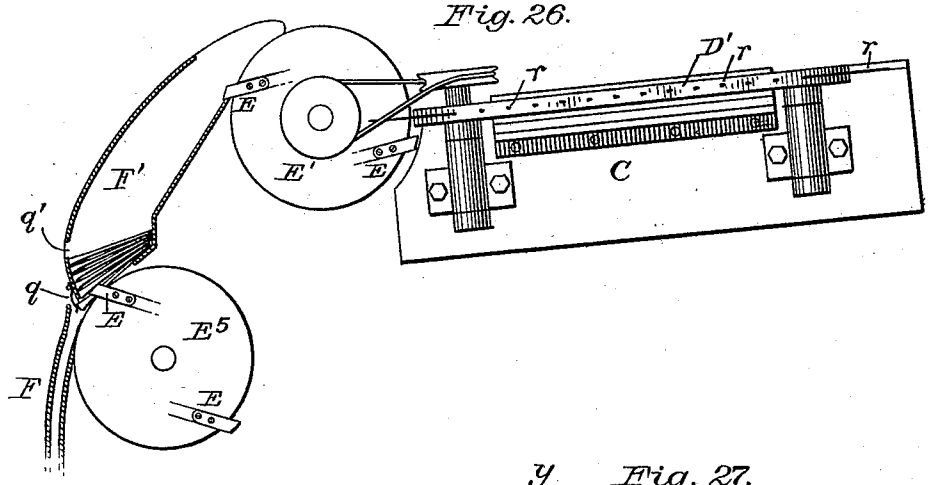


Fig. 27.

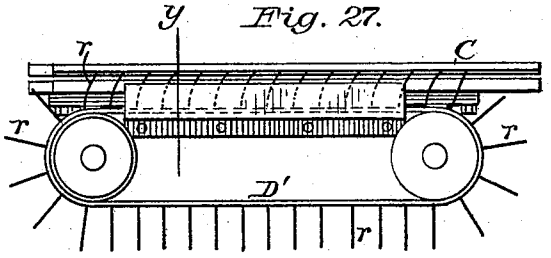


Fig. 28.

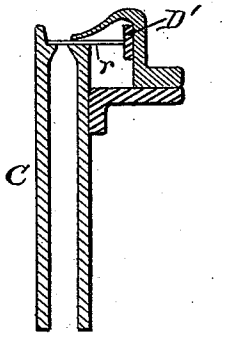


Fig. 29.

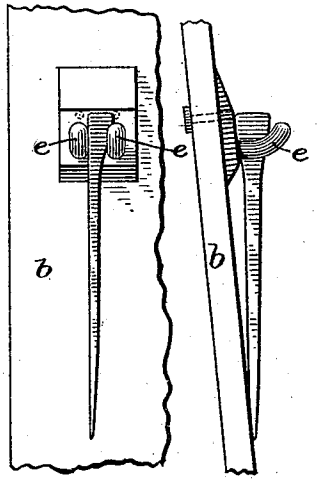
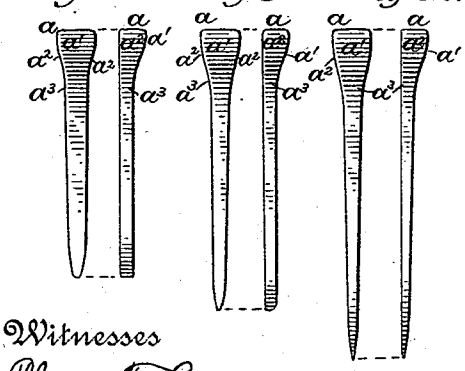


Fig. 30. Fig. 31. Fig. 32.



Witnesses

Philip F. Larner.

Lowell Battle

Inventor,

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By his Attorney

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N. PETERS. Photo-Lithographer. Washington, D. C.

UNITED STATES PATENT OFFICE.

JOHN A. COLEMAN, OF PROVIDENCE, RHODE ISLAND.

MACHINE FOR FEEDING HORSESHOE-NAILS.

SPECIFICATION forming part of Letters Patent No. 396,467, dated January 22, 1889.

Application filed January 28, 1887. Renewed October 28, 1887. Again renewed July 2, 1888. Serial No. 278,856. (No model.)

To all whom it may concern:

Be it known that I, JOHN A. COLEMAN, of the city and county of Providence, in the State of Rhode Island, have invented certain new and useful improvements in mechanism for feeding nails or nail-blanks one by one from a mass thereof to machines adapted to receive and operate thereon; and I do hereby declare that the following specification, taken in connection with the drawings furnished and forming a part thereof, is a clear, true, and complete description of the several features of my invention.

Although my said improvements have been devised by me for use in connection with rotary dies in the manufacture of horse-nails, some of them are applicable to other classes of machines for performing duty more or less analogous. Said rotary dies operate in pairs, after the manner of rolls, and draw out the nail-shanks by a rolling contact with their sides and edges alternately. This class of machines is necessarily fed at precise and regular intervals with single blanks or partially-finished nails, and these must of necessity be fed to the dies longitudinally and head first, and either sidewise or edgewise, according to whether the sides or the edges of the shanks are to be acted upon by said dies; but in either case the blank should be presented to the dies with the greatest possible accuracy as to time, as well as with reference to the axial adjustment of the blank.

Although considerable attention has heretofore been given to the subject of automatically feeding blanks from a mass thereof to horse-nail machines, resulting in quite a number of patented organizations, I know of no instance in which hand-feeding has been heretofore practically superseded. The difficulties heretofore encountered in blank-feeding have led to the devising of that class of machines which embody blank-cutting dies so arranged with reference to the rotary dies that as soon as each blank is cut it is kept under control and at once directed to the rotary dies. In the use of this last-named class of machines it has been proposed to employ more than two consecutively-operating sets of rotary dies, and to have the blanks delivered from each set to the next succeeding set of dies and so on throughout the series; but the complications necessarily involved have as a rule led in practice to the use of but two sets or pairs of rotary dies and one point-trimming punch in any one machine. With this last-named organization I have experienced practical difficulties, which have led me to avoid in any one machine more than a single pair of rotary dies whether with or without a point-trimming punch; and, still further, I have been led to reduce the work of said punch to a minimum, (because of the delicacy of the punch and the cost of its maintenance,) and sometimes to even wholly dispense with it, thus not only avoiding the attendant expense, but also economizing by saving a large percentage of valuable nail metal heretofore wasted. I find that this economy in metal can only be accomplished by a series of gradual steps involving the use of many sets of rotary dies, whereby that metal which would otherwise be wasted at the pointing-dies may be gradually developed into a substantial portion of the pointed end of the nail, thus either completing the point of the nail in the rotary dies or requiring the pointing-punch to do the least possible work.

In seeking to obviate the cost of hand-feeding, which would render my new system commercially impracticable, as well as to obviate the objectionable grouping of many sets of rotary dies in one machine, I have devised my feeding mechanism, and have rendered it practically reliable in the matter of continuous supply and in accuracy of presentation of single blanks head first to the rotary dies. In view of the great number of feeding mechanisms necessarily required in any one plant as organized by me, the matter of simplicity and economy is of unusual importance, and these ends have been specially sought and attained by me without any sacrifice of efficiency in the apparatus.

As a rule all blank-feeding mechanism depends for its successful operation upon some arbitrary peculiarity of configuration common to all of the blanks, and mine depends upon the fact that a horse-nail blank or nail in its best form for my purposes has a shank which just below the head is substantially

rectangular in cross-section and has a greater width than thickness. The two tapered sides of the head can be wholly relied upon by me for enabling special control of the blank at all points in its path through the feeding mechanism and enabling its final presentation either flatwise or edgewise, but always head first, to the rotary dies. It is, however, sometimes desirable to rely upon the tapered edges of the head at one step in the feed for enabling the presentation of the blank-head first and sidewise to the rotary dies.

Having thus indicated the ends sought by me, I will state that my feeding mechanism is the first known to me by means of which nails or nail-blanks in mass can be arranged in line in a precise axial adjustment and positively delivered singly from said line head first and either sidewise or edgewise, as may be desired, according to that particular axial adjustment of the blank required by the rotary dies, and after fully describing the mechanism illustrated the features deemed novel will be specified in the several clauses of claim hereunto annexed.

Referring to the eight sheets of drawings, Figures 1, 2, and 3 illustrate one of my complete machines in its best form, respectively in side, front, and rear views. Figs. 4 and 5, Sheet 4, are respectively side and top views of the rotary dies or die-rolls, the raceway, and the intermediate mechanism. Fig. 6 is a sectional view of the foot of the feed-tube adjacent to the rotary dies, a nail being shown in position for delivery. Fig. 7, Sheet 5, is a side view of my combined adjusting-chute and raceway. Fig. 8 is a lateral sectional view of the adjusting-chute on line x, Fig. 7. Fig. 9 is a lateral sectional view of the same on line x'. Fig. 10 is a lateral section of the raceway on line x^2. Fig. 11 is a side view of the foot of the raceway, the feed-tube, and intervening diving-fingers carried on a disk, and with the latter shown partially in section. Fig. 12 is a top or plan view of the parts shown in Fig. 11. Fig. 13 is a partial plan and sectional view on line x^3, Fig. 11. Fig. 14 is a lateral section of Fig. 13 on line x^4, and also shows a nail-blank suspended at the foot of the raceway. Fig. 15 is a sectional view of a portion of the disk which carries the diving-fingers. Fig. 16 is a sectional view of the raceway on line x^5, Figs. 11 and 12. Figs. 17, 18, and 19, Sheet 6, illustrate, respectively, in side view, central section, and edge view, a set of diving-fingers differing in construction and arrangement from those shown in the preceding figures, accompanied in Fig. 17 by a feed-tube, a raceway, and a spider-wheel. Figs. 20 and 21 illustrate, respectively, in side and top view, still another form of feeding-fingers, together with a feed-tube and raceway with which they co-operate. Figs. 22 and 23, Sheet 7, in side, partial section, and top view, illustrate feeding-fingers on a disk, as illustrated in Fig. 11, but arranged to operate at right angles to the foot of the raceway, the latter and a feed-tube being correspondingly modified in construction and arrangement. Fig. 24 is a side view of the foot of the raceway as when co-operating with the diving-fingers, arranged to operate as shown in Figs. 22 and 23. Fig. 25 is a side view of a pair of feeding-fingers, their disk, and a twisted feed-tube, the latter being shown in lateral section on three lines clearly indicated. Fig. 26, Sheet 8, is a side view of a raceway, diving-fingers, and a spider-wheel, and in section a feed-tube serving in part as a magazine. Fig. 27 is a top or plan view of a corresponding part of Fig. 26. Fig. 28 is a partial sectional view on line y, Fig. 27. Fig. 29, in two views, illustrates part of an endless belt shown in Figs. 1, 2, and 3 and its carriers with a nail suspended thereon. Fig. 30, in side and edge views, illustrates one of my nail-blanks as it is delivered from cutting-dies. Fig. 31, in side and edge views, illustrates one of my blanks after it has been acted upon by rotating dies. Fig. 32, in side and edge views, illustrates a finished nail.

I will first state that the rotary dies A are of the usual form, and that they are mounted in a frame having a pair of vertical standards, A'.

As hereinbefore indicated, the blanks or partially-finished nails are supplied in bulk to the feeding mechanism, and it is well known that when placed in a pan and agitated they soon become a more or less clingy tangled mass, from which it is quite difficult to detach blanks singly except by actual manipulation. At this initial operation I seek to secure a proper supply of blanks, while carefully avoiding the separation and conveyance from the mass of too many blanks in any one group, because at certain portions of the path to be followed each blank should be free from contact with one or more other blanks, so that each may be absolutely free to assume certain positions which are requisite as a prelude to its assuming other absolutely-essential positions.

The blanks may be delivered irregularly to my machine directly from the dies by which they are cut from plates; but I prefer to first subject them to liberal tumbling in a revolving barrel, thus not only enabling them to move smoothly in their route to the rotary dies, but also securing a better finish on the nails.

I deem it best to now refer to Figs. 30, 31, and 32, Sheet 8. Fig. 30 illustrates in two views one form of horse-nail blank generally used by me. Fig. 31 illustrates in like manner a partially-worked blank, and Fig. 32 illustrates a finished nail; and it is to be understood that, however much the nails and the blanks may differ, the heads a thereof are substantially rectangular in cross-section, their sides a' being wider than the edges and more or less inclined at one or both sides, and both of the

edges a^2 being more or less inclined outwardly from the neck a^3 at the junction of the head and shank.

That portion of my machine in which blanks are separated from the mass and are conveyed along the initial portion of their path may be termed a "hopper," although said blanks are not discharged from their receptacle by gravitation, as is usual with hoppers. My hopper includes an endless belt, b, mounted on guide-rollers b', and supported in an inclined position depending from the tops of the frame-standards A'. The upper belt-roller, b', is mounted on said standards A', and the lower roller, b^2, is mounted in a horizontal frame, b^3, pivoted at one end to the frame of the machine at b^4, and having at its outer end a weight, b^5, thus maintaining said belt at proper tension. A pair of side plates, c, each pivoted on the shaft of the upper roll, b', and slotted at its lower end, as at c', loosely accommodates the shaft of the lower roll, b^2, and they serve as bracing-supports for the hopper. The hopper also includes the receptacle or pan d, having vertical sides d' and a back, d^2, and a front, d^3, which are inclined with reference to each other for affording a funnel-shaped form, and its bottom d^4 is curved, so as to conform to the path of the belt at the lower roller. This pan is supported at its lower end upon a yoke, d^5, pendent from the shaft of the lower roll and provided with a screw-seat, d^6, by means of which the relations of the bottom of the pan and the belt may be adjusted. The upper portion of the pan at the edges of its narrow sides rests against hubs on the shaft of the upper guide-roll, b'. The back d^2 of the pan does not extend fully to the bottom, but terminates just above the lower roll and at the rear of the belt, so that the latter really serves as a movable back for the pan, said back d^2 serving as a support or bearing for said belt.

The belt may be variously made to serve as a conveyer without departure from certain portions of my invention; but I have devised a series of lifters or carriers, e, for said belt, and so arranged them thereon as to preclude any undue grouping of blanks at any point. As shown in Fig. 29, these carriers are pairs of small curved studs projecting from the face of the belt b and having a space between them which is less than the sectional dimensions of the heads of the blanks or nails, so that said carriers operate as forks while passing in contact with a mass of nails in the pan, and can only lift one nail or blank by its head; and in order to avoid undue grouping on the belt these carriers are widely separated and arranged crosswise in diagonal rows, as shown in Figs. 2 and 3. It will be seen that the carriers e are so arranged on the belt that if a blank be carried upward in a horizontal position it can only occur in the event of its being nicely balanced on a carrier, and should one or more nails be thus started on any one carrier the vibration of the belt, due to its traveling movement, generally causes one or both to be dropped, and therefore, as a rule, only those blanks which are lifted in a pendent position are carried over the upper roller, although it is immaterial in what position they may be carried so long as no one carrier conveys more than one blank, although an occasional carriage of two or even three in a group will not defeat my purposes. The nails or blanks thus separated from the mass in the pan and carried upward by the belt are discharged from the latter while passing over the upper roller into a spout, f, transversely mounted on the frame-standards A'. This spout may be agitated without departure from my invention; but I prefer to have it inclined, as shown, so that the blanks on falling therein will freely slide downward. The bottom of the spout is concave laterally, so that whether the blanks fall therein head first or tail first or sidewise they will at once assume positions substantially lengthwise in the spout and pass therefrom endwise into the inclined conducting-chute g, which is mounted on one of the side plates, c, and is in substance a mere prolongation of the spout f, for conducting the blanks to the upper end of the adjusting-chute B. It is now to be understood that between this adjusting-chute B and the pan d the mechanism need only be capable of separating single blanks or nails from the mass, and conveying them without undue grouping and discharging them singly into the adjusting-chute; but this latter chute must be of such form as will adjust each blank axially and force all blanks to travel longitudinally in the same line or path, whether head first or tail first, and in either event to be so supported in said chute that when each reaches and passes freely from the lower end of said chute it will assume a vertical position and be ready to continue its downward course edgewise. In other words, this chute B, however a blank may be received therein, axially adjusts the blank and enables it to always enter the raceway C in an edgewise position. This chute B is, therefore, essentially **V**-shaped in cross-section, as shown in Fig. 8, and at its lower end its **V**-shaped bottom merges into a groove, h, rectangular in cross-section, as shown in Fig. 9, and this groove is a little wider than the thickness of the head of a blank, and therefore each blank as it drops into this chute is at once supported upon one of its sides and one of its edges at the bottom of the **V**, and when the head of the blank (whether the latter travel head first or tail first) reaches the rectangular groove the blank is at once fully adjusted axially and supported in an edgewise position.

The raceway C is composed of two inclined parallel plates affording between them a space, i, a little wider than the thickness of the shank of a blank below its head, and the groove h of the adjusting-chute terminates at

the upper end of said space *i*, so that if a blank be moving tail first its point drops promptly into said space, thus permitting the blank to assume a vertical position. Said raceway at its upper end, at and a little below its junction with the adjusting-chute, is in substance a prolongation of the groove *h*, being of the same width, as shown at *h'*, Fig. 10; but instead of being closed at its bottom, like said groove, it is open centrally, because of the space *i*, and therefore, when a blank or nail descends head first said groove *h* assures the edgewise position of the head, and the blank then passes endwise head first upon the raceway until its point has passed the end of said groove, whereupon it drops into the space *i* and the blank assumes a vertical position, and in both cases the blank is supported on the raceway by the contact therewith of the inclined sides of the head with surfaces on the side plates at the top of the space *i*.

Although the adjusting-chute and raceway have been thus described as separate devices, it is to be understood that they can be constructed integrally without in any manner departing from my invention, it being obvious that there is required therein, first, the V-shaped supporting-surface; second, the slot or space *i*, and, third, the parallel supporting-surfaces at the top of said slot or space. These three features of construction are ample for securing the proper control and arrangement of all blanks or nails which pass downward, point first, upon the V-shaped supporting-surface, and there is a decided tendency for the blanks to proceed in that particular position. With only said "three" features, however, a blank descending head first is liable to fly from the track after leaving the V-shaped supporting-surface, because the complete axial adjustment of the blank is not fully assured by said surface, and hence at its junction with the slot or space *i* the rectangular groove *h* and its extension or prolongation *h'* constitute a "fourth" feature of construction in the combined adjusting-chute and raceway, which is of great value for assuring, as I believe, the best possible results. The inclination of the combined adjusting-chute and raceway is important only in the matter of assuring the prompt forward movement of the blanks in their path, especially in the adjusting-chute; but the raceway need not be so inclined as to enable gravitation and impetus to alone cause the blanks to travel to the foot of the raceway, and, although with a properly-inclined raceway fair results will accrue if there be no mechanical contrivances for moving the blanks in their path thereon, I employ for obtaining the best results a spider-wheel, D, provided with slender curved spring-fingers, which move in the inclined plane occupied by the heads of the blanks at the lower portion of the raceway, and by gentle frictional contact with said heads assure the forward movement of the blanks toward the foot of the raceway. An inclined lip, *c'*, is provided at one side of the top of the raceway for enabling the spring-fingers to readily ride up to and occupy proper positions for engaging with the blank-heads.

At the foot of the raceway C, as shown in Fig. 16, I provide two pairs of coincident ribs, c^2, between which spaces are afforded for the free passage of the shank of a blank moving downward on the raceway edgewise and in a pendent position, thus causing each blank to stand more thoroughly vertical than could be the case if said shank-space were not thus restricted, it being obvious that the upper portions of said raceway should have a wide free shank-space, so as to enable free sliding movements of the pendent blanks.

At the foot of the raceway, as shown in Figs. 7, 13, and 14, there are two slender parallel plates, c^3, the upper edges of which serve as a prolongation of the raceway and afford a support for a pendent blank and leave the two sides of the head wholly accessible for the engagement therewith of what I term "diving-fingers" E. These fingers may be variously constructed and operated without departure from certain portions of my invention; but they must be capable of causing the blanks held at the foot of the raceway to dive head first into a feed-tube, F, or other receptacle wherein the required axial adjustment of the blanks can be maintained or controlled, and it is for this reason that I apply the term "diving" to said fingers. As shown in Figs. 11, 12, and 13, I employ two pairs of diving-fingers E, and they are mounted upon a wheel or disk, E', which is caused to reliably rotate by means of a sprocket-chain, *k*, coupling said wheel with the shaft of one of the rotary dies A, as shown in Fig. 3. Each diving-finger is a thin plate of hard metal bolted in a recess in the side of the disk E', as clearly indicated in Fig. 13, and projecting beyond the periphery, and so spaced between their outer ends as to laterally embrace both of the projecting raceway-plates c^3, and, therefore, as the disk revolves each pair of fingers lifts a blank by contact with the sides *a'* of its head and carries it upward and forward head first while lying on its edge in a tangential recess provided therefor in the periphery of the disk, (shown in Fig. 15,) and as the diving-fingers move along the blank soon assumes a practically vertical position and dives head first into the feed-tube F. If simplicity and economy be not specially sought, the feed-tube may be arranged to serve as a magazine at its upper end between the diving-fingers and the feed-tube proper, as will be hereinafter further described.

The feed-tube F (shown in Fig. 11) has a flaring mouth extending toward and into the vertical plane occupied by the diving-finger wheel, and although as a rule the blanks will freely dive from said fingers, I provide for exceptions to the rule by employing a clearer, *l*, preferably in the form of a slender curved

pointed vertical plate having its point coincident with the center of the peripheral face of the disk, and therefore, should a pair of diving-fingers fail to promptly release a blank at the proper point, the tip of said clearer by being interposed between the fingers, and also between the blank-head and the periphery of the disk, will effect a positive clearance and leave the blank free to dive. In Fig. 11 the feed-tube F has such a sectional area that a blank can only enter it edgewise, and hence the latter cannot change its axial adjustment while descending, or even if it be brought to rest within said tube, and therefore this particular tube is restricted to use with such rotary dies as are adapted to operate upon the edges of the heads and shanks of the blanks. At the foot of the feeding-tube each blank is preferably arrested, so as to secure an absolutely accurate delivery of the blank to the dies. This I accomplish by means of a spring-tappet, *m*, (clearly shown in Fig. 6,) which partially closes or contracts the opening of the lower end of the tube, and one of the rotary dies A is provided with two slight projections, *m'*, which are so nearly adjacent to the ends of the head-receiving matrices in the rotary dies that as said matrices approach their receiving position a blank is released and dropped into them head first.

For enabling the blanks to be delivered to rotary dies adapted to operate upon the sides of the heads and shanks a further axial adjustment is necessary. This may be accomplished by the use of such twisted feed-tubes as are shown in my Letters Patent Nos. 286,390 and 286,391, and also as here shown in Fig. 25; or the diving-fingers may be so organized with the foot of the raceway as to lift the blanks therefrom by contact with the edges of the heads instead of the sides, as will be hereinafter further described, in which case a straight feed-tube can be relied upon for delivering blanks to rotary rolls adapted to operate upon the sides of the heads and shanks of the blanks.

In view of the description given of the several parts, the operation of the machine as a whole will be readily understood, and it will be seen that each of the several parts may be more or less varied in construction, as well as in its mode of operation, without substantial departure from the main features of my invention—as, for instance, the form of the receiving pan or receptacle may be widely varied, as well as the means by which the blanks are separated from the mass and delivered into the spout, provided the delivery of too many blanks in groups is prevented. I have used a belt having a roughened surface and operated at such an inclination as would enable it to readily carry blanks resting upon its surface, and also belts having thin cross-bars, and these have been angularly mounted on said belt, and also crosswise, and I have also used agitating devices by which the belt would be shaken for separating such blanks as might be unduly grouped upon the belt; but I obtain the best results with the belt and lifter shown and described, and, as the speed of the belt and the number of carriers thereon should be in proper harmony with the requirements of the rotary dies and always afford a considerable group of blanks at the foot of the raceway, I provide for varying the conveying capacity of the belt, either by varying the number of lifters thereon or varying the speed of the belt by changing the sprocket-wheels by which it is driven.

As to the conducting-spouts between the belt and the adjusting-chute B, it will be obvious that their presence is mainly desirable because of the relative positions of the belt and the chute B, which are arranged, as shown, for economizing in space, as well as in the cost of construction. I find, however, that there are some advantages which accrue from the use of said spouts, as distinguished from discharging directly from the belt into the adjusting-chute.

As a rule, the blanks are discharged singly from the belt; but sometimes two or more will be discharged at the same time, and then they are as liable to fall sidewise as either end first, in which case the two spouts are conducive to the breaking up of the groups and aligning the several blanks, so that it is seldom, if ever, that more than one blank at a time will pass into the adjusting-chute, it being obvious that if two blanks should pass downward therein side by side and point first the two points would be liable to drop simultaneously into the groove at the foot of the raceway and result in obstructing the path.

As to the adjusting-chute B, I deem the V form absolutely essential, first, because it is on that particular form that I rely for supporting-surfaces which assure the initial axial adjustment and true alignment of the blanks, it being obvious that, regardless of how a blank may be dropped therein, it will be supported upon one of its two sides and one of its two edges, and its point will occupy the bottom of the V, whether the side of the head of the blank rests on one side of the V or the opposite side. The upper end of the raceway is so intimately merged with the lower end of the chute B as to render it immaterial whether the raceway be deemed a part of the adjusting-chute or the latter a part of the raceway, as has been hereinbefore indicated; but it is essential that the V-chute should be provided with a slot, or that it be coupled to a raceway having a slot narrower than the width of the shanks of blanks and a little wider than their thickness, so as to enable the blanks to promptly assume a vertical position and to be freely suspended by the supporting-contact of the sides of their heads with the surfaces at each side of said slot or space. This combined adjusting-chute and raceway I believe to be broadly new as an organization for aligning blanks in a precise axial adjustment, notwithstanding the fact

that a V-shaped chute slotted centrally at its lower end has been used for assorting round-headed pins, so that on receiving pins in mass or from a pin-making machine they would slide down the bottom of the chute until the slot was reached, into which the points would drop, and while enabling all properly-headed pins to be suspended therein and to pass downward and off into a receptacle all non-headed or imperfectly-headed pins would drop through said slot, and also notwithstanding the fact that in machines for assorting nails and tacks slotted V-shaped spouts have been used, and also notwithstanding the fact that a chute and a pair of endless belts affording a space between them, in which the nails were suspended and carried by their heads, have been employed in machines for assorting ordinary nails, and also in machines for assorting horseshoe-nails of a certain form and arranging them in line preparatory to their delivery to other mechanism.

The combined adjusting-chute and raceway provided with the longitudinal groove by which the heads of blanks are set on edge and the ultimate axial adjustment of the blank assured is believed to be broadly new.

The combination, with the raceway, of the diving-fingers and a feed-tube is also believed to be broadly new, notwithstanding the prior existence of a horizontal raceway, a feed-tube, and a revolving carrier radially chambered and arranged to receive a horse-nail blank point first from the raceway into some one of its radial chambers and then by its rotation to discharge the blank head first into a feed-tube, as distinguished from my diving-fingers, which assume the control of a blank while still on the raceway and maintain a complete control thereof until it is caused to dive head first into the feed-tube.

Although I prefer the diving-fingers constructed, arranged, and operated as illustrated in detail in Figs. 11 to 15, inclusive, it is to be understood that they can be widely varied without departure from certain portions of my invention—as, for instance, in Figs. 17, 18, and 19 I show four pairs of diving-fingers, E^2, each pair being at the end of a sliding bar, n, in radial grooves in the side of a revolving disk, E^3, and caused to be moved to and fro longitudinally by means of a stationary cam-plate, n', the scroll n^2 of which occupies transverse grooves in the sliding bars n, as clearly indicated in Fig. 18. The stationary scroll n^2 being eccentric to the axis of the disk and properly arranged, as shown in dotted lines in Fig. 17, it follows that as the disk is revolved the fingers will be advanced for picking a blank from the raceway and retired for releasing it at the mouth of the feed-tube F. I have in Fig. 17 also illustrated the foot of the raceway in a horizontal position and a revolving spider-wheel provided with spring-arms n^3, which in their path enter the tail-piece of the raceway from below and force the pendent blanks toward and into proper relation to the path of the diving-fingers, and above the raceway a spring, n^4, is provided, beneath which the heads of the blanks can be easily pushed, and which will prevent the blanks from being moved rearward while the fingers are taking control of the blanks. With this arrangement the fingers will at times initially engage with two or three blanks, in which case all but one will be dropped as a result of the longitudinal retirement of the fingers. It is to be understood that with the diving-fingers thus constructed and operated the disk E^3 will necessarily be much larger in diameter than the corresponding disk of Fig. 11. It is, however, to be understood that the diving-fingers need not necessarily be continuously rotated, as by means of a revolving disk or wheel, as I find that although that mode of operation is generally desirable, fairly good results will accrue if said fingers be reciprocated in the arc of a circle, as illustrated in Figs. 20 and 21. In this case one pair of diving-fingers, E^4, are in the form of spring-plates mounted upon a rock-shaft, o, having bearings in a stationary segmental plate, o', the fingers projecting beyond the curved or arched surface of the plate, which affords a support for the shank of a blank, while the fingers are moved from the raceway to the feed-tube F. For opening said spring-fingers, preparatory to embracing the head of a blank, and for releasing it at the feed-tube, double-faced wedge-blocks o^2 are employed. Each of said wedge-blocks is carried on an arm loosely pivoted on the rock-shaft o and next to the plate o'. Two stationary pins or studs, o^3, project from the sides of said plate o', with which the wedge-block arms engage at the two ends of their stroke. The spring-fingers, having engaged with the head of a blank, are moved in the arc of a circle, and carry the wedge-blocks with them until the arms of the latter strike one pair of the studs, which arrests their further swinging movement; but the arms, continuing onward, pass over the wedge-blocks, and being thus sprung apart absolutely release the blank, which then dives into the feed-tube. With the return movement of the fingers they carry the wedge-blocks before them until the other pair of studs arrest the movement of said blocks, whereupon the fingers are spread apart, thus straddling the head of a blank, and then, after passing the wedge, grasping a blank, as before. In each instance the diving-fingers thus far described move in the same vertical plane as that occupied by the foot of the raceway, and this arrangement is essential if the diving-fingers are to engage with the sides a' of the blank-heads. If, however, the diving-fingers are to engage with the edges a^2 of the heads, the path of said fingers should be at right angles to the raceway, as illustrated in Figs. 22, 23, and 24. In this case the foot of the raceway C is provided with a vertically-extended closed end, c^4, and at one side thereof the raceway is in substance vertically slotted

to afford paths for the fingers E. A blank being at the foot of the raceway is supported at one side of its head upon the one side of the raceway and at the opposite side of the head upon the top of the vertical rigid tongue p, which is about as wide as the width of a blank at its neck a^3, and at each side of said tongue there is a vertical slot, p'. When thus organized the diving-fingers are preferably mounted on a revolving disk, E′, as in Fig. 11, and which is provided with the same peripheral recesses; but in this case said recesses are somewhat wider than those, because the blanks are carried therein flatwise instead of edgewise. The feed-tube F^2 in this case is internally adapted to receive the blanks flatwise from the fingers, and therefore its upper end is of such form and dimensions as will preclude axial variations in the position of a blank after its head once enters the mouth of the tube.

I find with the mechanism thus far described for delivering the blanks from a mass to the combined adjusting-chute and raceway that the delivery is sufficiently uniform and reliable to warrant the interposition of the diving-fingers directly between the foot of the raceway and the feed-tube; but I also find, if other less reliable means be employed between the mass of blanks and the adjusting-chute, that it is desirable to provide for the grouping of blanks in a vertical pile edgewise to always afford a sufficient quantity in reserve to secure an unbroken delivery to the rotary dies—as, for instance, in Fig. 26 I show the raceway at its foot and the diving-fingers E as in Fig. 11; but the feed-tube F is enlarged at its upper end, as at F′, to enable it to serve as a magazine for blanks piled edgewise therein as received from the diving-fingers E. At the foot of the magazine an external spring-finger, q, extends inward slightly for preventing the free passage of a blank downward, except when forcibly drawn from the magazine by the diving-fingers on the revolving disk E^5, which, as before described, engage with the sides of the head of a blank and cause it to dive into the feed-tube proper, the spring-finger q retaining the overlying blanks.

In order that the pile of blanks in the magazine may be properly restricted as to numbers, and thereby prevent irregular piling, I have found it desirable to provide for the endwise escape of blanks through the front side of the magazine by way of an opening, q', therein at a proper height from the bottom of the magazine, so that when the head of the last blank deposited lies even with said opening the next blank received from the raceway will slide endwise on its edge upon the underlying blank and escape through said opening. I also find if a magazine be actually desirable because of the imperfect character and operation of the mechanism between the mass of blanks and the raceway that it is also desirable that the raceway be less inclined, and sometimes substantially horizontal. I have shown in Figs. 26, 27, and 28 a raceway, C, which requires blank-accelerating mechanism to be applied throughout the whole or a considerable portion of its length, and hence, instead of a spider-wheel of the form shown in Fig. 1, I here employ as the equivalent thereof a series of spring-fingers, r, carried by a belt, D′, mounted on wheels, one of which is driven like the spider-wheel D, before described, so as to cause the spring-fingers to sweep against blanks pendent on the raceway and to move them forward into position for engagement by the diving-fingers.

For obtaining the best results I prefer to employ the complete but simple organization illustrated by Figs. 1 to 16, inclusive; but the several modifications shown clearly indicate that certain features of my invention can be employed independently of others for obtaining practically valuable results if complexity and cost are to be more or less ignored.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. The combination, substantially as hereinbefore described, of a raceway for supporting pendent blanks in line and in precise axial adjustment, a receptacle for said blanks wherein said axial adjustment is maintained or controlled, and diving-fingers which are interposed between said raceway and receptacle and detach blanks singly from said raceway, turn them end for end, and cause them to dive into said receptacle.

2. The combination, substantially as hereinbefore described, of a raceway for supporting pendent blanks in line and in a precise axial adjustment, a feed-tube which controls or maintains said axial adjustment, and diving-fingers which are interposed between said raceway and feed-tube and detach blanks singly from said raceway, reverse them endwise, and cause them to dive into said feed-tube.

3. The combination, substantially as hereinbefore described, of a raceway slotted to support pendent nail-blanks in a precise axial adjustment and an inclined V-shaped adjusting-chute merging at its foot with the slot in said raceway, whereby blanks with rectangular heads on being dropped into said chute are axially adjusted and their shanks aligned with and accurately delivered to the raceway in a precise axial adjustment.

4. The combined adjusting-chute and raceway, substantially as hereinbefore described, consisting of a raceway slotted to support flat-sided and substantially rectangular-headed nail-blanks in a pendent position and with a precise axial adjustment, and an inclined V-shaped chute merging with said raceway and having at their junction a longitudinal central groove which is in line with the slot of the raceway and with the center of the chute and has a width less than the width of the head of a blank and slightly greater than its thickness, whereby a blank while sliding

down said chute is partially adjusted axially therein, then fully adjusted by being turned on its edge in said groove, and then delivered to and held by said raceway in a pendent position and in a precise axial adjustment.

5. In horse-nail-feeding mechanism, the combination, substantially as hereinbefore described, of a combined adjusting chute and raceway essentially embodying an inclined V-shaped supporting-surface and a slot or space for receiving blanks and supporting them in a pendent position, a receptacle for nail-blanks in mass, and carriers for detaching single blanks from said mass and delivering them to said chute, whereby a row or line of blanks is deposited on and supported by said raceway, each in a pendent position and in a precise axial adjustment.

6. In horse-nail-feeding mechanism, the combination, substantially as hereinbefore described, of the combined adjusting chute and raceway, a receptacle for blanks, carriers for detaching and conveying blanks from the mass to said chute, and diving-fingers at the foot of the raceway which pick blanks from said raceway, turn them end for end, and cause them to dive into a receptacle which maintains or controls the axial adjustment of the blanks.

7. In horse-nail-feeding mechanism, the combination, with the raceway, of a revolving disk provided with fingers which pick blanks from said raceway, reverse them end for end, and cause them to dive into a suitable receptacle, substantially as described.

8. In horse-nail-feeding mechanism, the combination of the diving-fingers, a blank-supporting raceway, and a spider-wheel provided with yielding arms, which sweep along a portion of the path occupied by the blanks while supported on said raceway, substantially as described, and thereby to place the foremost blank within the path of the diving-fingers to enable the latter to pick the blanks in regular order from the raceway.

9. In horse-nail-feeding mechanism, the combination, substantially as hereinbefore described, of a blank-supporting raceway provided at its foot with thin slender projections for supporting a headed blank by contact with the sides thereof adjacent to its neck, and diving-fingers separated by a space slightly greater than that occupied by said projections, whereby said fingers may readily move freely by the projections and nevertheless engage with the head of a blank for picking it from the raceway.

10. In horse-nail-feeding mechanism, the combination, with the raceway, of diving-fingers and the revolving disk carrying said fingers and provided at its periphery with a recess for the reception of the shank of a blank carried by said fingers.

11. In horse-nail-feeding mechanism, the combination, substantially as hereinbefore described, of a pan or receptacle for receiving blanks in mass, a feed-tube for delivering said blanks to the metal-working mechanism and interposed between said pan and tube, a series of blank-carriers on an endless belt, a combined adjusting-chute and raceway, and diving-fingers which detach blanks singly from said chute and cause them to dive into said feed-tube.

12. In a horse-nail-feeding mechanism, the combination, substantially as hereinbefore described, of a pan for receiving blanks in mass, an endless belt traveling within the pan and along its back and provided with carriers for engaging with the heads of the blanks, and thereby detaching blanks from the mass and discharging them singly from the pan.

13. The combination, substantially as hereinbefore described, of the blank-pan, the endless belt, and the belt-tightening frame.

14. The combination, substantially as hereinbefore described, of the blank-pan, the endless belt traveling within said pan, and an adjustable support for said pan, whereby the bottom of the latter is adjusted vertically with relation to the lower portion of the belt.

15. The endless belt provided with a series of carrying-studs in pairs and adapted to engage with the heads of blanks, substantially as described.

16. The endless belt provided with the series of carrying-studs arranged in diagonal lines on the face of the belt, substantially as described.

17. The raceway provided with surfaces for supporting headed nail-blanks in a pendent position and with interior coincident ribs for restricting the shank-space without undue frictional contact with the shanks of the blanks.

18. The combination, with the feed-tube and the diving-fingers, of the clearer within said tube and in the center of the path in which said fingers are moved, substantially as described.

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