(No Model.) 5 Sheets—Sheet 1.

S. HANSEN.

HORSESHOE NAIL MACHINE.

No. 382,646. Patented May 8, 1888.

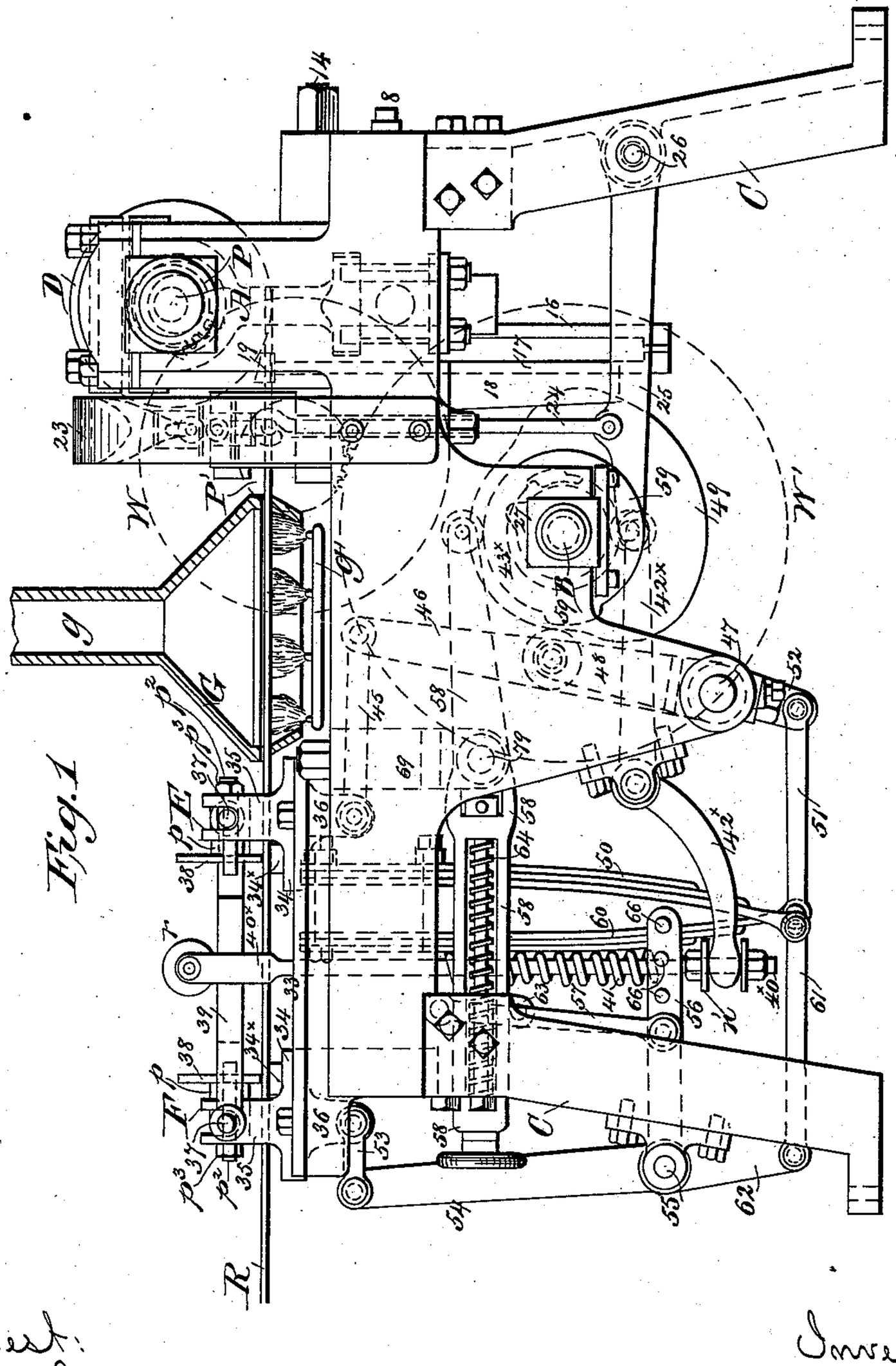

Fig. 1.

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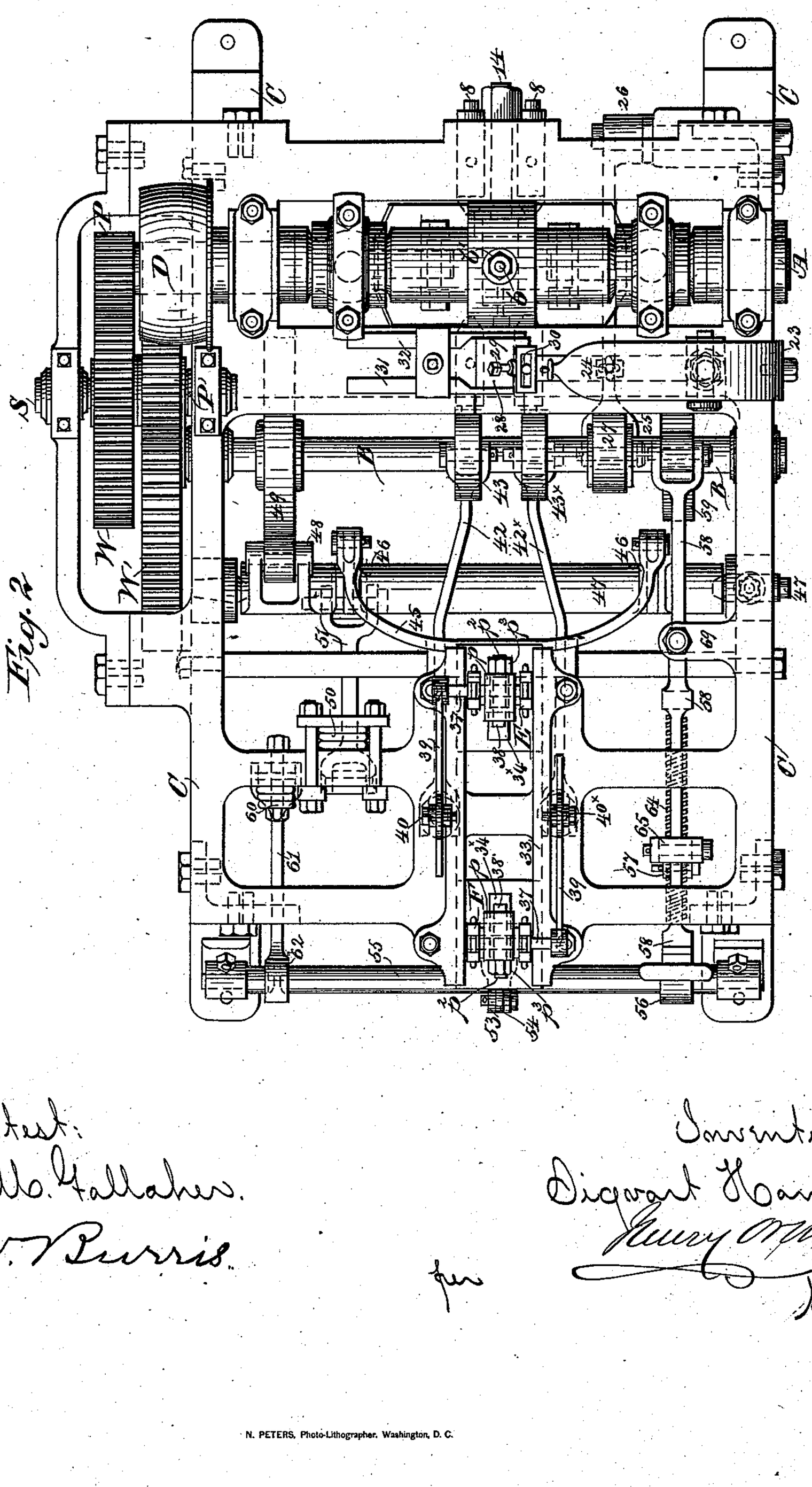

Fig. 2

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Fig. 3

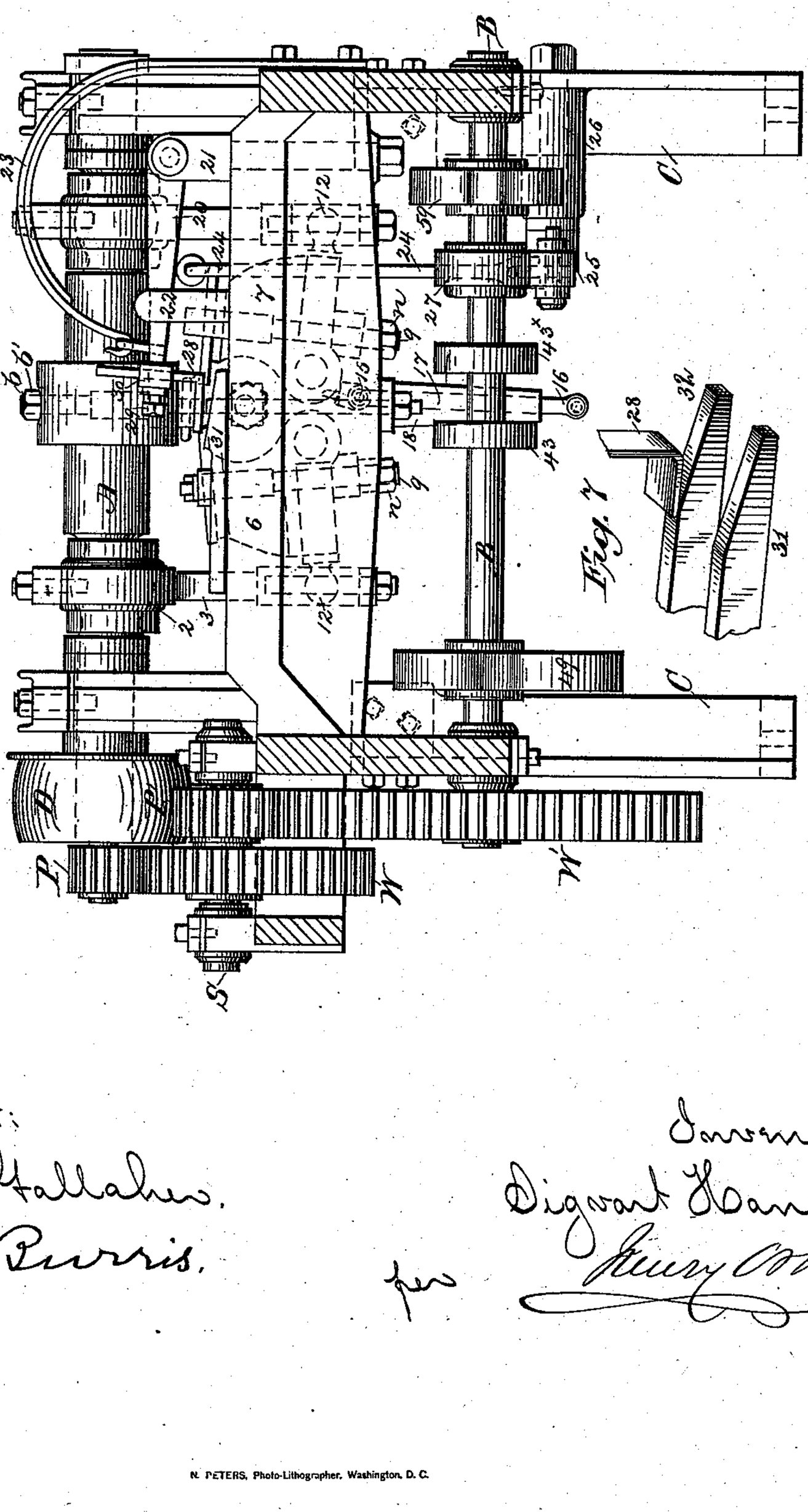

Fig. 7

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Fig. 4

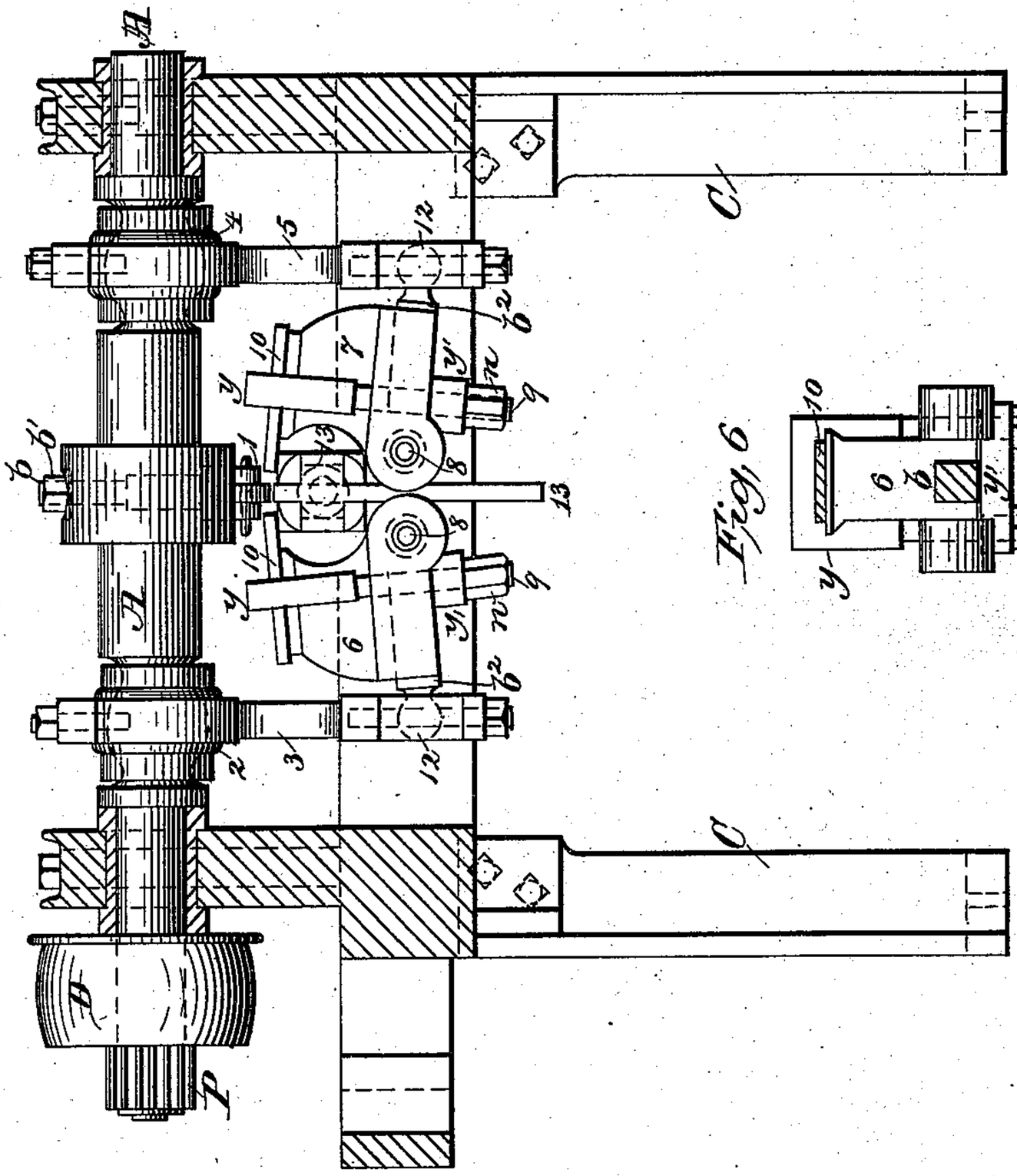

Fig. 6

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Fig. 5

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UNITED STATES PATENT OFFICE.

SIGVART HANSEN, OF BÖHN, CHRISTIANIA, ASSIGNOR TO CHRISTIAN CHRISTOPHERSEN, OF CHRISTIANIA, NORWAY.

HORSESHOE-NAIL MACHINE.

SPECIFICATION forming part of Letters Patent No. 382,646, dated May 8, 1888.

Application filed August 1, 1887. Serial No. 245,905. (No model.)

To all whom it may concern:

Be it known that I, SIGVART HANSEN, a citizen of Norway, residing at Böhn, Christiania, Kingdom of Norway, have invented certain new and useful Improvements in Horseshoe-Nail Machinery; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to letters or figures of reference marked thereon, which form a part of this specification.

Referring to the drawings, Figure 1 is a side elevation of my improved nail-making machine. Fig. 2 is a top plan view thereof, the heating devices being removed. Fig. 3 is a transverse section, looking from left to right, taken about in the plane of the main shaft A, Fig. 1, showing the forging devices, said main shaft being shown in full lines. Fig. 4 is a like section taken about in the plane of the cam-shaft B, Fig. 1. Fig. 5 is a longitudinal section on an irregular line, taken in front of the cam 43 on shaft B, Fig. 1, showing the mechanism for operating one of the carriages for feeding the nail-rod; and Fig. 6 is a sectional view of one of the hammers. Fig. 7 is an isometric detail view of so much of the cutting mechanism as will show the relative arrangement and co-operation of the several elements thereof.

The invention relates to machines for making horseshoe-nails, and has for its object certain improvements in the operating and feeding devices, whereby a better product is obtained.

The invention consists in feeding devices, in combination with forging devices, in structural features of the forging devices and combinations of parts, substantially as hereinafter fully described, and as set forth in the claims.

In the drawings, C indicates the frame from which all of the operating devices are supported; A, the main driving-shaft, that carries a belt-pulley, D, belted to any suitable prime motor, and a pinion, P, that meshes with a wheel, W, of a transmitting-gear, the short shaft, S, on which said wheel is mounted, also carrying a pinion, P′, that meshes with a gear-wheel, W′, keyed on a cam-shaft, B, from which the cutter and the feeding devices are operated.

In the machine under consideration the gearing for driving the cam-shaft B from main shaft A is so constructed that said cam-shaft will make one revolution to every eighteen revolutions of the said main shaft, though this is not absolutely necessary, as the relative speed of the shafts may be varied, if desired. The shaft A carries a forging-roller, 1, that is pivoted in a forked bearing at one end of a bolt, *b*, which bolt passes through said shaft and is secured thereto by a nut, *b′*, as more plainly shown in Fig. 5. The remaining forging devices comprise two hammers, 6 and 7, and an anvil, 13, which latter is arranged immediately below the forging-roller, said anvil being adjustable vertically in an eye or yoke bolt, 14, passing through the frame and locked in position by means of a wedge or a key or keys, *k*, as shown in Fig. 5. On each side of the anvil is arranged a hammer, 6 and 7, said hammers being operated from the main shaft A. The hammers 6 and 7 consist each of a stock and a hammer, 10, adjustably secured to the stock by means of a yoke, *y*, the legs of which pass through the cheeks of the stock and through a cross-bar, *y′*, the lower ends, 9, of said legs being screw-threaded for the reception of nuts *n*, by means of which the yokes are drawn tight to secure the hammers to their respective stocks, as more plainly shown in Figs. 4 and 6 and in dotted lines in Fig. 3.

By means of the described arrangement the hammers 10 may be adjusted toward and from the anvil to forge nails of different thickness.

In the tail of the hammer-stocks 6 and 7 is screwed a bolt, b^2, that has at its end a ball to connect the hammer-stocks 6 and 7 by a ball-and-socket joint, 12, with the eccentric-rods 3 and 5, respectively, the opposite end of said eccentric-rods encompassing the eccentrics 2 and 4, respectively, on main shaft A, as plainly shown in Figs. 3 and 4.

In order to properly guide the nail-rod to the forging devices, I employ a guide, 19, Figs. 1 and 5, which in machines of usual construction has a horizontal vibrating or rocking motion. In such a construction the nail-rod always lies in contact with the anvil, and when side-forged is liable to have rough edges or

fins. To avoid this I impart to the guide a vertical vibrating motion, so timed that when the hammers 10 10 are making their effective stroke the nail-rod will be lifted clear of the anvil and be carried back again to the anvil on the negative movement of the hammers, to be operated on by the forging-roller 1. This movement may be imparted to the guide in any desired manner from a moving element of the machine. I prefer, however, to impart that motion to the guide from one of the hammer-stocks—in this instance from the stock 7, as shown in Fig. 5—the guide being secured to a rod, 17, that slides in a guide-bracket, 18. The lower end of the rod 17 is pivoted to one end of a connecting-rod, 16, whose other end is pivoted on a pin or bolt, 15, screwed in a projection or boss depending from the hammer-stock 7, as shown in dotted lines in Fig. 3 and in full lines in Fig. 5.

As shown in Figs. 2, 3, and 7, the means for cutting the forged nails from the nail-rod consist of a cutter, 28, adjustably secured by means of a set-bolt, 29, in the head 30 of a vibratory stock or lever, 20, pivoted in bearings 21, secured to the main frame.

To prevent lateral motion of the cutter-stock and cutter, I employ a guide, 22, secured to the main frame. The upper end of guide 22 is forked, and within said fork vibrates or rocks the stock 20. A spring, 23, returns the cutter and stock to their normal positions after each downward motion. The effective movement of the cutter is imparted to the stock by the following devices: The stock is connected by a rod, 24, with a lever, 25, that has its fulcrum 26 on the main frame. (See Fig. 1.) The outer or free end of the lever carries a friction-roller that rides on the periphery of a cam, 27, on the cam-shaft B.

The cutter 28 is of rectangular form, and cooperates with two cutter-blocks, 31 and 32, Figs. 2, 3, 5, and 7, the devices operating to produce a shear cut, the cutter 28 passing between the two blocks 31 and 32 to sever the nail from the rod and at the same time sever the extreme fine point from the forged nail. Before the cutter descends to sever the forged nail from the nail-rod the latter is moved to the left such a distance as to bring the nail into proper position under the cutter to be cut from the rod, and after the cutter has done its work the feeding devices are operated to feed the nail-rod again to the forging devices. This is effected automatically at the proper time in and by the following manner and means, referring more particularly to Figs. 1, 2, and 5.

E and F are two independent carriages movable on ways 33 on the main frame C. Each of these carriages is provided with a dog for dogging the nail-rod in position while a nail is being forged, and for feeding the rod forward after a forged nail has been severed therefrom, as hereinafter more fully described. The two carriages and their dogging mechanism are similar in every respect, and their corresponding parts are lettered and numbered alike. A description of one of said carriages will therefore suffice for a full comprehension of the construction of both of them.

34 is a bed-plate, on which is formed a projection or bearing, $34^{\times}$, upon which the nail-rod R rests, as shown in Fig. 1. From the bed-plate project two standards, 35, and from the under side thereof a lug or ear, 36. The standards have bearings formed in them, in which is pivoted a perforated block, p, through the perforation of which passes a slotted bolt, p^2, in whose slot is held a dog, 38. The adjustment of the dog 38 relatively to the nail-rod R is effected by loosening the nut p^3, adjusting the dog vertically in the slot of the bolt p^2, so that its end will firmly bear on the nail-rod, and then screwing up the nut p^3, so as to firmly hold the dog 38 between the end of the slot in the bolt and the vertical face of the block p. One of the journals of the block p projects beyond its standard and carries a lever, 39, that serves to press the dog 38 onto the nail-rod R. As shown in the drawings, the lever for the block of carriage E is on one side of the guideway, and that of the block of carriage F on the opposite side of said guideway. These dogging devices are operated automatically but not simultaneously by the following instrumentalities:

40 and $40^{\times}$ are vertical rods forked at their upper ends, in which fork is pivoted a roller, r, that rides upon the levers 39, which levers pass through the forks of their respective rods 40 and $40^{\times}$—that is to say, the lever on the block of carriage E lies in the fork of the rod 40 below its roller r, and the lever on the block of carriage F lies in the fork of the rod $40^{\times}$ below its roller r. These rods 40 and $40^{\times}$ are respectively connected to levers 43 and $43^{\times}$, fulcrumed on the main frame C, the free end of said levers carrying rollers that ride upon the periphery of cams 43 and $43^{\times}$, respectively, mounted on the cam-shaft B.

On each of the rods 40 and $40^{\times}$ is mounted a coiled spring, 41, whose upper end abuts against a stationary abutment, while the lower end bears against a nut, n, by means of which the tension of said spring may be adjusted, a jam-nut, n', being employed in conjunction with the nut, for obvious purposes.

It will be seen that when the cam-shaft B is rotated, and that when the nose of either cam 43 or $43^{\times}$ passes under the roller of the lever-arm resting thereon, said arm will be oscillated, thereby lifting its rod and imparting to the block p a partial rotation that will lift the dog 38 off the nail-rod R, and that as soon as the nose of the cam has passed from under the roller the parts will return to their normal positions under the stress of the spring on the connecting-rods.

The power exerted by the dogs 38 to hold the nail-rod on the bearings $34^{\times}$ depends of course on the power of the spring 41, and this should be sufficiently strong to hold the said nail-rod firmly to its bearings.

The mechanism for imparting motion to the

carriages is operated by two cams, 49 and 59, on the cam-shaft B, and the following intermediate mechanism, and as the said intermediate mechanism for the two carriages differs slightly, I will first describe that of carriage E.

To the depending ear 36 of carriage E is pivoted one end of a connecting-rod, 45, whose other end is pivotally connected with a yoke or stirrup. The arms or legs of this yoke are pivotally connected with radial arms or levers, secured to a rock-shaft, 47, that has its bearings in the frame C. The said shaft also has a radial arm, 48, that carries at its end a friction-roller which rides upon the periphery of a cam, 49, on cam-shaft B, said cam being so constructed as to impart to the carriage E the proper movements in one direction, the movements in a reverse direction being imparted to the carriage by a strong spring, 50, Fig. 5, the upper end of which is secured in suitable bearings on the frame C, while the lower end of said spring is connected with one end of a connecting-rod, 51, whose opposite end is connected with a radial arm, 52, on the rock-shaft 47, as shown in Fig. 5. It will be seen that the carriage E is held in its normal position by the stress of the spring 50, operating on rock-shaft 47, and that said spring maintains the contact between the cam 49 and the radial arm 48 on said rock-shaft 47.

The carriage F is operated as follows: it is connected by means of a connecting-rod, 53, pivoted to the depending ear 36 of said carriage, to a radial arm, 54, secured to a rock-shaft, 55, Figs. 1, 2, and 5. Said rock-shaft 55 carries another radial arm, 62, connected by a rod, 61, to the lower end of a strong spring, 60, which, like spring 50, has its upper end secured in a clamp or holder on the main frame. (See Fig. 2.) The shaft 55 carries a third radial arm, 56, in which are formed a series of pivot-holes, 66. Said radial arm is connected by means of a link, 57, with a lug or ear, 63, depending from the housing or carriage 65 of a nut arranged in a longitudinal slot formed in the long arm of a lever, 58, that is fulcrumed at 79 on a bracket-bearing, 69, Fig. 1. Through the nut passes a screw, 65, that has its bearings in the long arm of lever 58, and by means of which the throw of the lever is adjusted, as will be readily understood. This adjustment may be amplified or restricted by adjusting the link 57 nearer to or farther from the end of the radial arm 56 by means of the pin-holes 66. The shorter arm of lever 58 carries a friction-roller that rides upon the periphery of a cam, 59, on cam-shaft B. The carriage or housing for the nut consists of a rectangular open frame in which the nut is seated, one side of which frame is detachable, and is bolted to the cross-bars of said frame. The nut may be pivoted in the frame or may be rigidly connected therewith by bolts, or any other suitable construction may be resorted to to connect the radial arm 56 with the screw.

In order to maintain the nail-rod at a proper temperature, I interpose between the feeding and forging devices a heater, which consists of a hood, G, provided with a chimney, *g*, and below said hood is arranged a jet-pipe, *g'*, whose jets lie in the plane of and below the nail-rod, a gaseous or liquid fuel being employed. By arranging the heater between the cutter and feed the end of the nail-rod is kept at a proper temperature, as said end is, after the nail has been forged, withdrawn into the heater and subjected to the action of the jets.

The operation of the machine may be briefly described as follows: A nail-rod, R, properly heated, is dogged to the carriage E, with the end of said rod in proper position on the anvil 13, the cam 43× now holding the block *p* of carriage F in a position in which the dog 38 is held out of engagement with the nail-rod. It has been stated above that the main shaft A makes eighteen revolutions to each revolution of the cam-shaft B, and that at each revolution of said main shaft A the forging-roller and the hammers are brought into operation once, the mechanism for effecting this being so timed that as the forging-roller ceases to operate the guide 19 lifts the end of the nail-rod clear of the anvil, and the two hammers 10 then strike the rod from opposite sides, the hammers immediately receding into their normal position. Before the forging-roller again delivers a blow the guide 19 descends and carries the end of the nail-rod back onto the anvil. These operations are repeated nine times to complete the forging of a nail, during which time the cam-shaft B will have made one-half a revolution to bring the cams into proper position for actuating the cutting and feeding devices. During the next half revolution of the cam-shaft B and the next nine revolutions of the main or roller shaft A the following operations take place, the forging devices working idle during these operations: The nail-rod R is first moved from right to left to bring the forged nail across the cutter-blocks, the nail is severed, and the rod fed forward again to the forging mechanism. On the completion of ninth revolution of shaft A and half revolution of shaft B the cam 49 will be in a position to cause the roller end of the radial arm 48 to ride upon the larger diameter of the said cam, thereby rocking shaft 47 from right to left, and through the medium of the radial arm 46 on said shaft 47, and the connecting rod 45, connected to said arm and to lug 36 of carriage E, moving said carriage toward the left a sufficient distance to bring the forged nail across the cutter-blocks 31 and 32 in proper position for cutting the nail off the rod R. The cam 27 will now be in a position to depress the lever 25, and through the latter the cutter 28, against the stress of the cutter-spring 23. The cutter 28 descends and passes between the blocks 31 and 32 and severs the forged nail. As soon as the nail is severed the cam 43 will be in a position to cause the roller-arm of lever 42 to ride upon the nose of said cam, thereby lifting the rod

40 against the stress of its spring 41 and tilting the block *p* of carriage E through the lever 39 to disengage the dog 38 from the nail-rod R. The cam 43× will now be in a position to cause the lever 40× to drop off the greater onto the smaller diameter of said cam, thereby allowing the spring 41 to draw the rod 40× down to tilt the block *p* of carriage F and bring its dog 38 into engagement with the nail-rod. Of course the cam 43× may be set relatively to the cam 49, so that the dog 38 of carriage F will be brought into engagement with the nail-rod as soon as carriage E has been moved to carry the forged nail to the cutters, the rod being then held by both dogs during the operation of severing the nail. As soon as the rod is held by the dog of carriage F the cam 59 will be in a position to allow the roller-arm of lever 58 to ride upon the nose or larger diameter of said cam, thereby rocking shaft 55 against the stress of its spring 60 from left to right through the medium of the link 57 and arm 56 connecting said shaft with lever 58, and thereby causing the carriage E to move a nail's length from left to right through the medium of the radial arm or lever 54 and the connecting-rod 53, that connects said arm to the lug 36 of carriage F. The arm of lever 40× now again rides on the larger diameter of cam 43×, thereby lifting the rod 40× against the stress of its spring 41 to disengage the dog 38 of carriage F from the nail-rod. Immediately after this has taken place the roller-arm of lever 58 drops off the nose of cam 59, allowing the spring 60 to return carriage F into its normal position by rocking shaft 55 from right to left. Simultaneously therewith the roller-arm of lever 42 will also drop off the larger onto the smaller diameter of cam 43, again engaging the dog 38 of carriage E with the nail-rod R, through the medium of the spring 41 on its rod 40. The cam 49 will now be in a position to allow the roller-arm of lever 48 to drop from the larger onto the smaller diameter of said cam, thereby allowing carriage E to move back into its normal position and carry the end of the nail-rod onto the forging-anvil. In this movement the carriage E is, as will be readily understood, propelled by the spring 50, acting through the medium of the rod 57 on the radial arm 52, to tilt the rock-shaft 47 from left to right.

It will be observed that the carriage E feeds the nail-rod a proper distance in reverse directions—first from right to left to bring the forged nail to the cutters, and then from left to right to bring the end of the nail-rod back again to the anvil. This of course could not be effected without feeding the nail-rod a proper distance independently of the feed-motion of carriage E, and carriage F performs that function, as it feeds the nail-rod a sufficient distance to carry the end thereof into the position of the nail previously severed therefrom, carriage E finally feeding said rod so as to bring said end into proper position on the anvil for forging the next nail. When the latter has taken place, the shaft B will have completed its revolution and the shaft A will have completed its eighteenth revolution, the forging-roller being again about to operate on the nail-rod. It will also be observed that as long as the forging devices operate on the nail end of the rod the next or adjacent nail-length or several nail-lengths of the rod are kept hot by the heating devices, and this is also the case while the nail is being severed from the rod, so that when the rod is again brought to the anvil it will be of the proper temperature for forging. The interposition of the cutter between the feed and forging devices is therefore apparent, as it is obvious that were the cutter arranged differently the rod would become cooled during the operation of cutting and feeding.

Having now described my invention, what I claim is—

1. In a machine for making horseshoe-nails, the combination, with the forging devices, the nail-rod-feeding devices, and the cutter interposed between said devices, of a dog operating to dog the nail-rod in position for forging, said dog having a reciprocating motion timed to withdraw the nail-rod from the forging devices and carry the same to the cutter to sever the forged nail therefrom, substantially as and for the purposes specified.

2. In a machine for making horseshoe-nails, the combination, with the forging devices and the cutter, of a nail-rod-feeding device comprising a dog operating to dog the rod in position, said dog having a rectilinear motion toward and from the forging devices to feed the nail-rod thereto, and a releasing mechanism to disengage the dog from the nail-rod and allow it to return to its normal position, substantially as described.

3. In a machine for making horseshoe-nails, the combination, with the forging devices and a feeding device operating to feed the nail-rod to the forging devices, of a cutter interposed between the forging and feeding devices, and a dog operating to hold the nail-rod while a nail is being forged, said dog having a rectilinear motion toward and from the cutter and forging devices and operating to withdraw the nail-rod from the forging devices and carry the nail thereof to the cutter, substantially as and for the purpose specified.

4. In a machine for making horseshoe-nails, the combination, with the forging devices and the nail-rod, feeding devices, and a cutter interposed between said devices, of a dog operating to hold the nail-rod in position while a nail is being forged, said dog having a rectilinear motion toward and from the cutter, and forging devices timed relatively to said devices to carry the nail end of the rod from the forging devices to the cutter, and a releasing mechanism operating to release the dog from the nail-rod when the nail is severed therefrom and permit the feeding devices to feed said rod to the forging devices, substantially as and for the purpose specified.

5. In a machine for making horseshoe-nails, a hammer comprising a stock and a hammer adjustable thereon, substantially as and for the purpose specified.

6. In a machine for making horseshoe-nails, forging devices for forging a nail, comprising a vertically-adjustable anvil, a forging-roller revoluble above the anvil, and two hammers on opposite sides of said anvil, said hammers being adjustable toward and from such anvil, substantially as and for the purpose specified.

In testimony whereof I affix my signature in presence of two witnesses.

SIGVART HANSEN.

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