

W. C. Grimes,

Making Wrought Nails

N^o 39,287.

Patented July 21, 1863.

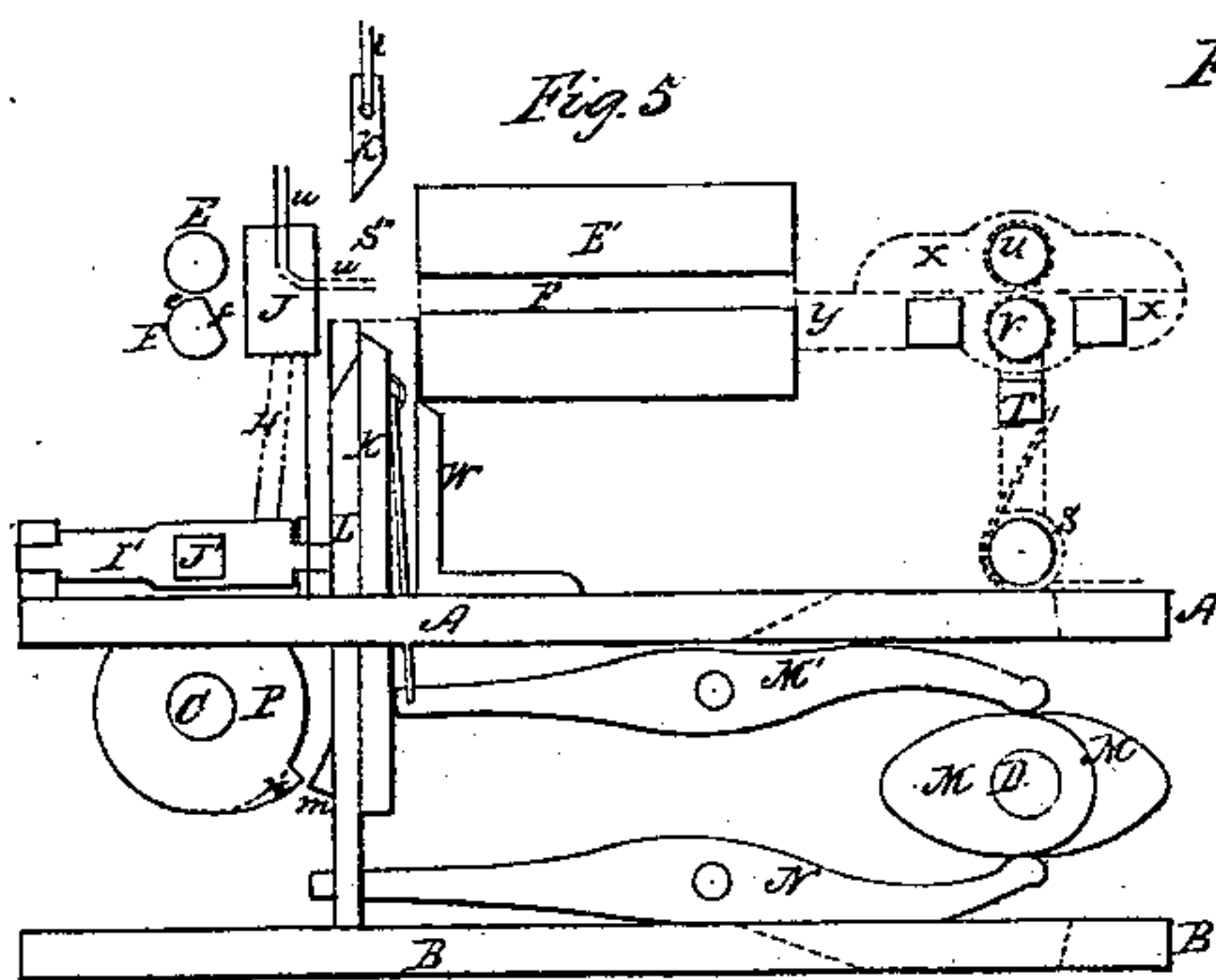
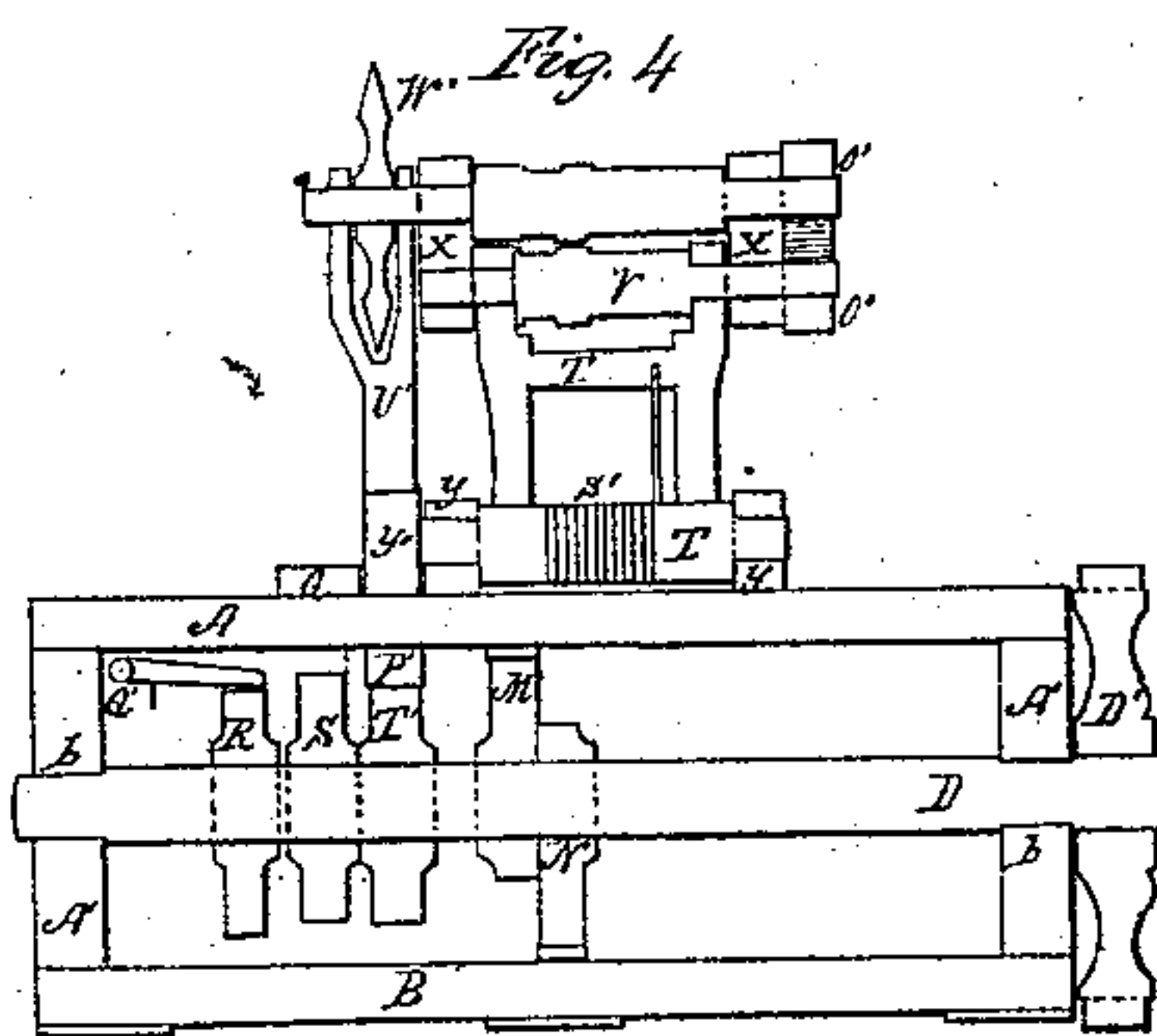
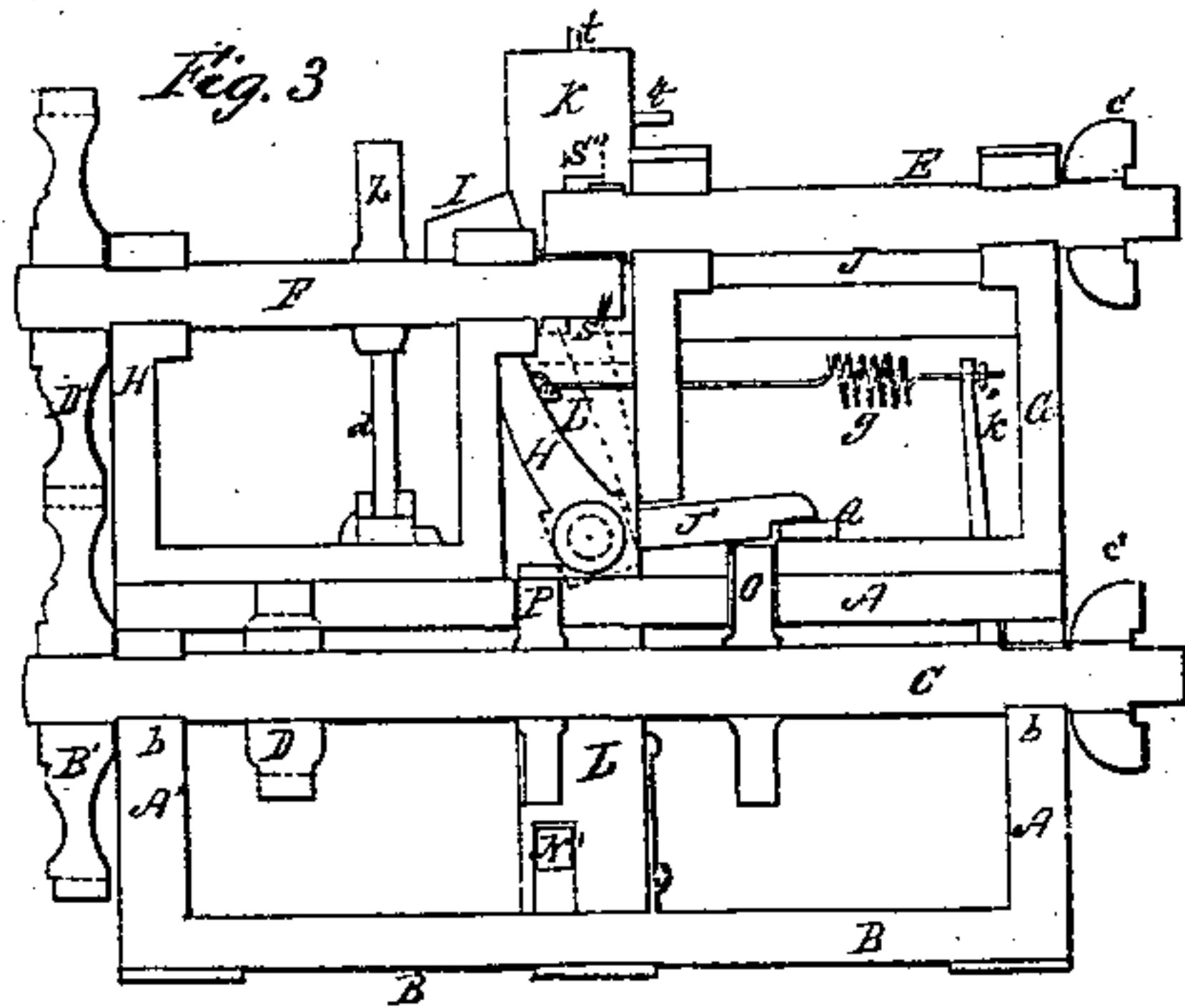
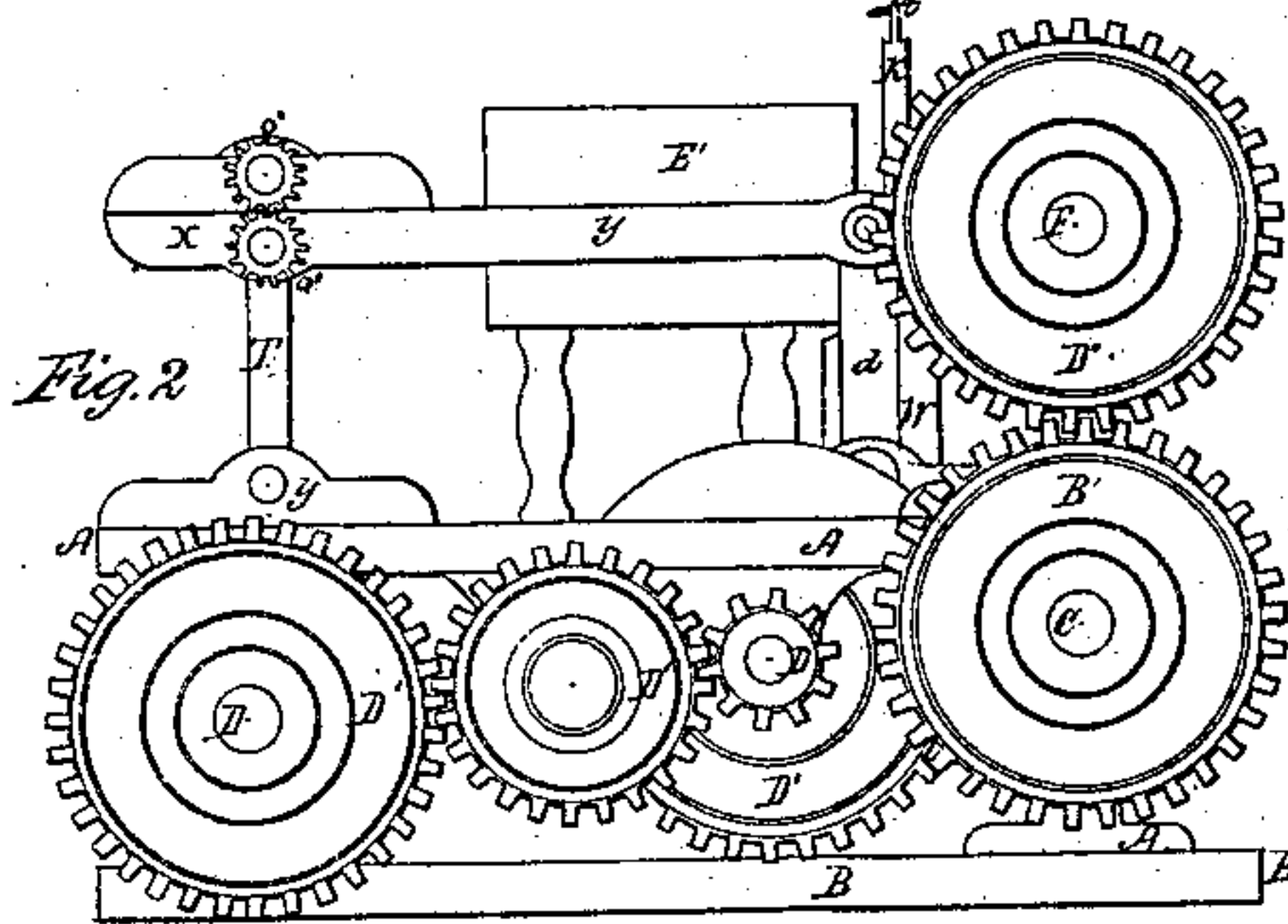
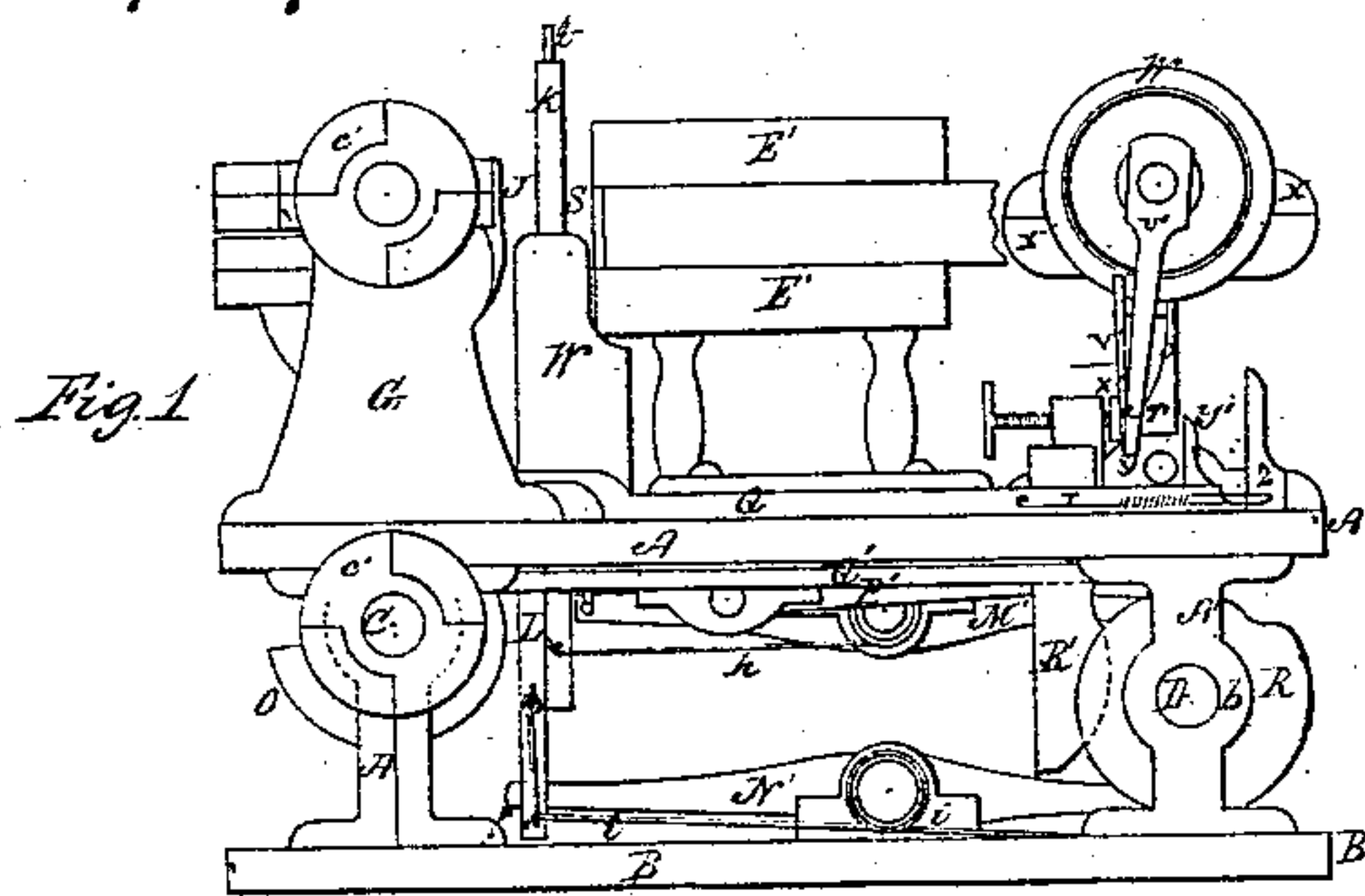


Fig. 8

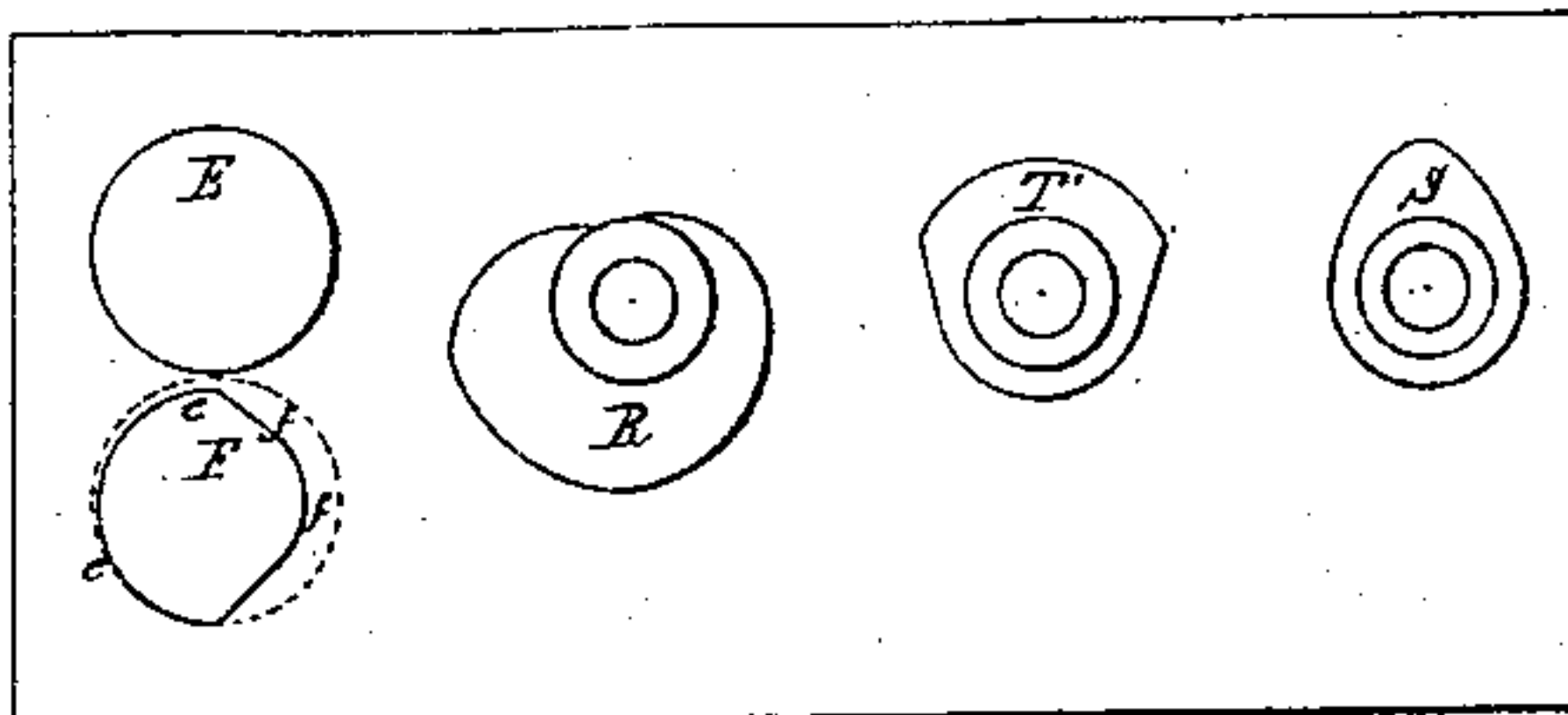
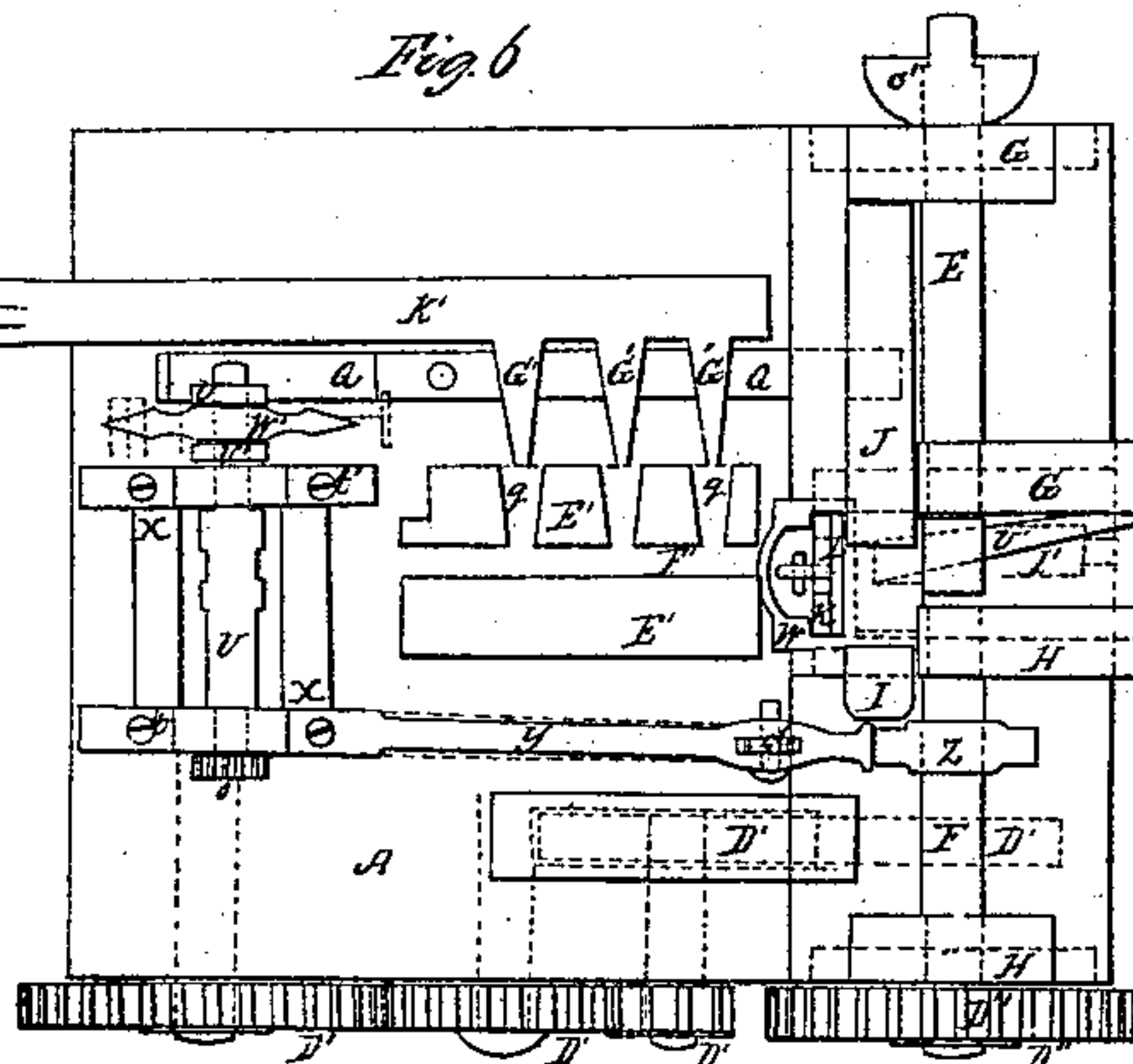
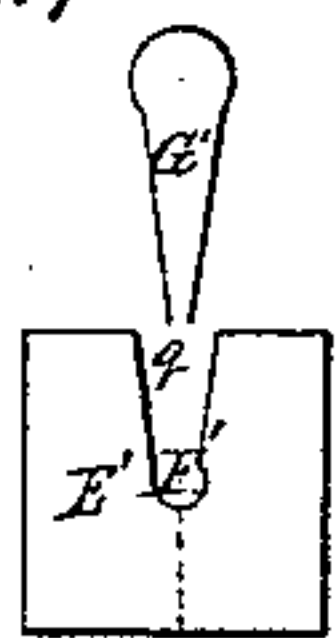


Fig. 7



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WILLIAM C. GRIMES, OF PHILADELPHIA, PENNSYLVANIA.

IMPROVEMENT IN MACHINES FOR MAKING NAILS FOR HORSE-SHOES.

Specification forming part of Letters Patent No. 39,287, dated July 21, 1863.

To all whom it may concern:

Be it known that I, WILLIAM C. GRIMES, of the city of Philadelphia and State of Pennsylvania, have invented a new and Improved Machine for Making Wrought Nails or other Metallic Articles; and I do hereby declare that the following is a full and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon.

The nature of my invention consists in forging or forming nails or other metallic articles by means of the compound and combined action of a pair of rolls, an anvil, and a die or hammer, operating alternately upon the material which may be used to form the article. The action of the rolls is to elongate that part of the rod or material upon which they operate, and to give the proper or desired form and thickness to the article. The action of the hammer is to reduce the lateral or transverse spreading of the material under the action of the rolls, and to give the proper or desired form and width to the article. The alternate action of the rolls and hammer upon the material, is repeated more or less frequently, as the nature of the article may require. The rod, which is being constantly heated as it is fed to the rolls, has at the same time a longitudinal reciprocating movement, corresponding in time and speed with that of the periphery of the rolls. When the article is formed, it is severed by proper mechanism from the rod, and the latter is again fed in or advanced automatically to the rolls to form another article.

Referring to the drawings, like letters refer to like parts in all the figures.

Figures 1 and 2 are longitudinal elevations of opposite sides of the machine. Fig. 3 is a vertical transverse section of the machine, passing longitudinally through the rolls and the forward cam-shaft, with the outlines of the adjacent parts in the rear. Fig. 4 is a vertical transverse section of the machine, passing longitudinally through the feeding-rolls and the rear cam-shaft. Fig. 5 is a vertical longitudinal section through the center of the machine, with the outlines of the adjacent parts. Fig. 6 is plan or top view of the machine, but showing the shear-bars and their guides or guide-box in section, and the oven and jet or blast tubes also in section. Fig. 7 is a trans-

verse section of the oven and one of the jet-tubes; Fig. 8 shows the form of cams R, S, and T, and a transverse section of the operative rolls, on a scale enlarged.

In the construction of this machine, two metallic plates, A and B, are placed one above the other, with a sufficient space between them for the cams, levers, &c., to operate in. These plates are bolted to the flanged posts A' A', in which are formed the bearings *b b* for the journals of the front and rear cam-shafts, C and D. Upon the upper plate, A, the operative rolls E and F are mounted in the journal-bearings G and H. The rolls and the cam-shafts C and D project outwardly beyond their bearings, and upon one end of shaft C and roll E are affixed the coupling C' C', whereby the said shaft and rolls are connected with other shafting, through which motion and power are communicated to the machine. Upon one end of the cam-shaft C and the outer end of the roll F are affixed the toothed wheels B'' and D'' by which the former propels the latter, and they turn in equal time. The inner ends of the rolls E and F also project beyond their bearings. The one, E, overlies the other, and between these projecting ends (which are the rolls proper) the rolling of the article is performed. The upper roll, E, is cylindrical, while the lower roll, F, is of the form shown in section, in Fig. 8, where a part of the periphery at *e e* is sufficiently varied from a concentric circle to give to the article the proper form or varied thickness. Another and contiguous part, *f f*, in the circumference of the roll F, is cut away sufficiently to allow the rod in its forward motion to pass freely between them, (the rolls,) so as to be acted upon only in its receding movement. In the rear of the rolls, as near to them as may be practicable, and in the same horizontal plane, are placed the hammer I and the anvil J, while the plane dividing their faces is perpendicular to the axes of the rolls. These faces are designed to form the sides or edges of the article, and are the counterpart in form of those sides or edges. The anvil is stationary. The hammer is on the helve or lever H', one end of which is attached to shaft I', and said shaft oscillates in proper bearings. An arm or lever, J', attached to shaft I', stands out horizontally from it and rests upon the cam O, the periphery of which is a volute, with

an abrupt offset at its terminus. The rotation of said cam raises the lever J' and throws the hammer back from the anvil, and when the said offset passes the lever it falls and the spring g forces the hammer to the anvil with a blow. The spring g is connected to the helve H' below the hammer, and forms a part of a link-connection between the helve of the hammer and the arm or lever k . The levers k and l are united to the rocking shaft Q' . They stand at right angles to the shaft and to each other, the one vertical, the other horizontal, the latter, l , resting upon the cam R , the periphery of which is so formed that its action upon the lever, l , shall vary the force of the different strokes of the hammer in the formation of each article, as the nature of the work may require. As near the hammer and anvil as is necessary, stand the shear-bars K and L , which move longitudinally in the upright guide-box W , and operate in a vertical direction. The upper end of the one, L , is its cutting-edge, while the upper end of the slot S'' in the shear-bar K , through which the rod passes, is the cutting-edge of the other. The shears are operated by the cam P on the front, and cams M and N on the rear, cam-shaft, the former acting directly, the latter indirectly, through the levers M' and N' . These last act at each rotation of the cams that operate them, while the cam P acts only at every seventh (more or less) revolution, or only when the cams M and N have brought the edges of the shears near the rod, which brings the lug m on the back of the shear-bar L into the path of the tooth n on cam P , which, from its rapid motion, suddenly raises and drops the shear L , and severs the nail from the rod, and at the instant that a blow would otherwise be given by the hammer, if it were not for the automatic means provided to prevent it, which consists of the following parts or device: A rod or bar, Q , resting upon the plate A , is provided with proper guides, and has attached to it, at a right angle, the arm R' , which passes down through a slot in the plate A , in front of the rear cam-shaft, where, at each revolution of said shaft, it is briefly acted upon by the cam S , which moves the bar Q forward and in the direction of its length, and passes the end of it under the outer end of the lever J' at the time when the said lever is raised to its height and the hammer thrown back, retaining it in that position during a partial revolution of the cam O , the shears now acting in the periodic time of the hammer, and then falling back to their former position. The bar Q receding by the action of spring r , as the cam S revolves, allows the hammer to act again as before.

To avoid the injurious effect of heat from the rod and the gaseous flame upon the cutting-edges of the shear-bars, these edges are kept widely separated by the springs h and i , till near the moment they are required to act. As a further guard against the injurious effect of the heat upon the shears, the anvil, or

other parts of the machine, I drill a hole into or through the metal near the part most exposed to the heat, and screw in small metallic tubes, as $t t$ in the shear and $u u$ in the anvil. These tubes are connected with a fountain, from which a constant flow of water is made to pass through them. Where a part of any tube must be flexible, to yield to the movement of the part with which it is connected, such part may be made of india-rubber, gutta-percha, or other flexible material.

All the operations of the machine in the formation of a nail or other article are performed during one revolution of the rear cam-shaft, which is one in seven (more or less) of the forward cam-shaft, C , they being connected by the cog-gearing $D' D' D' D' D'$.

At the rear end of the machine are placed the feeding-rolls $U V$. They are mounted in a horizontal rectangular frame, XX , which rests upon and is jointed to the upright frame TT , which is also jointed below, being provided with proper bearings, $y y$. Thus an oscillating or reciprocating movement may be given to the feeding-roll frame $X X$ transversely to the axes of the rolls, but in the longitudinal direction of the machine.

Connected with or forming a part of the frame $X X$ is the arm or bar Y , which is supported near the ends by the jointed stud d , and extends to the cam Z on the shaft F , against which cam it is constantly borne by the spring S' , the cam having the requisite form to give the proper motion to the feeding-roll frame. The feeding-rolls are geared together by the toothed wheels $o' o'$, and the set-screws $t' t'$, which pass through the caps of the journals of the upper roll, serve to tighten the rolls upon the rod or material which is to be fed to the machine.

The motion of the feeding-rolls is intermitting, which motion is effected by clutch-gearing, as follows: One journal of the upper feeding-roll, which extends beyond its bearing for the purpose, has affixed upon it the clutch-wheel W' . The clutch consists of two levers, one of which, U' , is forked, and these forks, with proper bearings formed in them, embrace the neck or journal of the roll on each side of the clutch-wheel. The other clutch-lever, V' , is jointed to or rests against a rib or lug, a , formed upon the lever U' , near its end, while the other or upper end is a V-shaped fork, which fits upon the beveled edge of the clutch-wheel. The lever V' forms a slight angle with lever U' , and is so adjusted in its length as to impinge or wedge tightly upon the beveled edge of the clutch-wheel, when forced there by spring j , or otherwise; and when the levers are swung upon their axis of suspension and in the direction from U' to V' , as indicated by the arrow, the resistance of the wheel to the motion causes the lever V' to set more firmly upon and to turn it; but when the levers swing in the opposite direction the friction of lever V' upon the wheel tends to carry said lever from lever U' ,

and thereby loosens the hold of lever V' and allows it to slip upon the wheel; hence the oscillation of the levers turns the wheel intermittently and in one direction only. As the clutch-wheel W' and the levers U' and V' are appendages to the feeding rolls, they partake of the reciprocating motion of the latter; hence, to intercept the motion of the lower end of said levers will cause them to oscillate upon their axis of suspension, and thus to give an intermittent turn or motion to the feeding-rolls, which motion should be suspended during the latter part of the time of forming each article, which suspension is effected as follows: Three stops, X' , Y' , and Z' , lie in the path of the motion of the lower end of the levers. Stop X' is the head of an adjustable set-screw, which is provided with a wheel or winch at the other end, and works in the upper end of a stud or post fixed in plate A . Stop Z' is a fixed stud or post, which serves to prevent the levers from being turned out of their position. The space between stops X' and Z' is such that the levers are not acted upon by them in their back-and-forth movement. Stop Y' is the short arm of a bent lever, P' , which is hinged at the other end to the under side of plate A , with the arm or stop passing up through a proper opening in said plate. The bent lever at or near the bend rests upon the cam T' , and rises and falls in accordance with the form of said cam. When in its lower position, the upper end of the arm or stop Y' is below the end of the levers U' and V' , which in their reciprocating motion pass freely over said stop; but when the latter is raised the lower end of the levers are intercepted in their movement in part, their motion then being limited to the space between stops X' and Y' , which motion may be made more or less by the adjustable stop X' , which regulates the quantity of material to make the article.

The furnace or heating-oven consists of an elongated rectangular block, E' , of baked fire-clay, with a cylindrical or other formed aperture, F' , running longitudinally through it, into which open the series of lateral, conical, or other formed apertures $q q q q$. The axis of the longitudinal aperture in the block is a line passing between the upper and the lower feeding and the upper and lower operative rolls, and parallel to and near the face of the anvil. The block E' in length nearly fills the space between the shears and the feeding-rolls, and it may rest in a metallic box supported upon short columns rising from the plate A , or it may be supported in any other convenient manner. A series of conical metallic tubes, $G' G' G' G'$, coinciding in number and relative position with the aforesaid lateral apertures in the clay furnace, are placed with their axes in a line severally with the axis of each of said apertures, and near the orifices of the latter the points of the tubes terminate. From these tubes jets of inflammable gases (common illuminating or street gas or other gases) are dis-

charged into said apertures, where they are inflamed, and pass into the central aperture or heating-oven. The aforesaid conical tubes are branches from the supply-tube K' , connected with a gasometer. Into and concentric with said supply-tube, and in the direction of its length, is discharged a jet of atmospheric air through the tube L' with less or more force, as may be necessary to give the required force to the several jets at their points of discharge, and to supply nearly the required quantity of air for the combustion of the gas, the balance of air required for that purpose being supplied from the atmosphere at the orifices of the aforesaid apertures, the air being supplied by a fan or blowing-cylinder.

Operation of the machine: The rod being passed into the furnace, and the feeding-rolls drawn tight upon it, the machine set in motion, the gas let on and ignited, the rod becomes heated as it is moved forward by the feeding-rolls, and when it reaches the operative rolls it passes between them at the time when the space $f f$ in the lower roll is in the position to allow it to pass. The motion of the rod is then reversed, and at that moment the contiguous surfaces of the rolls approximate and impinge upon the rod near its end, reducing it in thickness, and slightly elongating that part of it. The rod then recedes from between the rolls, and stops with the rolled part opposite the face of the anvil, where it instantly receives a stroke or blow from the hammer upon one edge, thus reducing its width and imparting form. The motion changes, and again the rod passes between the rolls. The alternate operation of the hammer and rolls is thus repeated six or eight times, (more or less,) according as the machine may be geared, to suit the nature of the work, to reduce the material, and properly form the article. The rod is now at the terminus of its receding movement. It stops there for an instant. The hammer is thrown back by the cam O , and locked there by the bar Q . The edges of the shears have been drawn near the rod, and the cam P now suddenly raises the shear-bar L , which severs the nail from the rod, and it falls into the spout u' , and passes into a proper receptacle.

What I claim as new and as my invention, and desire to secure by Letters Patent, is—

1. The forging or forming of nails or other metallic articles by the compound and combined action of a pair of rolls and a swage or hammer and an anvil, or their equivalents, operating alternately upon the material to form the nail or other article, as hereinbefore described.

2. In combination, a pair of rolls having a contour suited to give the required form to the opposite sides of the article, with a hammer and an anvil, the faces of which are the counterpart of the required form of the other opposite sides or edges of the nail or other article, as before specified.

3. The mode of effecting the periodic sus-

pension of the action of the hammer by means of the lever j' , the bar Q, arm R', cam S, and spring r , or their equivalents, constructed substantially as herein described, and operating as and for the purpose set forth.

4. The feeding-rolls U V, having a rotary and a reciprocating movement, in combination with the operative rolls E and F, as hereinbefore described, and for the purpose set forth.

5. The clutch, substantially as described, in combination with the adjustable stop X',

bent lever P', and cam T', or their equivalents, as described, and for the purpose set forth.

6. The shear-bars K and L, or their equivalents, when operated by cams, as M, N, and P, on separate shafts that revolve with unequal speed, as hereinbefore described, and for the purpose set forth.

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Witnesses:

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