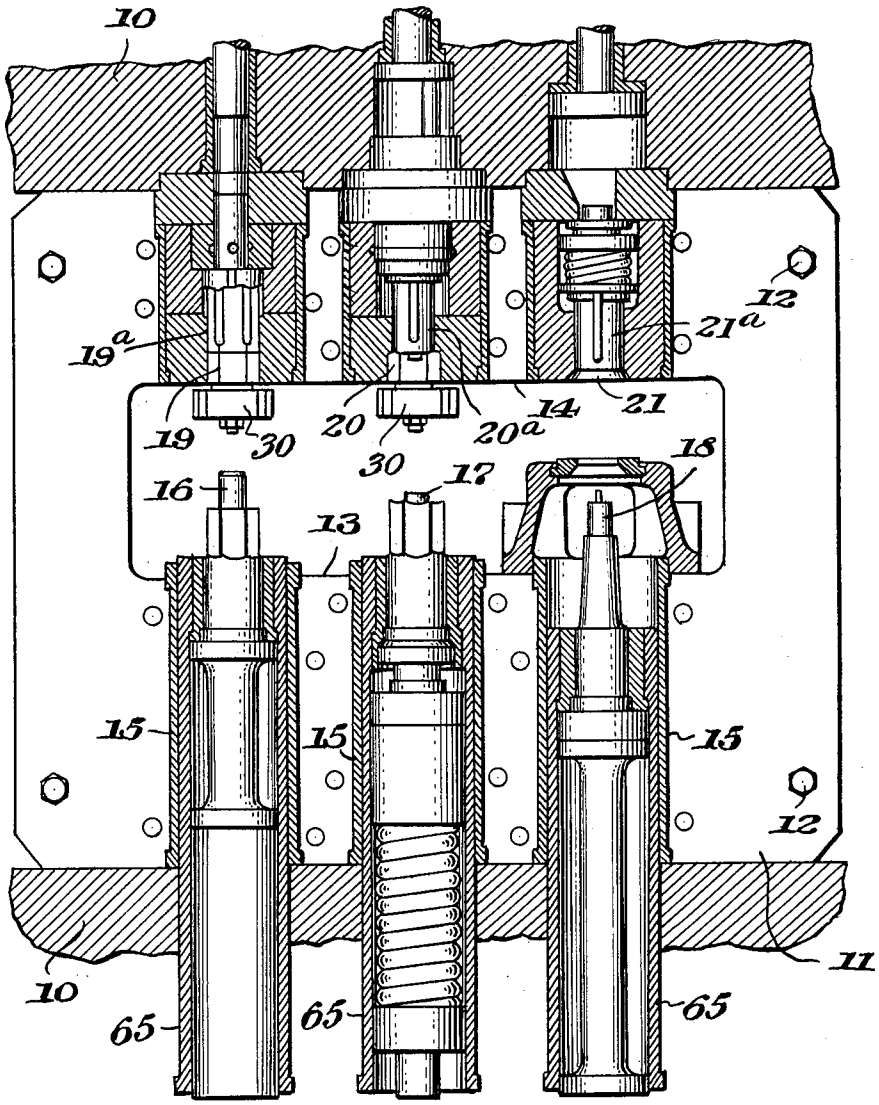
March 6, 1956 F. B. HATEBUR 2,736,909

TRANSFER MECHANISM FOR NUT FORGING MACHINE

Filed April 28, 1955 8 Sheets-Sheet 1

Fig. 1.



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TRANSFER MECHANISM FOR NUT FORGING MACHINE

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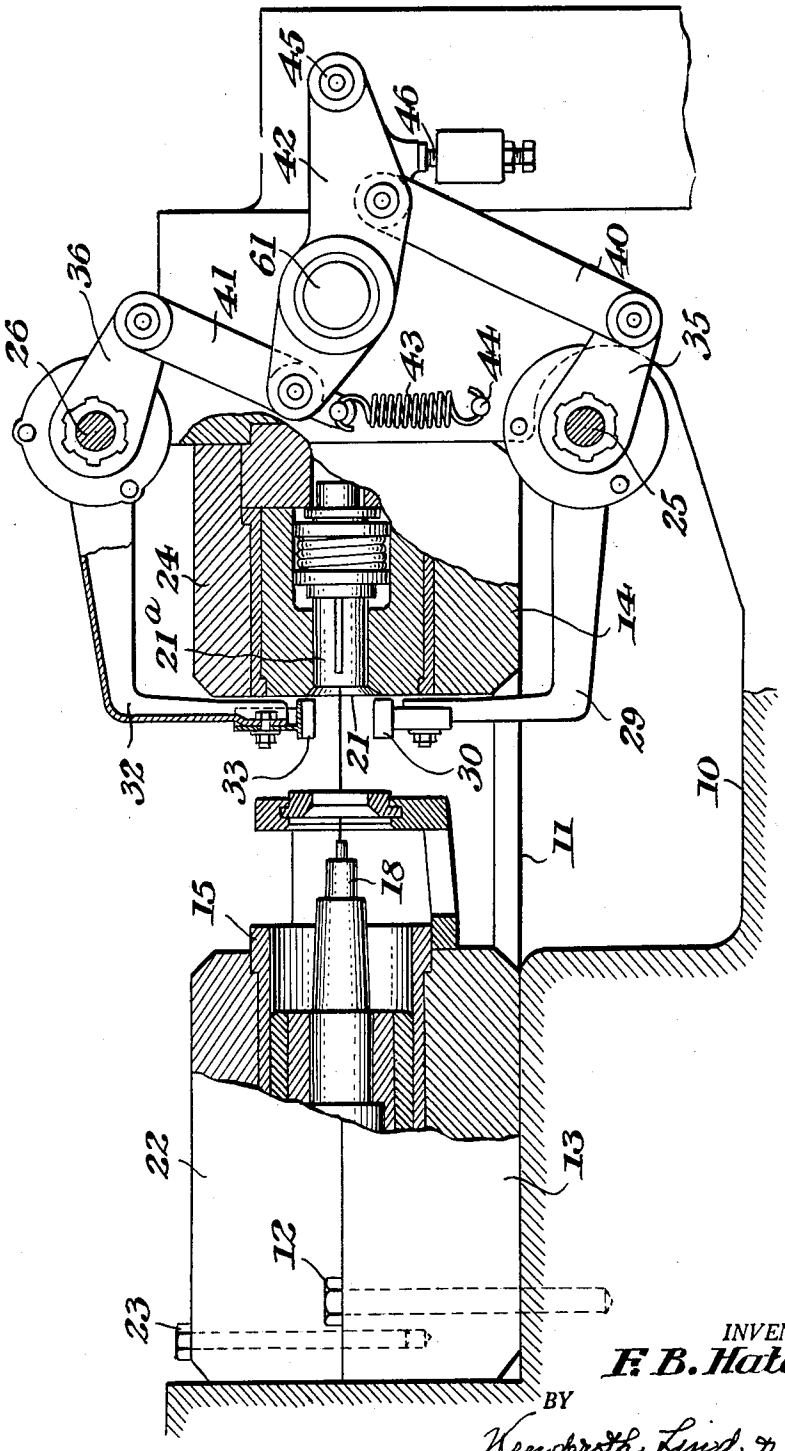


Fig. 2.

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TRANSFER MECHANISM FOR NUT FORGING MACHINE

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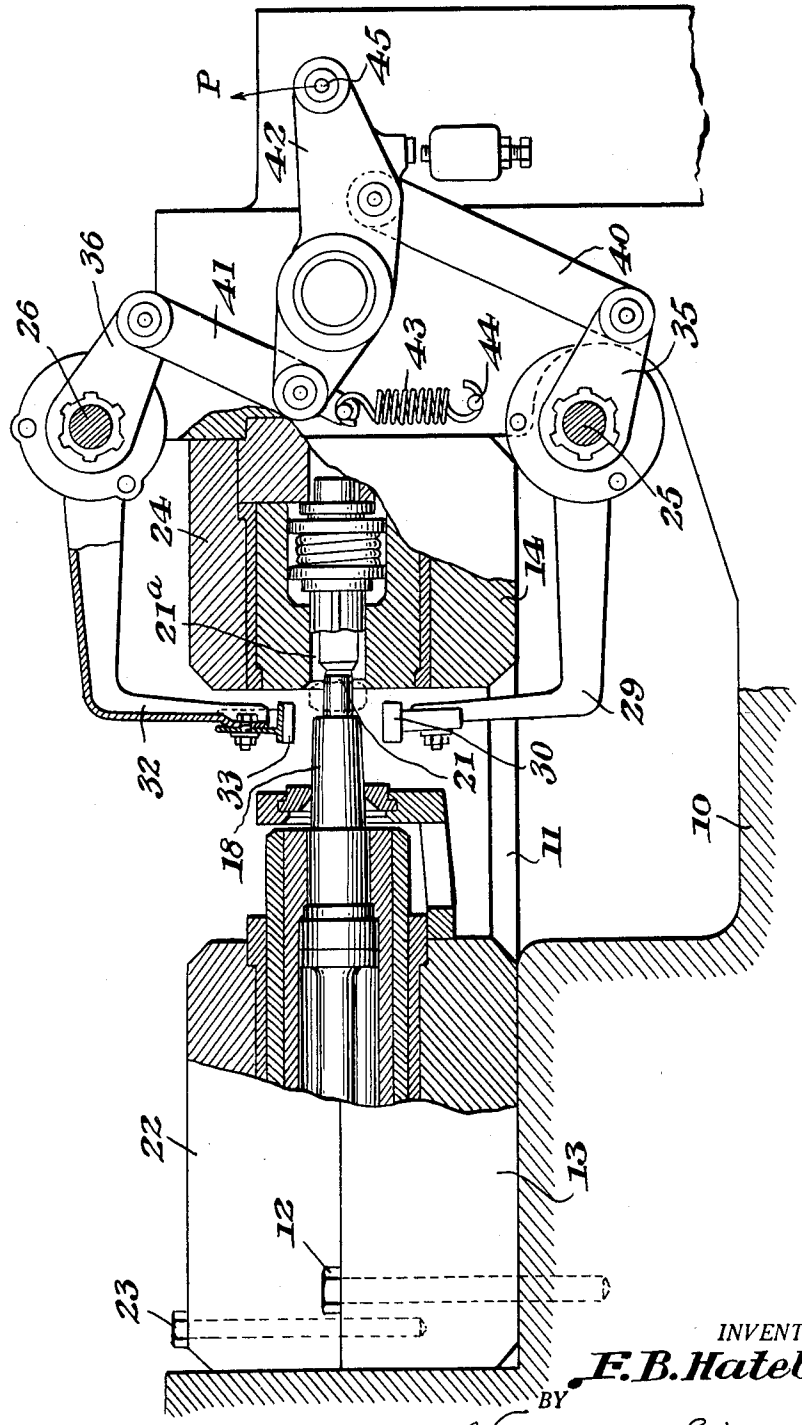


Fig. 3.

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TRANSFER MECHANISM FOR NUT FORGING MACHINE

Filed April 28, 1955 8 Sheets-Sheet 4

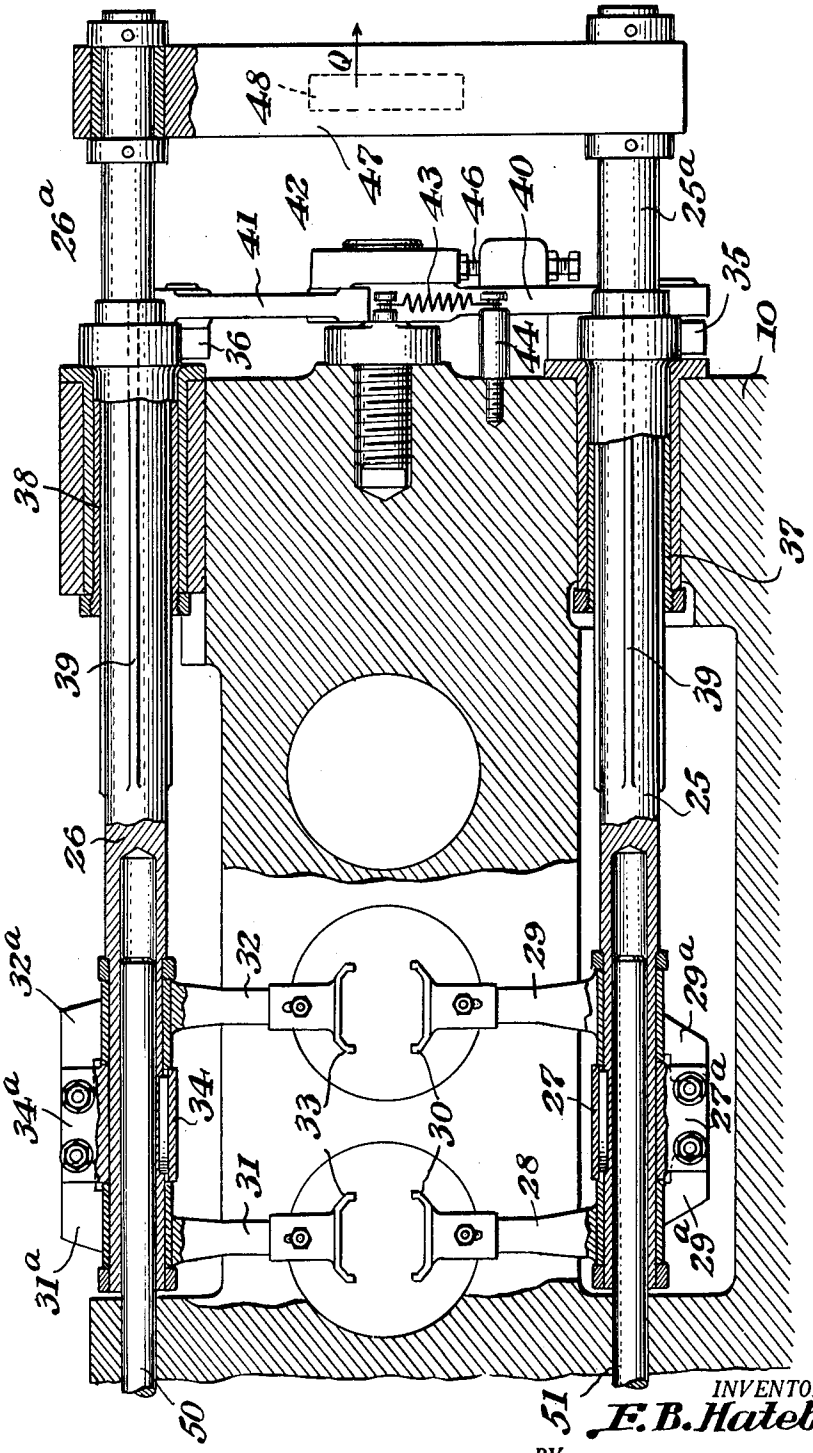


Fig. 4.

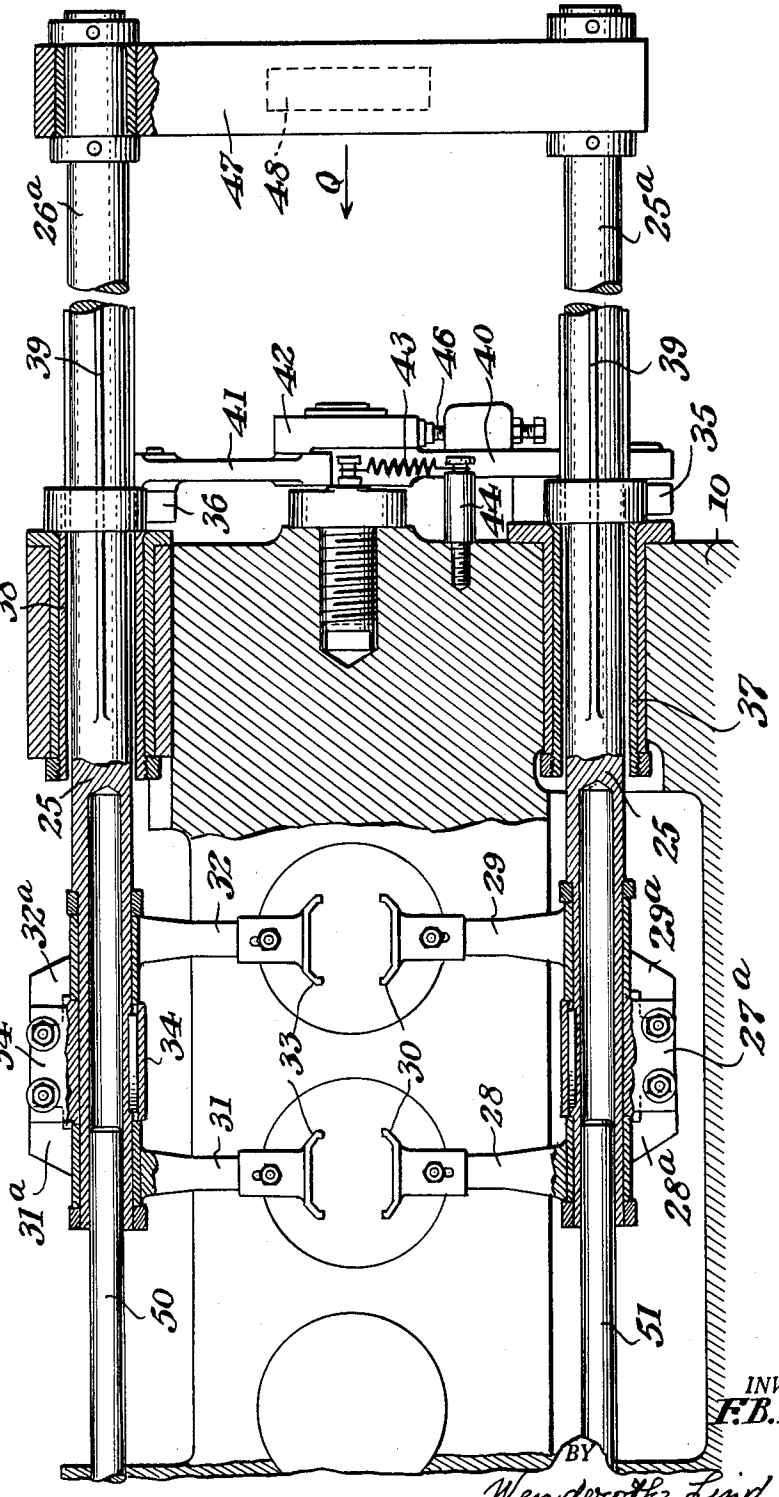
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TRANSFER MECHANISM FOR NUT FORGING MACHINE

Filed April 28, 1955 8 Sheets-Sheet 5

Fig. 5.



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TRANSFER MECHANISM FOR NUT FORGING MACHINE

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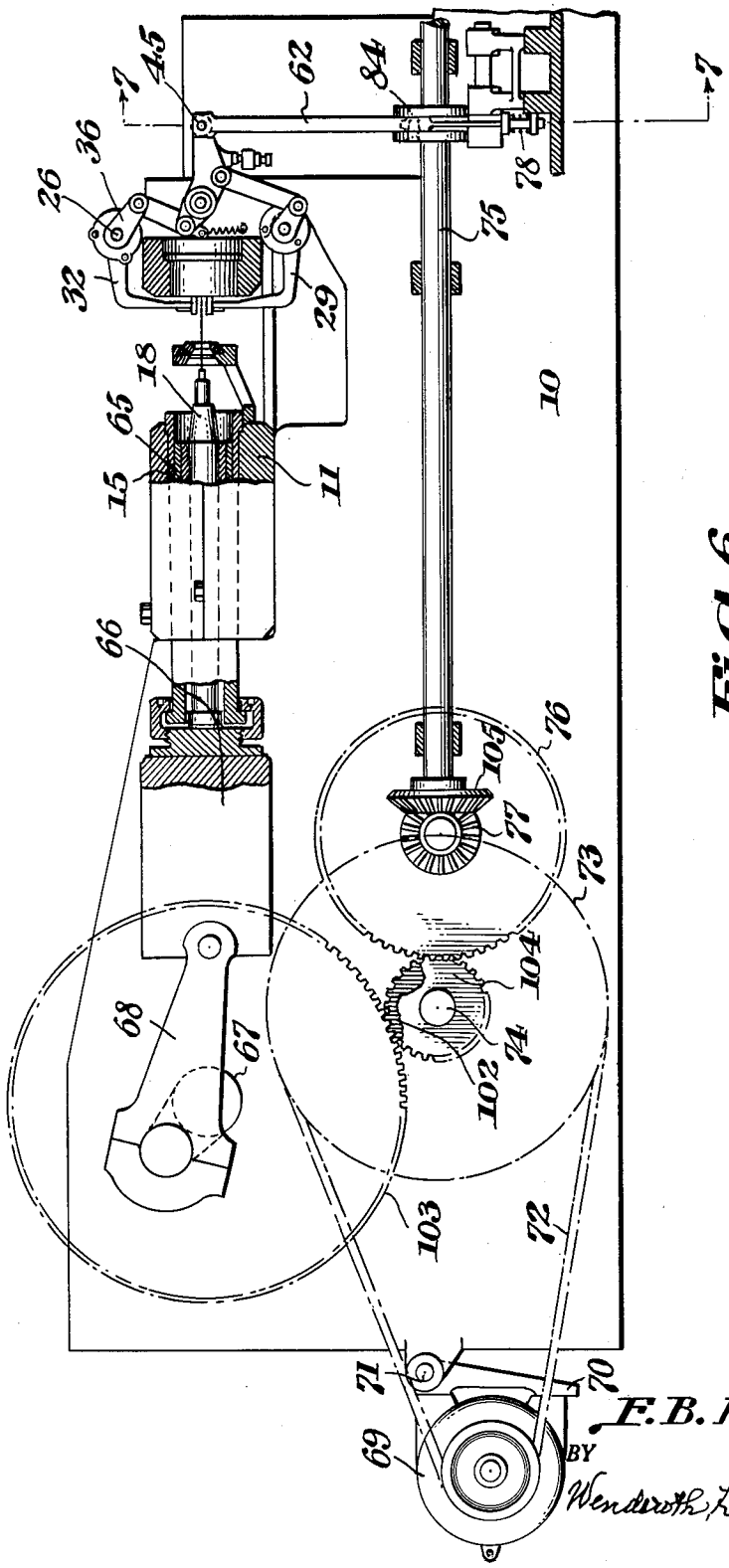


Fig. 6.

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March 6, 1956 F. B. HATEBUR 2,736,909

TRANSFER MECHANISM FOR NUT FORGING MACHINE

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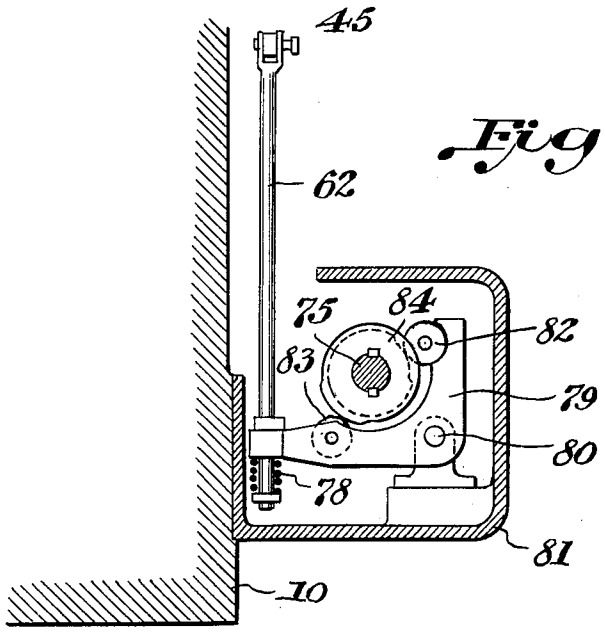


Fig. 7.

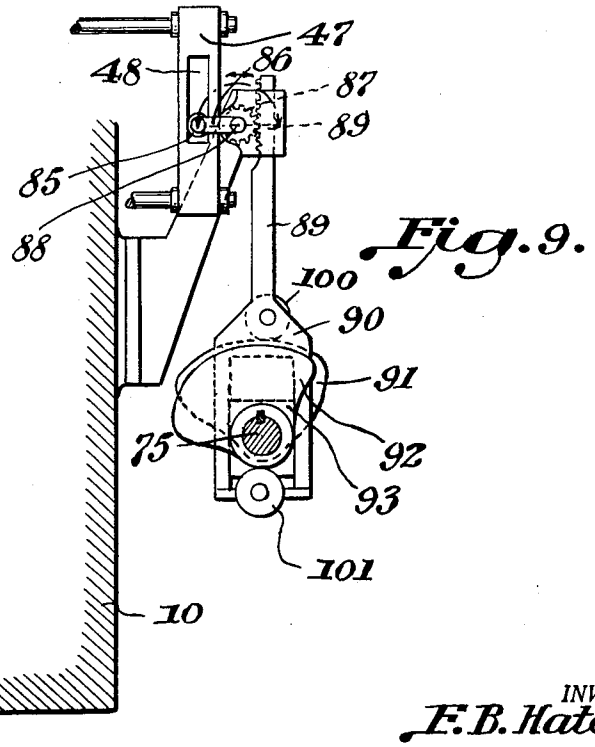


Fig. 9.

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TRANSFER MECHANISM FOR NUT FORGING MACHINE

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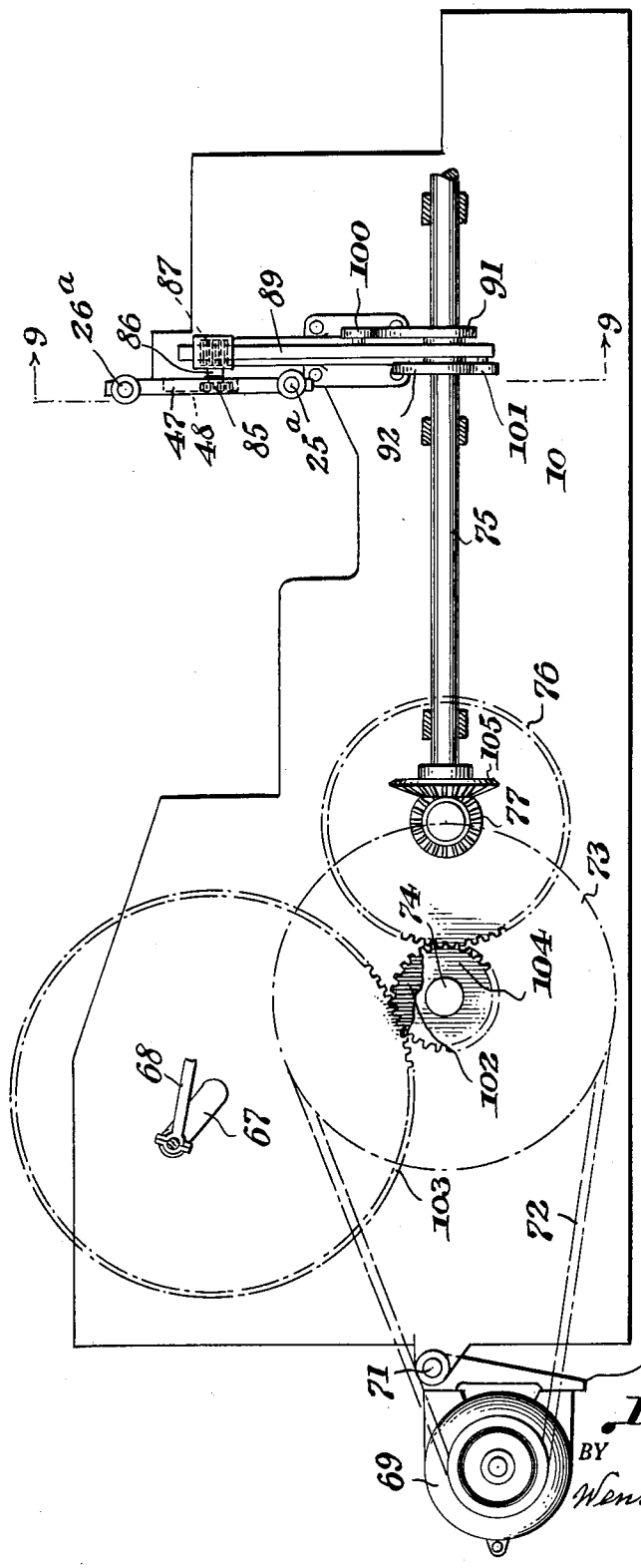


Fig. 8.

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United States Patent Office 2,736,909 Patented Mar. 6, 1956

2,736,909

TRANSFER MECHANISM FOR NUT FORGING MACHINE

Fredrich Bernhard Hatebur, Basel, Switzerland

Application April 28, 1955, Serial No. 504,551
Claims priority, application Switzerland May 13, 1950
5 Claims. (Cl. 10—76)

This application is a continuation-in-part of my application Serial No. 201,525 filed December 19, 1950, now abandoned.

The present invention relates to a multiple punch press intended particularly for the manufacture of nuts and wherein at least two or more press tools are utilized each consisting of a die and a punch.

An object of the invention is to provide a construction wherein the dies and the guiding sleeves for the punches are arranged upon two opposite members of a frame unitary block which is detachably secured to the press bed in such a manner that the latter takes up the deformation stress.

A further object of the invention is to provide a construction wherein at least one pair of conveyer tongs for conveying the blanks from one die to the next can reach with its nipper arms from either side approximately at right angles to the plane of the block between the members thereof and be displaceable from one die to the other in a direction parallel to the members of the block which carry the press tools so that the nippers of the tongs grip the work transverse to the direction in which the work is conveyed.

A further object of the invention is to provide means for operating the various elements of the press synchronously.

With the above and other objects in view which will appear from the detailed description below taken in conjunction with the drawings, a preferred form of construction is shown therein in which:

Figure 1 is a partial plan view of a press with the three press tools shown in cross section;

Figure 2 is a side elevational view of the press with portions shown in cross section and showing the conveying tongs in closed position;

Figure 3 is a view similar to Figure 2 showing the conveying tongs in open position;

Figure 4 is a front elevational view of a portion of the press showing parts in cross section;

Figure 5 is a view similar to Figure 4 illustrating particularly the lateral movement of the longitudinal shafts for the conveying tongs;

Figure 6 is a side elevational view with parts diagrammatically shown illustrating the driving mechanism for the ram for actuating the punches and the controlling and actuating mechanism for operating the conveying tongs;

Figure 7 is a cross sectional view with parts shown in elevation along section lines 7—7 of Figure 6 illustrating the controlling mechanism for actuating the tongs;

Figure 8 is a similar view to Figure 6 with parts omitted for greater clarity showing particularly in elevation the means for actuating the transfer of the conveying tongs from one die to another and

Figure 9 is an elevational view taken upon section line 9—9 of Figure 8 looking in the direction of the arrows and showing particularly the means for transferring the tongs from one die to the next.

In the various figures of the drawings similar reference characters indicate like parts.

A rigid bed **10** is provided for the press in which there is located a frame-shaped block **11** of integral construction. The block **11** is secured by the bolts **12** to the bed **10** and is provided with semi-cylindrical recesses in which sleeves **15** are partially inserted. The recesses for the sleeves **15** are provided in the two opposite members **13** and **14** of the block **11**.

The sleeves **15** partly house the press punches **16**, **17** and **18** on one hand and their respective dies **19**, **20** and **21** with appurtenant ejectors **19***a*, **20***a* and **21***a* on the other hand. The covers **22**, clamp the sleeves **15** in which the punches are housed as shown in Figure 2 and the covers **22** are secured by the bolts **23**.

The dies **19**, **20** and **21** are similarly held by the covers **24**. When the bolts **23** for the covers **22** and **24** are released these conveyers may be raised perpendicularly to the plane of the block **11** so that the punches and dies may be separately replaced.

The advantage of enhanced accuracy is achieved by the fact that the punches and dies of the press tools are mounted in a common block made in one piece, because when the block is machined on a jig-boring mill the dies are positioned exactly coaxially with their respective punches. Despite this, each separate press tool in the press described can be individually replaced, so that the press can be rapidly, and with very little preparatory work, rearranged for the production of different pressings.

The block **11** is mounted on the machine bed **10** in such manner that the bed takes up the stresses which arise during the pressing operation with the block **11** itself remaining free of stress and serving merely to guide and to center the press tools. This assures continued accuracy in the work performed by the press.

As shown particularly in Figures 4 and 5 two shafts **25** and **26** extend parallel to the portion **14** of the block **11** which accommodates the press dies. The shafts **25** and **26** are mounted on the bed **10** on opposite sides of the plane of block **11**. The shafts are rotatably and axially displaceably mounted.

As shown in Figure 4, coupling members **27** and **34** are keyed to the shafts **25** and **26** and two nipper arms **28**, **29** and **31**, **32** are mounted on the shafts at the ends of said coupling members **27**, **34**, being spaced a distance apart equal to the distance between the axes of two adjacent press dies. Said nipper arms **28**, **29** and **31**, **32** are connected to the coupling members **27**, **34** by means of flaps **27***a*, **28***a*, **29***a* or **31***a*, **32***a*, **34***a* screwed together with springs, not shown in the drawing, inserted between them. Nippers **30** and **33** are mounted adjustably on each of the arms **28**, **29** and **31**, **32**. The two nipper arms **31** and **32**, which are equipped with adjustable nippers **33**, are arranged on the shaft **26**, and held against rotation, by means of a coupling member **34** in such a way that the nippers **30** and **33** are located opposite to one another for purposes of cooperation.

The nipper arms are so shaped and designed as to be capable of being inserted between the portions **13** and **14** of the block from both sides of the plane of such block and with a movement that is approximately perpendicular to the plane of the block.

A crank arm **35** is nonrotatably connected to the shaft **25** and a crank arm **36** is similarly connected to the shaft **26**. The crank arm **35** is fixedly secured to the sleeve **37** (see Figure 5) and the crank arm **36** is fixedly secured to the sleeve **38**. The sleeves **37** and **38** may rotate upon the shafts **25** and **26** respectively but are held against axial displacement relative thereto. The sleeves **37** and **38** are fixed to the shafts **25** and **26** by means of axially extending splines and slots have joint rotation therewith.

A portion of the shafts **25** and **26** are constructed as a movable spline shaft with the shaft splines **39** ex-

tending over such a length of the shafts that they can be displaced axially by a distance separating the axes of two adjacent dies.

The link members 40 and 41 are connected respectively to the crank arms 35 and 36 and at the other end thereof are connected to a two-armed lever 42 pivotally mounted at 61 upon the bed 10.

The system of connecting levers is so designed that when the lever 42 is pivoted by means later to be described the nipper arms 28, 29 and 31, 32 with their nippers 30 and 33 swivel towards one another. In other words, the shafts 25 and 26 rotate in opposite directions. One end of a tension spring 43 is attached to the point of articulation between the lever 42 and the link 41 and at the other end is secured to a bolt 44 provided upon the bed 10. The spring 43 tends to actuate the lever system so that the nippers 30 and 33 are urged away from one another. A drawbar 62 is attached to the lever 42 at the point 45 and such drawbar is actuated by a mechanism described below. The drawbar can oscillate the lever 42 in the direction of the arrow P shown in Figure 2 against the action of the spring 43 until the lever 42 encounters the adjustable stop 46.

With respect to the drive of the press tools it is pointed out that the dies are stationary. Only the press punches are each moved in known way by a horizontal eccentric parallel to the punch axis. The shafts which these eccentrics drive are connected with the press drive over a gear system and a compressed air coupling. The limited opposite rotation of both spline shafts 25 and 26 for the opening and closing of the tongs is accomplished from the press drive over a gear system, line shaftings, bevel gears, a control cam shaft and a lever mechanism to the link 45 as described below. The driving power is shown in Figures 2 and 3 by the arrow P. In Figures 4 and 5 the driving power is similarly indicated by the arrow Q for the longitudinal movement of the spline shafts 25 and 26 which are connected through their extensions 25*a* and 26*a* and the yoke 47 at the slot 48 to a lever mechanism which furthermore is connected to the press drive through the medium of a connecting rod. A sliding member with a gear segment, a cam disk, a control shaft, bevel gears, connecting shafts and a gear system are described below. The shafts 25 and 26 are hollowed out at their ends which carry the coupling pieces 27 and 34 and mandrels 51 and 50 engage therein as shown in Figures 4 and 5 for the support during the horizontal movement. The mandrels 51 and 50 are fixed in the press bed 10.

The opposing nipper arms 28, 31 and 29, 32 arranged opposite each other in pairs combine so that each pair forms a set of conveyor tongs for transferring the work from one die to the next.

The principle of operation is as follows: A workpiece which has been formed in the first press die 19 is ejected from the die by the ejector 19*a* as soon as the punch 16 has backed into the position shown in Figure 1. At this instant the driving mechanism swivels lever 42 in the direction of the arrow P in Figure 2. This causes the nippers 30 and 33 of the nipper arms 28 and 31 to approach one another and to grip the pressing which is emerging from the die. The cross-beam 47 is then drawn to the right, in the direction indicated by the arrow Q in Figure 4. This motion is transmitted to the nipper arms by the shafts 25 and 26. In consequence, the conveyor tongs with the nipper arms 28 and 29 move in a direction parallel to the members 14, accommodating the dies of block 11. This direction is to the right of Figures 1 and 4. The described motion of the conveyor tongs continues until the pressing lies coaxial with the second set of press tools, comprising punch 17 and die 20. On the forward movement of the punch, the latter pushes the pressing into the die, wherein it undergoes further forming. As the punch is being advanced, the nipper arms swivel apart again as illustrated in Figure 3 so as to clear a passage for the punch. With the nippers 30 and 33 separated, beam 47 is returned to its initial position, to the left in Figure 4, while the pressing process is taking place. When the pressing is subsequently ejected from die 20 by ejector 20*a* it comes within range of the second pair of conveyer tongs with nipper arms 29 and 32, and is carried by the same, in a similar manner, to a position in line with the axis of the third press die 21. As punch 18 advances it pushes the pressing into the third die, where the pressing is given its final shape and from which it is then ejected by ejector 21*a*. At the same time the conveyer tongs return again to the positions shown in Figures 1 and 4. The finished pressing drops onto a chute, not shown, which guides it into a collecting bin.

Actually the press functions in such a manner that the three punches 16–18 move forward simultaneously and that the three dies each contain a pressing at the same time.

The two sets of conveyor tongs with the nipper arms 28 and 31, and 29 and 32 respectively, must then each seize a pressing at the same time. In the event of these pressings not having equal dimensions, the nippers 30 and 33 of the tongs may have to approach each other more closely in one case than in the other, which would not be possible if the nipper arms were rigidly attached to the two shafts 25 and 26, which are common to both pairs of nippers. This possibility has been provided for, in the case of the press described, by means of the springs, previously mentioned but not shown in the drawing, which render elastic the connection between the flaps 28*a* and 29*a* of the nipper arms and the flaps 27*a* of coupling member 27 and, in a similar way, the connection between the nipper arms 31 and 32 and the coupling member 34. The individual nipper arms are thus elastically secured to the shafts 25 and 26 and can accordingly yield somewhat, when seizing pressings, as may be required by the dimensions of the latter. The grip exerted by the nippers 30 and 33 is thus transmitted by means of the said springs.

The purpose of spring 43 is to take up the play in the joint 45 and in the remainder of the transmission mechanism, not shown in the drawing, for actuating the lever 42, this mechanism being permanently subjected to a unidirectional force exerted by spring 43.

The conveyor tongs described for the conveyance of the pressings, have the advantage over known types that their nippers grip the pressings in a direction transverse to that of conveyance of the latter, with the result that only a relatively small opening or closing travel of the nippers is required. Despite the fact that several sets of conveyor nippers are provided, as in the embodiment shown, it is possible to design the press on relatively simple lines by arranging the nipper arms on common shafts which rotate about their axes in contrary directions and are at the same time axially displaceable. This construction is imposed by the use of a frame-shaped block 11, because, since the members of the block run parallel to the direction of the press, it is impossible to make use of the conveyor tongs otherwise customary.

A further essential advantage of the construction described lies in the fact that the mounting of the tongs is located beyond the range of influence of the heat and of the scale.

In Figures 4 and 5 the coupling piece 34 is shown in cross-section. The mandrels 51 and 50 are shown in elevation and their purpose is as above described. It is understood that the splines 39 of the shafts 25 and 26 are longer than the interval from one die to the next in order that the tong arms can be opened or closed during the entire longitudinal movement of the shafts. The spline shafts do not rotate but oscillate oppositely to one another through a small angle from the ends of the revolution point so that the tong arms grip almost vertically in the free space between the block portions 13 and 14.

The means for driving and operating the various in-

strumentalities mentioned above will now be described with particular reference to Figures 6, 7, 8 and 9.

The punch holders 65 for holding the punches 16, 17 and 18 sliding in the sleeves 15 are connected to the ram 66 in known manner and the ram is reciprocated by the main crank 67 through the connecting rod 68.

A motor 69 is mounted in a cradle 70 which is pivotally connected at 71 to the bed 10 so that the tension upon the V belts 72 may be adjusted. The belts drive a flywheel 73 which is connected to the countershaft 74 by a multiple disc clutch not shown. The main crank 67 is driven by the pinion 102 and the gear 103 and the longitudinally extending cam shaft 75 is driven by the pinion 104 upon the countershaft 74 meshing with the gear 76 mounted upon a stub shaft which also carries the bevel gear 77 which meshes with the bevel gear 105 keyed to the cam shaft 75.

The means for operating the tongs is shown at the right of Fig. 6 and in Fig. 7. This consists of a rod 62 connected pivotally to the joint 45 and resiliently connected by means of a spring 78 to one end of a double armed lever 79 pivoted to a stub shaft 80 which is mounted in a casing 81 secured fixedly to the bed 10. The double armed lever 79 has secured thereto on one arm a roller 82 and on the other arm a roller 83 which cooperate with a cam 84 keyed to the cam shaft 75. The cam 84 cooperating with the rollers 82 and 83 upon the lever 79 will reciprocate the arm 62 so as to bring about the proper operation of the tongs.

In Figures 8 and 9 the means for reciprocating the yoke 47 so as to move the tongs from one die to the next and return is shown. This comprises a slot 48 provided in the yoke 47 in which a roller 85 mounted upon a crank 86 operates. The crank 86 is keyed to a stubshaft 88 upon which is also fixed a pinion 87. The pinion 87 is oscillated through an arc of 180° by means of a rack 89. The rack 89 is reciprocated by means of the rollers 100 and 101 carried by the frame 90 of the rack cooperating with the cams 91 and 92 respectively mounted upon the cam shaft 75. A rectangular member 93 is rotatably mounted also upon the cam shaft 75 and slides within the frame 90 in order to secure rectilinear movement of the rack 89.

The center distance of the crank 86 is half the distance of one die to the other. The stroke of the cams 91 and 92 is arranged in such a way that the rack 89 will revolve the pinion 87 and the crank 180° so that the yoke 47 will move laterally covering the distance from one die to the next with a dwell at each end position. The dwell period is necessary in order to permit the nippers 29 and 32 to hold the blanks in front of the dies until the respective punches introduce them therein. The dwell period is also provided so that the nippers may stay in front of the dies in order to pick up the blanks when ejected.

The ratio of the gears 102 and 103 is the same as the total ratio of the gears 104, 76, 77 and 105. Therefore the main crank shaft will revolve at the same speed as the longitudinal cam shaft.

It is thought that the invention and its advantages will be understood from the foregoing description and it is apparent that various changes may be made in the process, form, construction and arrangement of the parts without departing from the spirit and scope of the invention or sacrificing its material advantages, the forms hereinbefore described and illustrated in the drawings being merely preferred embodiments thereof.

I claim:

1. A transfer mechanism for moving blanks from one station to another in a progressive press tool in order to continue the shaping of the blank in said press tool which comprises at least two dies and presses for the manufacturing of screw nuts, said transfer mechanism comprising two substantially right angularly bent nipper arms, a pair of shafts upon which said arms are secured, each of said shafts being located on opposite sides of the tool plane and parallel thereto, means for oscillating said shafts in opposite directions to move said nipper arms towards and away from one another so that the nipper arms may grasp said blanks in the free space in front of the dies and means for reciprocating said shafts longitudinally of their axes to transfer said blanks from one die to another when said blanks are gripped by said nipper arms.

2. A transfer mechanism for moving blanks from one station to another in a progressive press tool in order to continue the shaping of the blank in said press tool which comprises at least two dies and presses for the manufacturing of screw nuts, said transfer mechanism comprising two substantially right angularly bent nipper arms, a pair of shafts upon which said arms are secured, each of said shafts being located on opposite sides of the tool plane and parallel thereto, a crank arm secured to each of said shafts, a pivoted double armed lever to which said crank arms are connected, means for oscillating said lever to thereby oscillate said shafts in opposite directions to move said nipper arms towards and away from one another so that the nipper arms may grasp said blanks in the free space in front of the dies and means for reciprocating said shafts longitudinally of their axes to transfer said blanks from one die to another when said blanks are gripped by said nipper arms.

3. A transfer mechanism for moving blanks from one station to another in a progressive press tool in order to continue the shaping of the blank in said press tool which comprises at least two dies and presses for the manufacturing of screw nuts, said transfer mechanism comprising two substantially right angularly bent nipper arms, a pair of shafts upon which said arms are secured, each of said shafts being located on opposite sides of the tool plane and parallel thereto, a sleeve splined to each of said shafts, a crank arm fixed to each sleeve, a pivoted double armed lever to which said crank arms are connected, a reciprocating drawbar for oscillating said lever to oscillate said shafts in opposite directions to move said nipper arms towards and away from one another so that the nipper arms may grasp said blanks in the free space in front of the dies and means for reciprocating said shafts longitudinally of their axes to transfer said blanks from one die to another when said blanks are gripped by said nipper arms.

4. A transfer mechanism for moving blanks from one station to another in a progressive press tool in order to continue the shaping of the blank in said press tool which comprises at least two dies and presses for the manufacturing of screw nuts, said transfer mechanism comprising two substantially right angularly bent nipper arms, a pair of shafts upon which said arms are secured, each of said shafts being located on opposite sides of the tool plane and parallel thereto, means for oscillating said shafts in opposite directions to move said nipper arms towards and away from one another so that the nipper arms may grasp said blanks in the free space in front of the dies, a yoke interconnecting said shafts and means cooperating with said yoke to reciprocate the same and thereby move said shafts longitudinally of their axes to transfer said blanks from one die to another when said blanks are gripped by said nipper arms.

5. A transfer mechanism as set forth in claim 4, wherein said means cooperating with said yoke comprises a cam operated rack bar, a gear cooperating with said rack bar and an oscillating lever attached to said gear.

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