

July 8, 1952

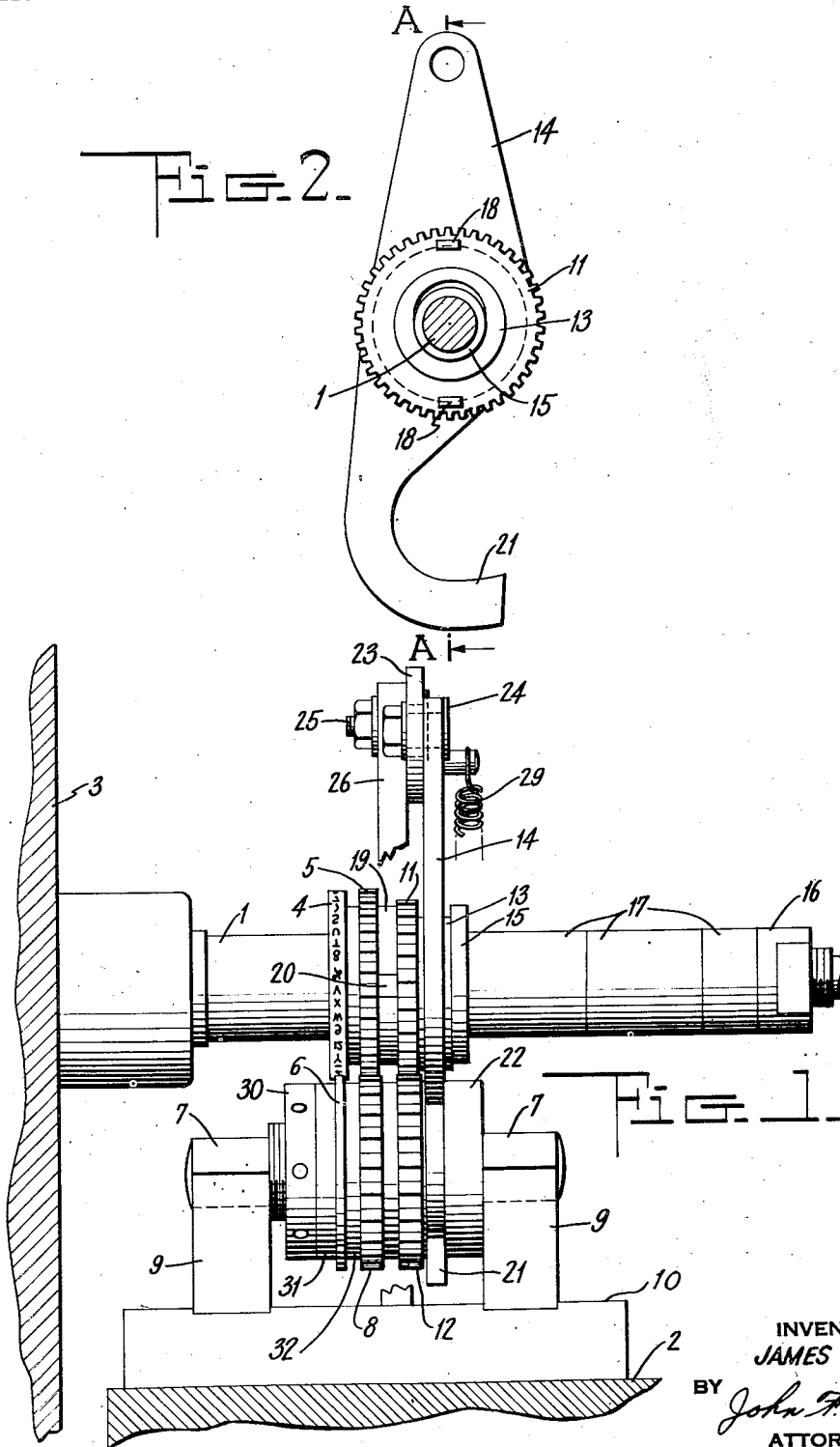
J. LAST

2,602,397

MANUFACTURE OF TYPE WHEELS

Filed Dec. 3, 1949

4 Sheets-Sheet 1



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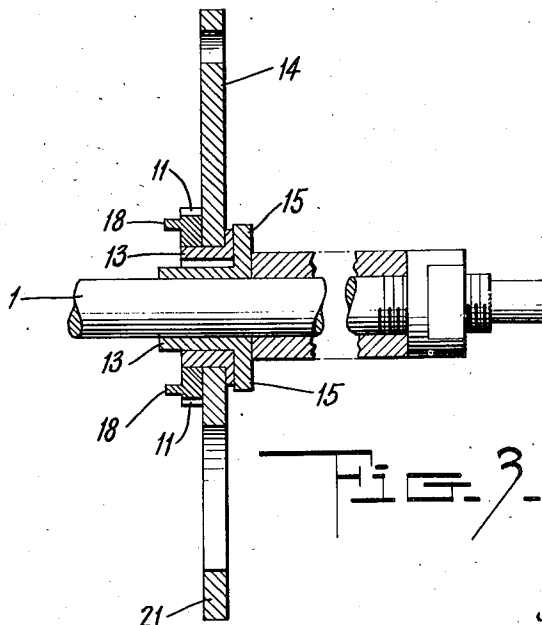
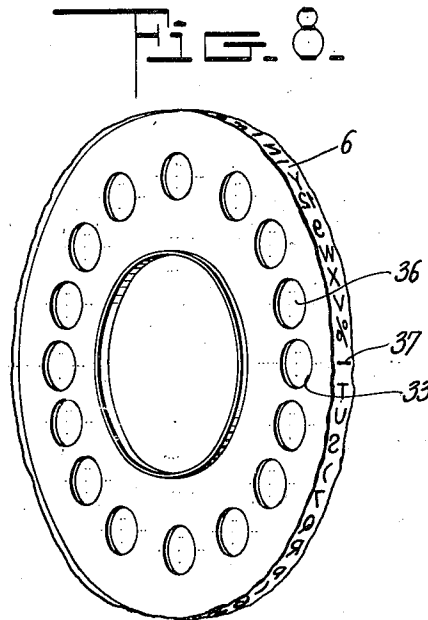
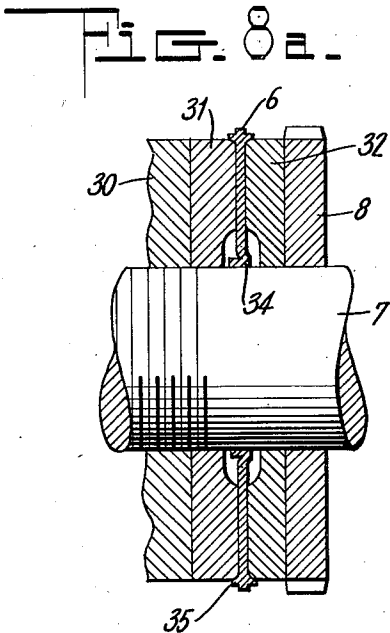
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MANUFACTURE OF TYPE WHEELS

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4 Sheets-Sheet 2



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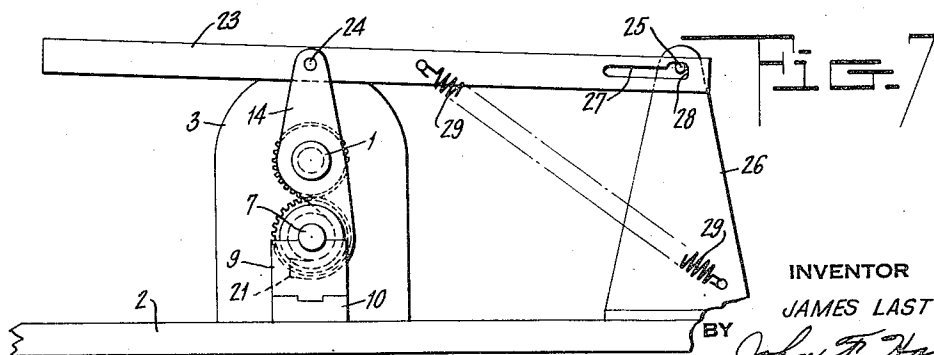
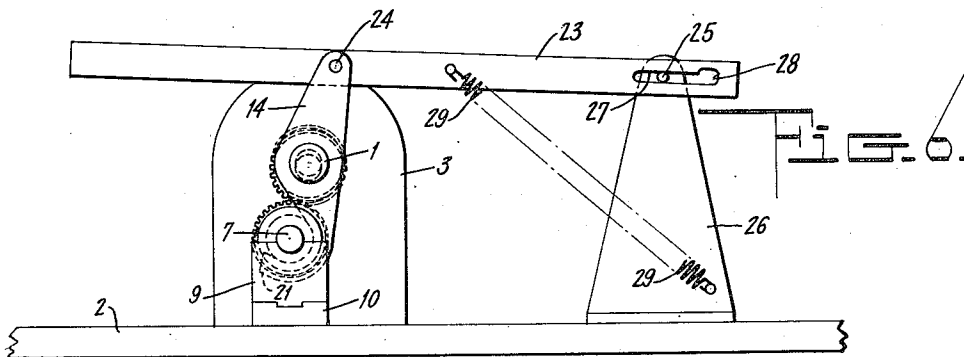
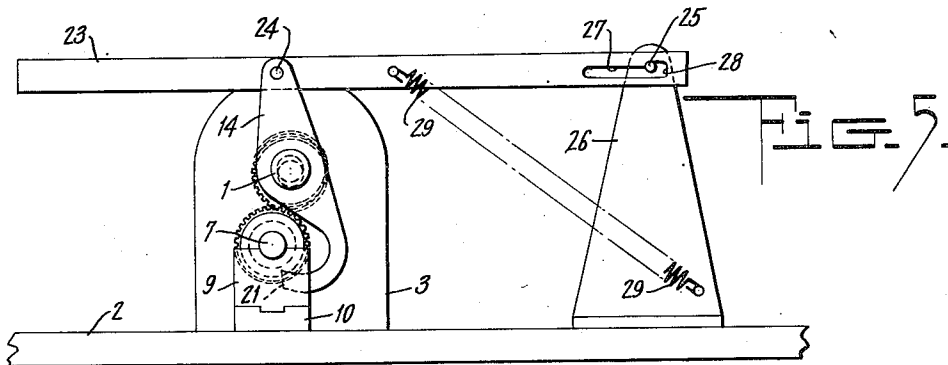
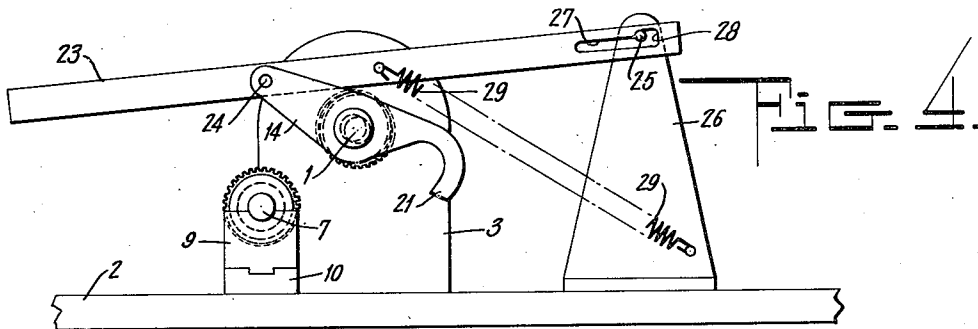
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2,602,397

MANUFACTURE OF TYPE WHEELS

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4 Sheets-Sheet 3



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MANUFACTURE OF TYPE WHEELS

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4 Sheets-Sheet 4

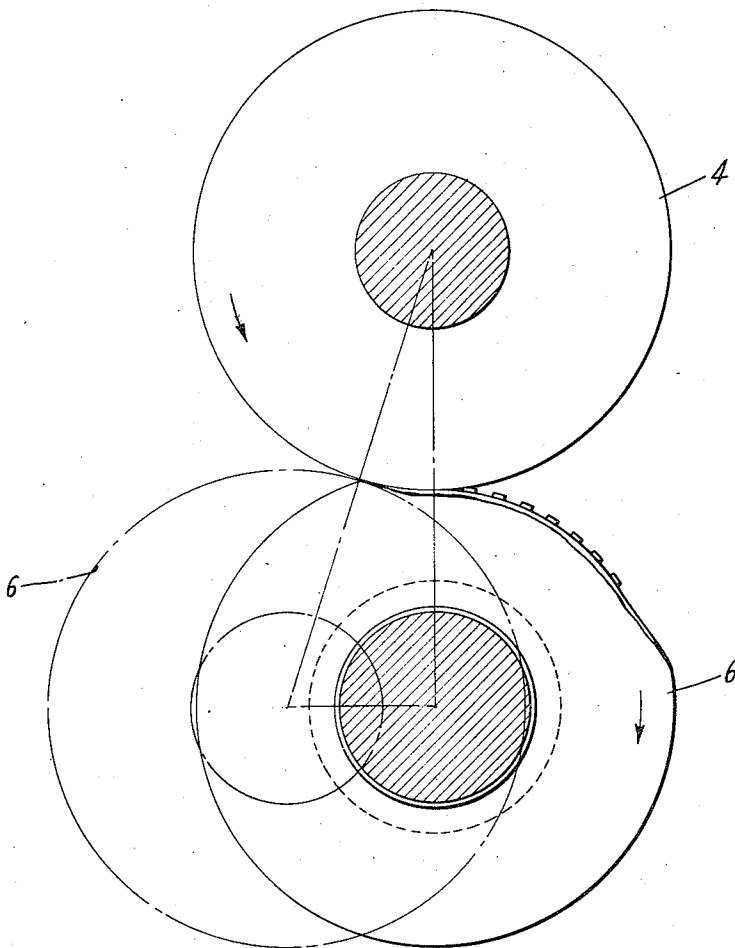


Fig. 9.

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UNITED STATES PATENT OFFICE

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MANUFACTURE OF TYPE WHEELS

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4 Claims. (Cl. 101—401.5)

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This invention relates to improvements in the manufacture of type wheels and in particular to circular type wheels suitable for use in printing mechanisms.

It is known to manufacture circular type wheels by a swaging process using an engraved matrix in bar form. This process requires that the wheel be reciprocated backwards and forwards over the bar, thus limiting the maximum speed at which a complete swaging operation can be carried out. Furthermore, the distance between the work shaft bearing the type wheel blank and the bar matrix must be gradually decreased as the swaging operation progresses. In consequence, the distance between the work shaft and the matrix must be reset at the beginning of each swaging operation, which may lead to variations in diameter of the type wheels. The same point on the type wheel always strikes the matrix at the beginning of each stroke, and this continued impact at one point may well lead to distortion or eccentricity in the finished wheel.

It is an object of the present invention to enable the more rapid manufacture of type wheels, thereby reducing the cost of manufacture, and, at the same time, to obtain greater consistency in diameter of the wheels.

According to the invention, apparatus for swaging characters formed on a matrix on to a circular blank comprises a rotating machine shaft adapted to receive the matrix at a fixed height above a table, a work spindle adapted to receive the blank mounted on a fixture on the table so that the matrix and the blank are in a plane, similar gear wheels fixed to the matrix and the blank, and means for sliding the fixture to bring the blank, while in the said plane, up to the matrix so that the gear wheels engage each other and then bringing the fixture vertically beneath the matrix so that the gear wheels fully mesh, the said fixed height being such that the matrix has fully swaged its characters into the blank when the two are in the said relative vertical position.

In the preferred form of the invention, the matrix is mounted on the shaft of a milling machine and the blank in half bearings secured to the milling machine table. A coupling is provided between the two gears mounted on the machine shaft and so arranged that throughout the swaging operation at least one of the said gears is fully in mesh with one of the gears mounted on the shaft carrying the blank.

The swaging operation is effected by moving the table of the machine so that the blank is

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brought from a position out of contact with the matrix into a position in which it is vertically beneath the matrix, the distance between the machine shaft and the table being such that at this point the characters are fully swaged into the blank, and then return the table to its original position. The swaged blank is then ground to remove surplus metal from the rim which is expressed during the swaging operation. A locating hole, together with a number of lightening holes, is drilled in the web of the wheel. The wheel may then be placed on a gear cutter so that gear teeth may be cut into the wheel intermediate the character positions, accurate location being effected by the locating hole. Finally, the completed type wheel is hardened.

Other objects of the invention will be pointed out in the following description and claims and illustrated in the accompanying drawings, which disclose, by way of examples, the principle of the invention and the best mode, which has been contemplated, of applying that principle.

In the drawings:

Figure 1 is a front view of the machine shaft and table with the matrix and blank in position.

Figure 2 is a side view of the hooked link.

Figure 3 is a vertical section on the AA line of Figure 2.

Figures 4, 5, 6 and 7 are diagrammatic views showing the relative positioning of the parts during various stages of the swaging operation.

Figure 8 shows a type wheel produced by the swaging operation.

Figure 8a is a vertical cross section showing a type wheel blank mounted on its shaft after swaging has been completed.

Figure 9 shows in greater detail the relative positioning of the matrix and the blank at stages illustrated in Figure 5 and Figure 7.

The apparatus for performing the swaging operation includes a machine shaft 1 and a table 2 which may be traversed in a direction perpendicular to the plane of the paper as shown in Figure 1. A milling machine with a headstock 3 may, for example, be used.

The matrix 4 is a disc of hardened steel with the required characters engraved around the periphery. It is mounted on the machine shaft 1 together with a gear wheel 5. This gear wheel 5 is provided with two diametrically opposed projecting lugs which engage with slots 20 in the disc 9.

A gear wheel 11 is mounted for free rotation on a sleeve 13. This gear wheel has two lugs 18 (Figures 2 and 3) which engage two additional

slots in the disc 19, the two pairs of slots lying on diameters which are at right angles. The sleeve 13 has an elliptical opening loosely receiving a sleeve 15 on the machine shaft 1 and permitting the sleeve 13 to move transversely relative to the shaft. The sleeve 15, the gear wheel 5 and the matrix 4 are retained in position on the machine shaft by washers 17 and a locking nut 16. The two gear wheels 5 and 11 together with the disc 19 form a coupling which drives the gear wheel 11 with the gear 5 even though the axes of the two gear wheels may not be in line.

A link 14 with a hook shaped end 21 (Figure 2) is pivotally mounted on the sleeve 13 and is movable with the latter transversely of the shaft 1. At the upper end, this link is pivotally secured to an arm 23 by a stud 24 (Figure 4). One end of the arm 23 has a slot 27 with an enlarged portion 28 cut therein, the slot being slidably engaged with a stud 25 secured to a standard 26 which is bolted to the machine table 2. The arm 23 is under spring tension due to a spring 29.

Also mounted on the table 2 is a base-plate 10 (Figure 1) carrying two half-bearings 9. In these bearings rests the work shaft 7 carrying the steel type wheel blank 6. A nut 30 on a threaded portion of the work shaft 7 serves to clamp the blank 6 firmly between collars 31 and 32. Secured to the work shaft 7 are two gear wheels 8 and 12 which are adapted to mesh with gear wheels 5 and 11 respectively when the table is traversed to the right. The hooked end 21 of the link 14 is adapted to engage with the part 22 of the work shaft 7 when the table is moved to a position in which the gears 11 and 12 are in mesh.

At the beginning of the swaging operation, the table 2 is at the extreme left hand position as shown in Figure 4. Since the standard 26 is secured to the table, in this position the link 14 is turned about the machine shaft 1 so that the hooked end 21 is moved to the right, the stud 25 being engaged by the portion 28 of the arm 23. The work shaft 7 carrying the type wheel blank 6 is placed in the half bearings 9 and the table 2 is traversed to the right until the blank 6 and matrix 4 are almost in contact (Figure 5). The sleeve 13 will be resting upon the sleeve 15 at this time and will support the gear 11 in a position to mesh with the gear 12 before the blank contacts the matrix and before the gear 8 meshes with the gear 5. With the gears 11 and 12 meshing, the link 14 may be operated to engage its hooked end with the work shaft.

Arm 23 is then raised so that stud 25 is disengaged from the portion 28. The spring 29 pulls the arm to the right so that stud 25 is in the slot 27. This movement causes the link 14 to pivot about machine shaft 1 and the hooked end 21 moves in a clockwise direction (Figure 6) to engage the part 22 of the work shaft 7 (Figure 1).

The gear wheels 11 and 12 now being fully meshed, power is applied to rotate the machine shaft 1 which, through the coupling and gear wheels 11 and 12, drives the work shaft 7. The table 2 is traversed further to the right by manually actuating the arm 23 to rotate the link 14 counter-clockwise so that it engages the work shaft and operates through the latter to move the table. This movement is continued until the axis of work shaft 7 is vertically below the axis of machine shaft 1 (Figure 7). As the table moves to the right, the gear 12 forces the gear 11 upwardly. The sleeve 13 and the link 14 move with the gear 11 and cause the hooked portion

21 to maintain its engagement with the work shaft. The height of machine shaft 1 above the table is such that the characters on the matrix are fully swaged into the blank and the gear wheels 5 and 8 (Figure 1) when the shaft 7 is in vertical alignment with shaft 1. This table movement also causes the stud 25 to become re-engaged in portion 28 of the arm 23, so that the parts are latched in swaging position. When swaging is completed, the table is traversed back to the left by swinging the hooked end 21 of the link 14 in a clockwise direction. This may be accomplished by unlatching the arm 23 so that the spring 29 is effective to swing the link 14. It will be seen that throughout the time when the blank and matrix are in contact, the gear wheels 11 and 12 are held fully in mesh, ensuring that movement of the blank relative to the matrix is that due to a pure rolling movement only.

It has been found (in practice) that with a blank of approximately two and a half inches diameter and a speed for machine shaft 1 of 400 R. P. M. the swaging operation occupies approximately twenty seconds so that about 130 passes of the matrix over the blank are effected.

The blank 6 is provided with a formed central boss 34 (Figures 8 and 8a) which increases the resistance of the blank to any stress tending to deform it. As shown in Figure 8a the collars 31 and 32 securing the blank 6 on the work shaft 7 are of slightly less diameter than the blank, so that the excess metal expressed during the swaging operation is constrained to form a rim 35 around the periphery of the blank. The width of this rim in the plane of the type face is not uniform since the letter "W," for example, contains more metal than the letter "I," so that less surplus metal is expressed.

A special symbol 37 is used to position accurately the swaged blank so that a location hole 33 may be drilled. Further holes 36 are also drilled in the web of the blank for the purpose of lightening it. At this stage, or before the holes are drilled, the rim 35 is ground to a uniform width and after drilling the positioning symbol 37 is ground off to leave a blank at this point on the type wheel. The blank is now placed in a gear cutting machine and teeth cut intermediate each character, the hole 33 providing for accurate location. Finally, the blank is hardened to form the finished type wheel.

While there have been shown and described and pointed out the fundamental novel features of the invention as applied to a preferred embodiment, it will be understood that various omissions and substitutions and changes in the form and details of the device illustrated and in its operation may be made by those skilled in the art, without departing from the spirit of the invention. It is the intention, therefore, to be limited only as indicated by the scope of the following claims.

What is claimed is:

1. An apparatus for the manufacture of type wheels comprising, in combination, a power shaft having its axis lying in a fixed plane, a matrix mounted upon said power shaft for rotation therewith and having characters thereon, a work shaft, means rotatably supporting said work shaft with its axis extending parallel to the axis of said power shaft, said supporting means being movable toward and away from a position in which said work shaft lies in a plane including the axis of said power shaft and perpendicular to said first mentioned plane, a blank fixed to

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said work shaft and subjected to a swaging action by said matrix when said supporting means is moved to said position, a first gear fixed to said work shaft, a supporting member movable in a vertical direction relative to said power shaft, a second gear rotatably supported by said member, means connecting said second gear continuously in driven relation with said power shaft, said member supporting said second gear in a position to mesh with said first gear, upon movement of said supporting means towards said position, before said blank comes into engagement with said matrix, and a hooked member pivotally supported by said supporting member and adapted to engage said work shaft for moving said supporting means to said position.

2. The apparatus of claim 1 including an arm pivotally connected to said hooked member and adapted to be operated manually for positioning said hooked member, and a spring connected to said arm for urging the latter in a direction to hold said second gear in mesh with said first gear and to engage said hooked member with said work shaft.

3. The apparatus of claim 1 including an arm pivotally connected to said hooked member and adapted to be operated manually for positioning said hooked member, said arm having a slot therein, said slot shaped to form a shoulder portion, a pin fixed to said supporting means and slidable within said slot, and a spring connected to said arm for urging said hooked member in a direction to hold said second gear in mesh with said first gear and to engage said hooked member with said work shaft, said pin being engageable with said shoulder portion for holding said arm against the action of said spring.

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4. An apparatus for the manufacture of type wheels comprising, in combination, a power shaft having its axis lying in a fixed horizontal plane, a matrix mounted upon said power shaft for rotation therewith and having characters thereon, a work shaft, means rotatably supporting said work shaft with its axis extending parallel to the axis of said power shaft, said supporting means being movable in a horizontal plane toward and away from a position in which said work shaft lies in a vertical plane including the axis of said power shaft, a blank fixed to said work shaft and subjected to a swaging action by said matrix when said supporting means is moved to said position, a first gear fixed to said work shaft, a sleeve mounted upon said power shaft and movable relative thereto in a vertical direction, a second gear rotatably supported by said sleeve, means connecting said second gear continuously in driven relation with said power shaft, said sleeve normally resting upon said power shaft and supporting said second gear in a position to mesh with said first gear, upon movement of said supporting means towards said position, before said blank comes into engagement with said matrix, and a hooked member pivotally supported by said sleeve and adapted to engage said work shaft for moving said supporting means to said position.

JAMES LAST.

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