April 28, 1936. E. W. ROBERTS 2,038,759

MANUFACTURE OF TYPE WHEELS

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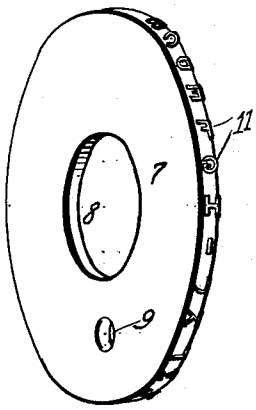


Fig. 1

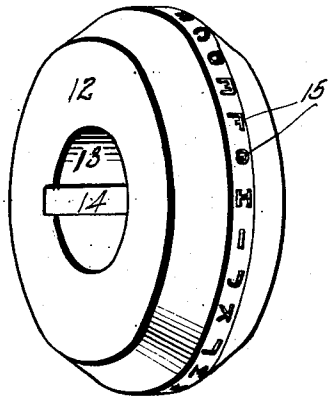


Fig. 2

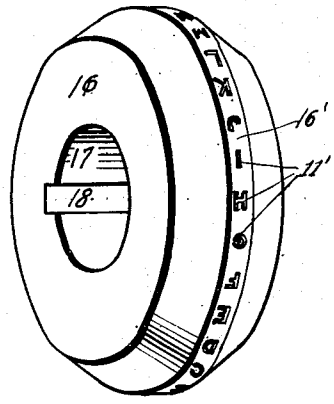


Fig. 3

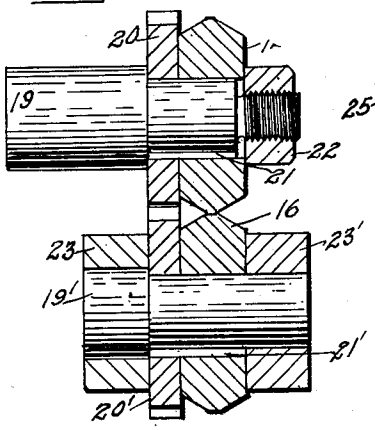


Fig. 4

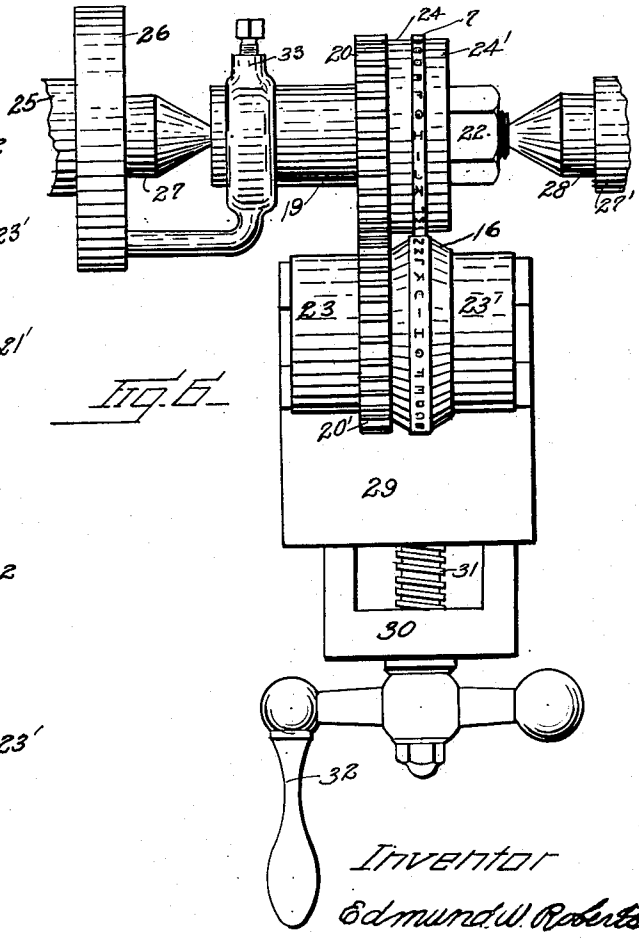


Fig. 6

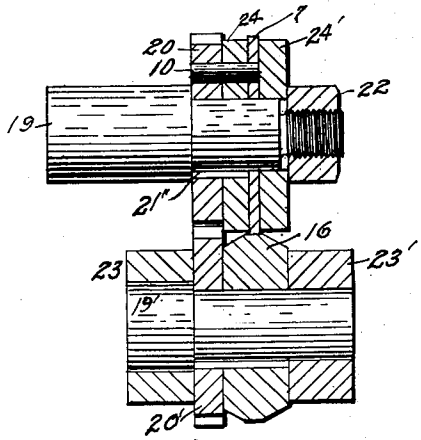


Fig. 5

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MANUFACTURE OF TYPE-WHEELS

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2 Claims. (Cl. 101—401.2)

This invention relates to means for forming raised type on the periphery of a cylindrical disk or type-wheel, the type being swaged from the material of the disk, and more particularly to means for so forming the type that they shall be accurately spaced on the periphery of the type-wheel, and in exact relation to any desired point on said wheel. To establish this accurate spacing, and the relationship aforesaid are the objects of my invention.

In the processing of my invention there is employed the well-known method of knurling, by means of which one or a plurality of characters or designs are swaged upon a cylindrical surface, by forcing a suitably engraved knurl against such surface and rotating the work. Such a process has been employed in the past for forming raised type on the periphery of a cylindrical disk. However, in the ordinary process of knurling in which the work alone is rotated, and is permitted to turn the knurl by frictional contact, there is always the danger of slippage such that the design on the knurl and the design partially formed on the work will not register at the second revolution of the work. Furthermore, a very slight variation from the exact diameter of the work, will bring about inaccurate spacing of the characters. This is especially true when the knurling must be deep as in the formation of raised type. The exact registration between a fixed point on the blank, and a fixed point on the knurl is practically impossible when the knurl is allowed to turn freely from the friction of the work. Hence the manufacture of type-wheels for certain forms of printing machines in which the wheels must be exact duplicates and the resulting impressions of the various wheels must be in alignment, is not possible with a free knurl.

In practicing my invention, I provide a pair of toothed gears of the type customarily known as spur gears, and so key the gears to the work and to the knurl that the knurl and the work, comprising a cylindrical disk, shall turn in exact unison. By providing a fixed driving means for the disk and by so marking the gears that the same set of gear teeth may always be meshed, I secure the desired relationship between a certain character on the knurl and a certain point on the disk.

For example, assume that the type to be formed on the periphery of the blank for the type-wheel shall include the letters of the alphabet, one or more punctuation marks and a blank space with no character. Furthermore, assume that the blanks for the type-wheels shall be provided with a plurality of raised surfaces corresponding to the positions of the letters. One of these raised surfaces may be omitted at the point where the blank or no character space is desired. Obviously this space should register with a corresponding point on the surface of the knurl. Hence, it is essential that these two points shall register. By providing a fixed relationship between the gear keyed to the blank and a fixed point on the blank this registration may be accomplished.

Further in the practicing of my invention, I provide gears such that their pitch diameters shall be very closely the diameters of the surface of the knurl and that of the blank at the base of the type. It is also essential that the two last-mentioned diameters be equal. It may be considered that the diameter of the knurl may be a multiple of the diameter of the blank, in which case two or more sets of intaglio characters must be provided in the knurl, but therein lies no specific advantage.

In order that the characters provided in the surface of the knurl, which must be intaglio or sunken characters, shall be of the same depth I make use of the following method in their formation. I first prepare a master type-wheel of tool steel, engraving the characters on this wheel of the precise form and in the same relationship as they are to appear on the type-wheel itself. This wheel is keyed to the gear provided for the type-wheel and the blank of tool steel for the knurl, as yet unhardened, is mounted with its gear keyed thereto. The peripheries of the master type-wheel and the knurl blank are now forced into contact and the pair are rotated by suitable power means. As they revolve, the pressure forces the type on the master type-wheel into the surface of the knurl blank, thus providing the intaglio characters which are afterward to serve as matrices for the type when in process of formation on the periphery of the type-wheel blank. By this means there is secured an even depth of the impressions provided thereby and assurance that the type formed therefrom shall all have the same radial height, as this is essential in a printing machine. This method of forming the type matrices in the provision of such openings in the periphery of the knurl, has a further advantage that a worn knurl may be discarded and another prepared to substitute it at merely the expense of making the blank, and no expense for engraving.

The knurl, being provided with the type matrices, is hardened and tempered, and is ready for use in the swaging of the letters on the type-

wheels. The process has been fully reduced to practice, and the following description is of the mechanical means employed, and of the manner of its use.

In the drawing:

Fig. 1 is a perspective of the type-wheel as it is manufactured by the means herein described.

Fig. 2 is a perspective of the master type-wheel employed in the formation of the knurl.

Fig. 3 is a perspective of the knurl.

Fig. 4 is a sectional plan of the master type-wheel and the knurl showing the relationship of these parts while the matrices in the knurl are in the process of being provided therein, the section being along a plane passing through the axes of the master type-wheel and the knurl.

Fig. 5 is a sectional plan of the type-wheel and the knurl, showing the relationship of these parts while the type is in process of formation on the type wheel, the section being along a plane passing through the axes of the type-wheel and the knurl.

Fig. 6 is a plan of the type wheel and the knurl in the same relative positions as in Fig. 5 with the addition of the essential portions of a lathe employed in the practicing of my invention.

In the figures, the type-wheel 7 is provided with a central bore 8, a hole 9 being provided to register with the driving pin 10 (Fig. 5). On the periphery of the type-wheel are the raised characters 11 which it is the purpose of this invention to produce. In type-wheels employed on certain printing machines for which this wheel is to be used, it is essential that these characters be accurately spaced, and that the radial distance from the center of the type-wheel to the faces of the type be exactly maintained, both for the type on one type-wheel and all type wheels on the machine.

The master type-wheel is designated by the numeral 12, being provided with a central bore 13 and a key-way 14. On the periphery of the master type-wheel are engraved the characters 15 corresponding in form and angular relationship with the characters on the type-wheel 7. Since it is a simple matter to turn the outer periphery of the wheel, corresponding to the surfaces of the type, to an exact diameter, the radial heights of the type may be made exactly equal. The engraver does not disturb the faces, but cuts away the metal below the faces, when forming the characters.

The knurl 16 is similar in form to the master type-wheel 12, with the exception that the diameter of the central portion 16' is that at the bases of the characters 15 on the master type-wheel 12. In the knurl there are provided the central bore 17 and the keyway 18.

In Fig. 4, the master wheel 12 is shown mounted on the arbor 19 together with the gear 20. Fixed relationship between the wheel 12 and the gear 20 is secured by means of the key 21 which lies in suitable keyways in the arbor and the gear and keyway 14 in the master type-wheel. The nut 22 serves to clamp the gear and the master type-wheel firmly on the arbor. On the second arbor 19' are mounted the knurl 16, the latter in the process of being provided with the type matrices, and the gear 20', they being held in fixed relationship by the key 21' which lies in suitable keyways in the arbor and the gear and in the keyway 18 in the knurl. Arbor 19' is mounted in bearings 23, 23'.

In Fig. 5 we have a relationship of parts similar to that in Fig. 4 with the exception that the type wheel 7 and the clamping rings 24, 24' are substituted for the master type-wheel 12. The pin 10, passing through the gear 20 and the clamp ring 24 serves to keep the type-wheel 7 in the desired angular relationship with the gear 20. The gear and the clamp ring 24 are keyed to the arbor 19 by means of key 21'', which is slightly shorter than key 21. The use of the pin 10 and the short key 21'' avoids the necessity of providing a keyway in the type-wheel 7. The knurl is mounted as in Fig. 4, having been hardened and tempered after being provided with the type matrices 11' (Fig. 3).

In Fig. 6 there are shown the parts illustrated in Fig. 5 mounted in the same relationship and fitted in a lathe of which there are shown a fragment 25 of the head stock spindle, the small face plate 26, the live center 27, a fragment 27' of the tail-stock spindle, the dead center 28, the cross-slide 29, the cross-slide ways 30, the cross slide screw 31 and the cross-slide handle 32. A lathe dog 33 clamped to arbor 19 serves to drive the arbor from the face-plate 26.

Both in the formation of the matrices provided in the periphery of the knurl and in the formation of the raised characters forming the type on the periphery of the type-wheel, the parts are mounted on the lathe as illustrated in Fig. 6, and pressure is applied to force the knurl and the type-wheel or the knurl and the master type-wheel together by means of the handle 32 while the arbor 19 is being driven by the lathe, and arbor 19' is being driven from arbor 19 through the medium of the gears 20 and 20'.

In the formation of the type, the blank for the type-wheel is clamped between the rings 24, 24' by means of the nut 22, and inserted between the lathe centers 27 and 28. The hole 9, having been located previously in the desired angular relationship with a point on the periphery of the type-wheel blank, is slipped over pin 10 in the process of mounting the blank on the arbor 19. The gears 20 and 20' are meshed according to markings provided thereon, and the lathe is started. Pressure is applied by turning the handle 32, forcing the cross-slide toward the center of the lathe, and the knurl 16 against the periphery of the type-wheel 7. The exact height of the type desired is secured by means of the customary cross-slide stop, which permits the cross-slide to traverse to a predetermined distance only. When the cross-slide has encountered the stop, the lathe is allowed to turn for a short period to ensure the flow of the metal of the type-wheel fully into the matrices provided in the periphery of the knurl.

The method of manufacture herein described is especially useful in the production of type-wheels of steel or other metals which may not be employed in a die-moulding process. The method is much faster than either hand or machine engraving, permits of exact duplication, is very much cheaper than engraving, and the product is fully equal to or better than that produced by any other method.

I claim:—

1. The method of making type wheels which consists in preparing a master wheel, rolling a knurl thereagainst under pressure, while positively rotating the master type wheel at the same speed as the knurl but in the opposite direction, and thereafter rolling type wheel blanks under pressure into contact with the knurl while rotating the knurl at the same speed as the blanks

but in the opposite direction, to produce finished type wheels.

2. The method of making type wheels which consists in preparing a type relief master wheel by cutting away portions only of the periphery to leave undisturbed original peripherial portions defining raised characters of uniform height, rolling a knurl in contact with said master wheel under pressure regulated to determine the intaglio depth therein of the relief type of the master wheel while rotating the master wheel at the same speed but in the opposite direction from the direction of rotation of the knurl, and subsequently rolling type wheel blanks against the prepared knurl under pressure to cause the material of the type wheel blanks to flow into and fill the intaglio type of the knurl whereby to form relief type on the finished wheel while at the same time rotating said knurl at the same speed but in the opposite direction to the direction of rotation of the type wheel.

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