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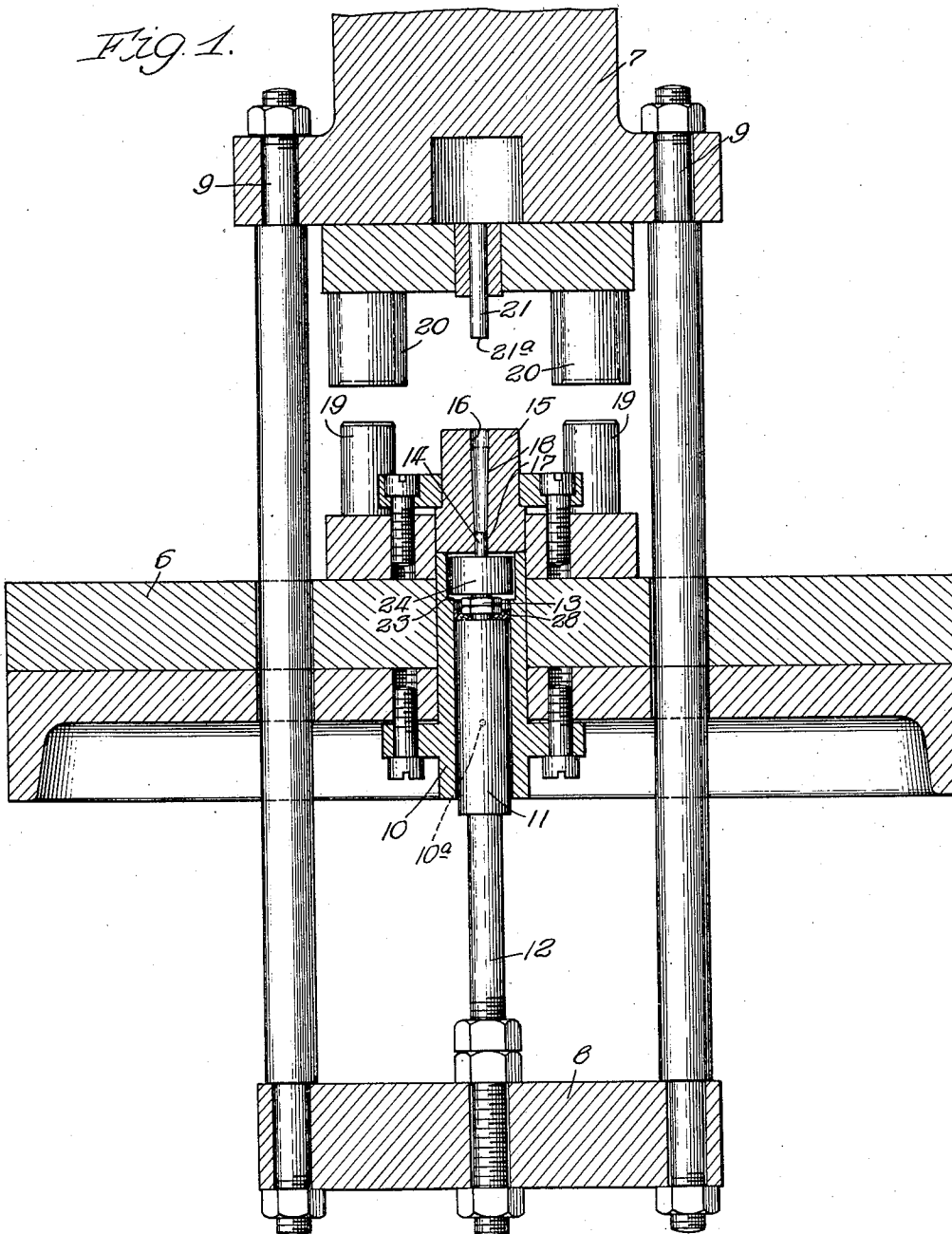
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APPARATUS FOR FORGING TAPER PINS

Filed July 28, 1943

2 Sheets-Sheet 1



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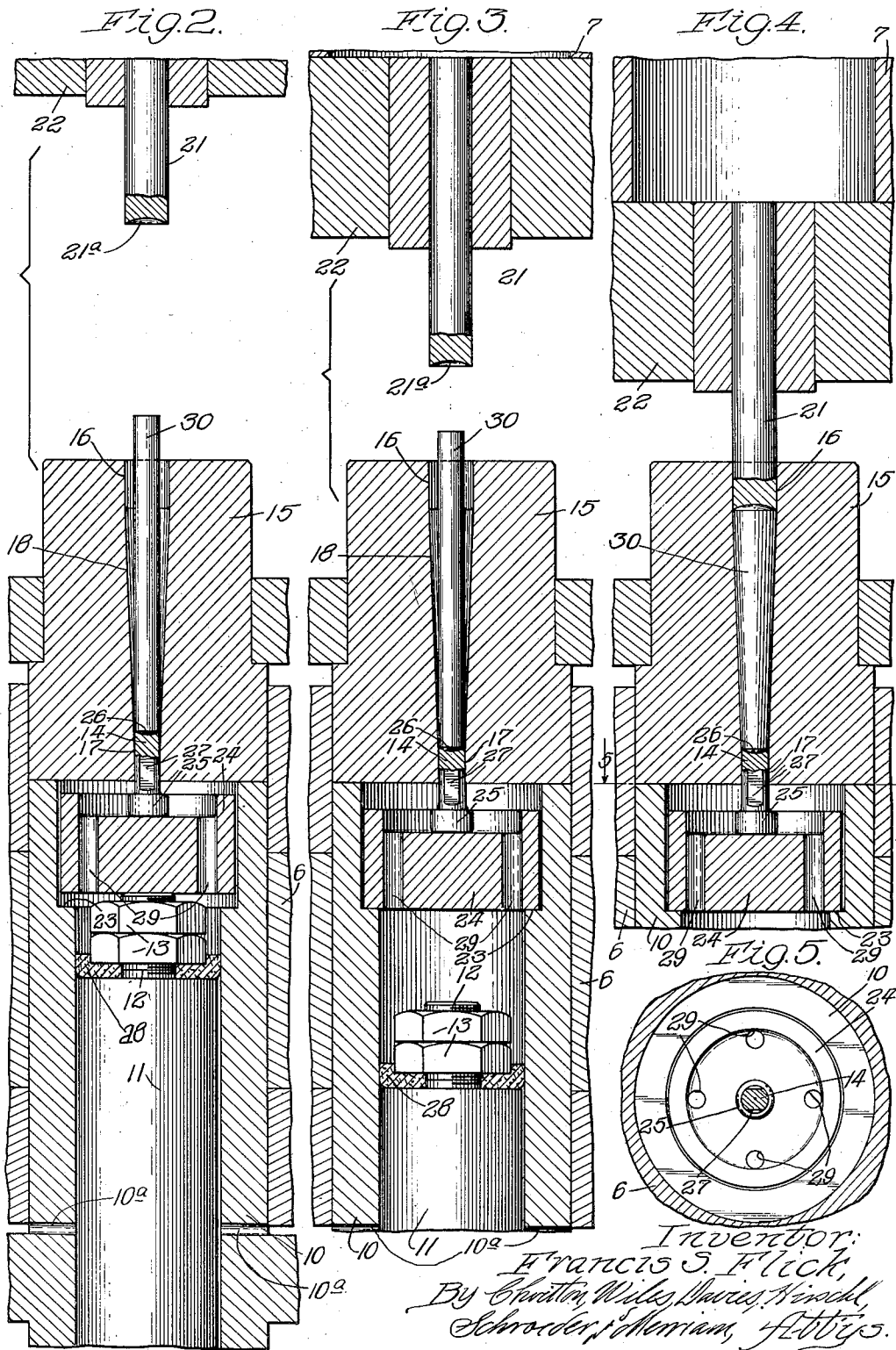
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UNITED STATES PATENT OFFICE

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APPARATUS FOR FORGING TAPER PINS

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2 Claims. (Cl. 78—61)

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This invention relates to an improved apparatus for forging taper pins, and more particularly to apparatus that can be operated, if desired, by a punch press.

Heretofore, taper pins have been made on screw machines which are more expensive than punch presses and cannot be as readily obtained as punch presses. By using the present method, the cost of manufacturing taper pins is greatly lessened, steel is saved, and the pins are more accurate as to size than pins as commonly manufactured commercially. By the present invention, taper pins are being made with a tolerance of plus .0013.

Another object of the invention is to make taper pins by a process similar to "cold heading" and avoid excessive flash metal around the end of the pin.

Another object of the invention is to provide an improved method of lubricating the cylindrical blank of steel which is to be made into a pin, so that the finished taper pin may be readily removed from the die and there will be no serious voids or channels on the face of the finished pin because of the lubricant.

Other objects of the invention are to provide an improved knock-out pin and apparatus for supplying compressed air and operating the knock-out pin automatically by mechanism secured to the punch head.

The invention is illustrated in the preferred embodiment of the accompanying drawings, in which—

Figure 1 is a fragmentary sectional view showing the improved apparatus secured to the bolster plate and ram of a conventional punch press; Figure 2, a fragmentary sectional view showing a cylindrical blank placed in the die and ready for the forming operation; Figure 3, a view similar to Figure 2 showing a second step in the operation wherein the knock-out pin is retracted to forming position and the punch is advancing towards engagement with the material; Figure 4, another view similar to Figures 2 and 3 but showing the punch in its lowermost position having just formed a taper pin; and Figure 5, a fragmentary plan sectional view, taken as indicated at line 5 of Figure 4.

In the embodiment illustrated, the die is secured to a bolster plate 6 of a punch press having a ram 7 to which is secured a head 8 by means of tie rods 9. A cylinder 10 is secured to the lower side of the bolster plate by means of bolts and contains a piston 11 which is secured to the head

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8 by means of a piston rod 12. Air inlet ports 10a are provided in the cylinder wall. The piston rod is adjustable and has a head 13 adapted to actuate the knock-out pin member 14 at the end of the top stroke of the piston 11.

The die 15 is preferably made of high carbon tool steel and has an upper cylindrical portion 16 and a lower cylindrical portion 17 which are connected by a tapered opening 18 in which the taper pin is formed. The die is securely bolted to the bolster plate by means of bolts and the bolster plate may be provided with leader pins 19 to be engaged by leader pin bushings 20 secured to the ram so as to guide the punch 21 accurately into the opening 16. The punch 21 may be secured to the ram by an upper die shoe 22, in the well known manner, and preferably the lower end of the punch has a hollow point 21a to give the end of the taper pin the final rounded form. Preferably, the punch is made of tough steel such as chrome vanadium steel.

The upper end of the cylinder 10 is counter-bored to provide a shoulder 23 upon which the knock-out pin support plate 24 may rest during the forming operation. The upper portion of the knock-out pin support plate is recessed to receive the enlarged head portion 25 of the knock-out pin 14. This head prevents the knock-out pin from advancing too far into the die 15 when it is ejecting a taper pin from the die. The knock-out pin 14 preferably has a hollow point 26 which forms a closure for the die during a pin forming operation. It will be noted that the sides of the knock-out pin 14 are flattened, as indicated at 27, to permit air compressed by the packing 28 on the piston and passed through openings 29 in the knock-out pin support plate, to pass into the die and finally eject the taper pin after it has been loosened by the knock-out pin.

In order to obtain the best results, cylindrical blanks 30, which are usually of cold drawn steel, should be properly treated so that the finished pins will be smooth and can easily be extracted from the die. It is common for taper pins to have one-fourth of an inch of taper per foot of length. If lubricants are used, they must be carefully applied. Ordinary lubricating oil is unsatisfactory as it is very difficult to avoid oil marks because the oil is practically incompressible and is completely confined within the die during the forming operation. Diesel engine oil and kerosene are used in making relatively short pins but for long pins the most satisfactory lubricant is white lead. The blanks should be wiped with white lead and

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then rolled between two fabric faces so as to remove the excess material and apply a very thin even coat. After the pins have been so treated with white lead, they should be used and compressed rather promptly. If exposed to the air for a period of two or three hours, satisfactory results are not obtained.

The operation will be readily understood by reference to Figures 2, 3, and 4. The operator places the blank 30 in the die 15 and trips the press. As the plunger descends to the position shown in Figure 3, the knock-out pin 14 travels down with its supporting plate until its top edge is even with the small end of the taper opening in the die. When the plunger completes its downward stroke to the position shown in Figure 4, the blank is compressed between the knock-out pin and the end of the punch and completely fills the taper portion of the die and accordingly takes its shape. It is important that the punch travel down through the enlarged cylindrical portion 16 of the die, as this prevents breakage of the punch which thereby does not have an opportunity to be deflected off its true center. As the punch 21 closely fits the opening 16, there is very little flash of metal around the punch and this small amount of waste metal may be readily ground off of the finished pin. On the return stroke of the ram, the piston 11 and packing 28 in its upward travel compresses air and near the top of its stroke strikes the knock-out pin support plate and drives the knock-out pin into the die loosening the finished pin in the die. At this moment the compressed air is admitted into the die beneath the taper pin and it is blown out of the die so that the next blank may be inserted.

The foregoing detailed description has been given for clearness of understanding only, and no unnecessary limitations should be understood therefrom for some modifications will be obvious to those skilled in the art.

I claim:

1. Apparatus for forming taper pins, which comprises: an open ended die having at one end a cylindrical portion to receive a punch and at the other end a smaller cylindrical portion to receive a knock-out pin, said cylindrical portions being joined by a tapered opening of the length and size of the taper pin to be formed; a punch to enter the larger cylindrical portion; a knock-out pin to enter the smaller cylindrical portion of the die; means for holding the knock-out pin with its inner end even with the end of the tapered portion of the die; a pump cylinder secured to the die member; a piston in said cylinder secured to the punch so that when the punch is retracted the piston is advanced to compress air in said pump cylinder and then to abut and move said

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knock-out pin to loosen the formed taper pin, and means rendered operative by the movement of said knock-out pin to admit the compressed air into said die to blast the formed taper pin therefrom.

2. Apparatus for forming taper pins, comprising, an open ended die having a cavity to receive the blank of the taper pin to be formed, a punch to enter one end of the opening in the die, a closely fitting knock-out pin to enter the other end of the opening in the die to form a closure for the die, a cylinder substantially fixed with relation to said die, a piston in said cylinder and connected to move simultaneously with said punch, packing on said piston and slidably contacting the inner walls of said cylinder, a knock-out pin support member having limited movement in the end of said cylinder adjacent one end of said die, said piston being out of contact with said supporting member until just before removal of the taper pin after it has been formed, apertures in said support member, said knock-out pin having an air passageway that is normally closed prior to the piston striking the support member, whereby when a taper pin has been formed in the opening in the die and the punch is retracted the piston will move toward the knock-out pin support member during recession of the punch whereby when the piston strikes the support member the knock-out pin will loosen the formed taper pin in the die opening after which air compressed by the movement of the piston will pass through the support member and the knock-out pin to eject the formed taper pin from the die.

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