Feb. 21, 1933. G. CHARLTON 1,898,814

PROCESS OF MAKING TAPPETS

Filed July 9, 1927

Fig. 1

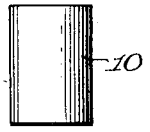


Fig. 2

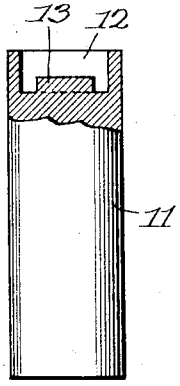


Fig. 3

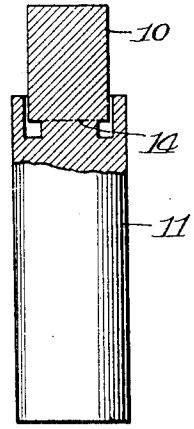


Fig. 4

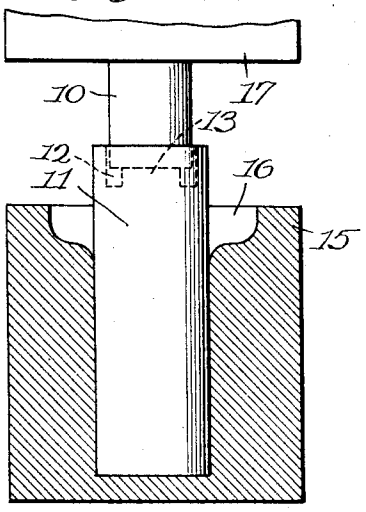
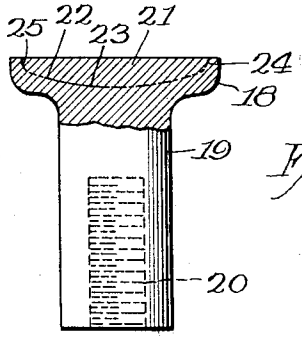


Fig. 5



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1,898,814

UNITED STATES PATENT OFFICE

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PROCESS OF MAKING TAPPETS

Application filed July 9, 1927. Serial No. 204,628.

This invention relates to tappets for poppet valves and the like, and has for its principal object to provide a light, durable structure composed chiefly of inexpensive common steel protected by a wear resisting facing. Generally speaking, materials that have great resistance to wear or mechanical abrasion are expensive in comparison with ordinary steel and are frequently comparatively brittle. And it is a further object of the invention to provide a tappet faced with the hard brittle metal which is securely connected to and supported by the softer, tougher metal forming the body of the tappet.

The invention is not confined, however, to the use of expensive wear-resisting metal, for inexpensive white iron makes an excellent tappet facing and may be used instead of the expensive materials in making tappets according to this invention.

The following selection will serve to illustrate suitable materials.

For the body portion of the tappet use a rod blank of SAE 1045 steel which will have substantially the following analysis—

Carbon	.40–.50
Manganese	.50–.80
Phosphorus	.045
Sulphur	.05

Remainder principally iron.

For the facing blank use a high carbon, high-chromium steel of substantially the following analysis—

Carbon	1.30– 1.50
Chromium	12.00–14.00
Cobalt	1.00– 1.35
Molybdenum	1.00– 1.35
Nickel	.75 max.
Silicon	.40– .60
Manganese	.30– .50
Phosphorus and sulphur	.35 max.

Or a tungsten steel of substantially the following analysis—

Carbon	.65– .75
Tungsten	17.00–19.00
Chromium	3.00– 4.00
Vanadium	.75– 1.25

Or an alloy known as stellite and generally composed of 20% tungsten, 15% chromium and 65% cobalt.

The drawing illustrates the preferred forms of parts in what I now regard as the best mode of procedure in manufacturing devices of this character.

Fig. 1 is a side elevation of a block of facing material;

Fig. 2 is a side elevation, partly in section, of a blank of metal adapted to form the body of the tappet;

Fig. 3 is a view similar to Fig. 2, illustrating the block and the blank assembled and welded together;

Fig. 4 is a sectional view diagrammatically illustrating dies used in reducing the blanks to the desired form; and

Fig. 5 is a side elevation partly in section of a product of this procedure.

These specific illustrations and the correspondingly specific description that follows are used to make the invention clear and are not intended to require any unnecessary limitation of the claims.

In making a selected tappet the block 10 of facing metal is seven-eighths inches in length and twenty-one thirty-second inches in diameter. The body blank 11 is two and one-half inches in length and seven-eighths inches in diameter. At one end of this blank is a hole or pocket 12 twenty-two thirty-second inches in diameter and five-sixteenth inches in depth, and rising from the bottom of the hole is a projection 13 seven-sixteenth inches in diameter and one-eighth inch in height.

The blanks 10 and 11 are brought together in the relation indicated in Fig. 3 and connected with the respective terminals or holders of a suitable welding machine by the operation of which a welded joint is produced at 14.

In one type of machine suitable for various purposes, a current of low voltage and high amperage is passed through the two blanks, then separated a few thousandths of an inch for a moment during which the resultant arc fuses the adjacent surfaces, and then they are quickly pressed together, and the weld is ef-

fected. This is commonly known as percussion welding and has the advantage of producing a joint with a minimum fin or flash.

In another type of welding, commonly known as flash welding, also suitable for various purposes, somewhat higher voltage and lower amperage are used and the parts are separated and brought together a plurality of times before the final pressure is applied.

In each of these welding processes there would be a tendency for the temperature of the joint surface on the body blank 11 to rise more slowly than that on the block 10 because of the loss by conduction through the larger body of metal. The chief purpose of the projection 13 is to offset this tendency sufficiently to permit the proper welding temperatures to be established on the appropriate surfaces of the dissimilar materials.

The difference in diameter between the pocket 12 and the block 10 provides clearance between their adjacent walls sufficient to prevent arcing across the space between them and the proper alignment is provided for by the organization of the welding machine.

The welding accomplished, the block and the adjacent portion of the body blank are heated to forging temperature and the assembly is placed in suitable forging apparatus diagrammatically illustrated by the die 15 having a cavity 16 and the cooperating die 17 by the action of which the upper portion of the assembly is spread laterally and made to fill the cavity 16, thereby forming the head 18 on the upper portion of the body blank, the remainder of which then becomes a stem 19, which by custom is threaded as indicated at 20.

The operation of the forging apparatus has reduced the block 10 to a flat button-like facing 21 embedded in the adjacent metal of the body blank which is thereby provided with a saucer-like depression 22 conforming in all respects to the under surface 23 of the facing 21 and having a circumferential surface 24 surrounding the corresponding surface 25 on the facing.

In the majority of cases the metal of the body blank is tougher than that of the facing and this construction provides the facing with ample support against strains that would cause it to fracture or break. On account of the fact that the facing and the recess in which it is fitted are formed simultaneously, the corresponding surfaces acting somewhat as a die in finishing each other, they are exactly complementary and are, hence, in uniformly intimate contact, but without stress or strain.

The welded joint 14 serves to securely fasten the facing to the body of the tappet and prevent the development of any looseness that might result in noise or lost motion.

This construction permits the facing to be very thin and this, in turn, permits the head to be kept within allowable dimensions which is very important on account of the requirement for tappets of extremely light weight.

The blanks 10 and 11 may be readily produced from wrought stock by simple machine or forge operations, and in some instances it will be desirable to use a cast plug for the blank 10.

I claim as my invention:

1. The process of making tappets which includes forming a pocket in one end face of a rod blank with a central projection rising from the bottom of the pocket, inserting in the pocket a block of facing metal of less cross section than the pocket, welding the bottom of the block to the top of the projection and acting upon the assembly with endwise pressure to embed the block in the blank and spread the block and the adjacent portion of the blank to form a head.

2. The process of making tappets which includes inserting a block of facing metal in a pocket in the end face of a blank, welding the block to the bottom of the pocket and hot forging the block and adjacent portion of the blank to spread them laterally and embed the flattened block in the spread portion of the blank.

3. The process of making tappets which includes welding a block of facing metal to one end face of a rod blank of greater circumferential dimensions than the block and forging the block and adjacent portion of the blank to spread them laterally and embed the metal of the block in the spread metal of the blank.

In testimony whereof I affix my signature.

GEORGE CHARLTON.