

P. B. McCULLOUGH.  
DENTAL SWAGING APPARATUS.  
APPLICATION FILED SEPT. 3, 1907.

1,012,401.

Patented Dec. 19, 1911.

2 SHEETS—SHEET 1.

Fig 2.

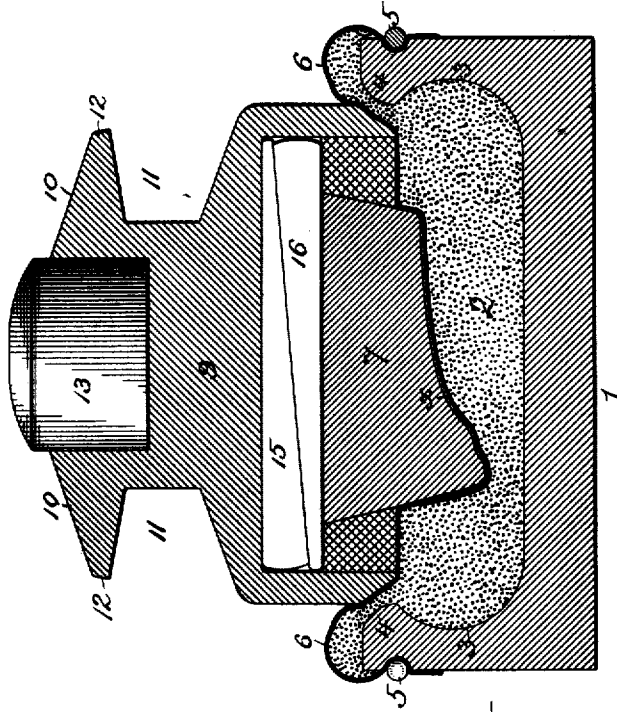
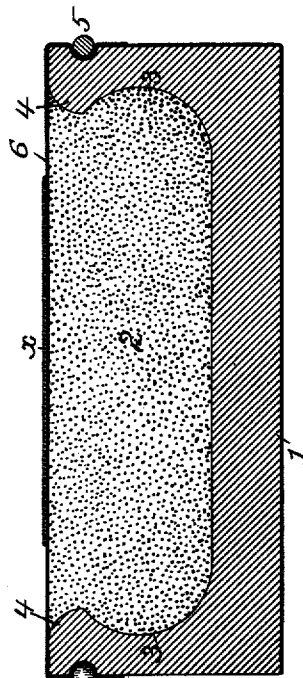
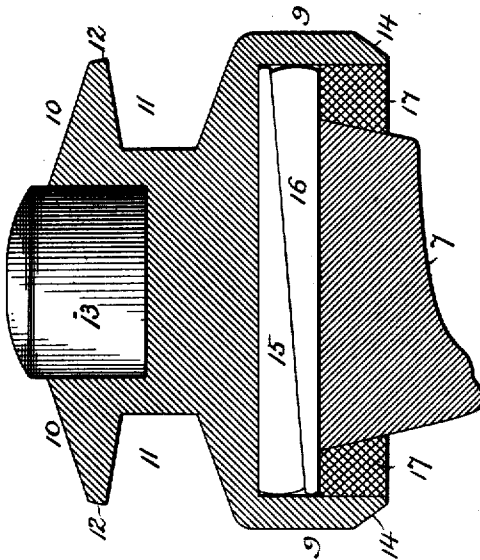


Fig 1.



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2 SHEETS—SHEET 2.

Fig. 4.

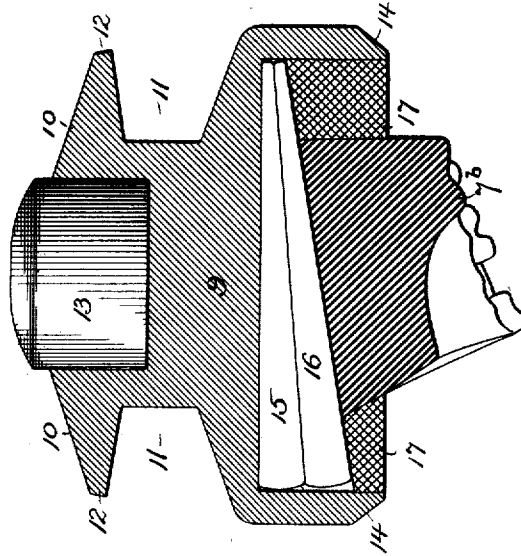
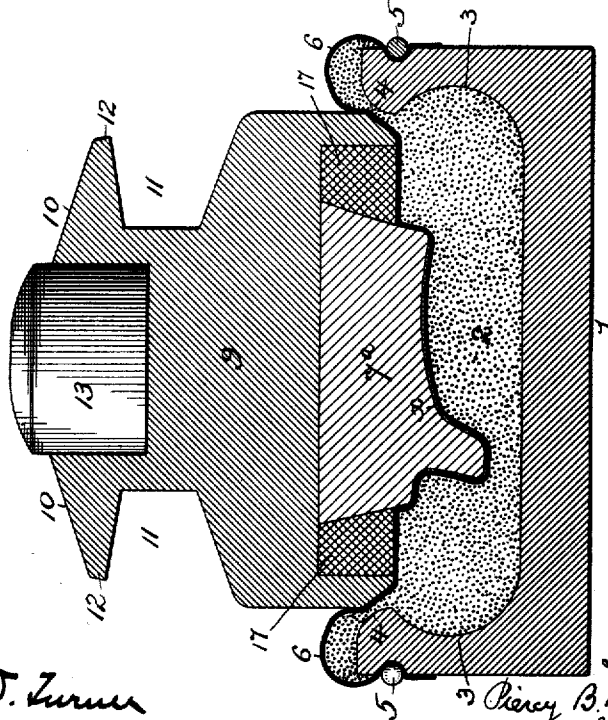


Fig. 3.



Witnesses  
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# UNITED STATES PATENT OFFICE.

PIERCY B. McCULLOUGH, OF PHILADELPHIA, PENNSYLVANIA.

## DENTAL SWAGING APPARATUS.

1,012,401.

Specification of Letters Patent.

Patented Dec. 19, 1911.

Application filed September 3, 1907. Serial No. 391,163.

*To all whom it may concern:*

Be it known that I, PIERCY B. McCULLOUGH, a citizen of the United States, residing in Philadelphia, Pennsylvania, have invented Improvements in Dental Swaging Apparatus, of which the following is a specification.

The object of my invention is to provide a swaging device whereby dental plates can be formed with less labor and greater accuracy than has heretofore been possible. This object I attain in the manner hereinafter set forth, reference being had to the accompanying drawings, in which—

Figure 1 is a sectional view of a dental-plate-swaging device constructed in accordance with my invention, the die being separated from the matrix; Fig. 2 is a similar view showing the position in respect to each other, of the parts after the formation of the plate has been partially completed; Fig. 3 is a like view illustrating the final stage in the formation of the plate, and Fig. 4 is a sectional view of the die holder, illustrating a different adjustment of the die therein from that represented in Figs. 1 and 2.

The matrix plate or block 1 which I employ consists of metal or other available material, and it may be of circular form or of any other desired shape. This block has formed in it a recess for the reception of a mass of matrix material 2, which consists of a mixture of fullers' earth and glycerin, combined in such proportions as will give the desired degree of plasticity, the recess formed in the matrix block for the reception of this matrix material having concave walls 3, terminating at the top in a convex, outwardly beveled face 4, the matrix block also having, in its outer face, an annular groove for the reception of a spring clamp 5, which serves to confine to the upper face of the block a sheet 6 of rubber or other flexible material which is also, by preference, of elastic character, this rubber sheet constituting the support for the metal plate  $x$  which is to be shaped or formed, and thereby serving to prevent direct contact of said plate with the matrix material as well as to prevent escape of the latter during the operation of forming or shaping the plate as hereinafter described.

The forming die, which I have shown in various forms at 7, 7<sup>a</sup> and 7<sup>b</sup>, is let into a recess in the lower portion of the die-holder 9, which is of the same shape as the matrix

block and has a beveled top face 10 and a deep annular recess 11 for the reception of the thumb and fore-finger of the hand which carries the die-holder, the flange 12, formed by the projecting upper wall of the groove 11, serving, in conjunction with the beveled top 10 of the die-holder, to deflect, in case of a misdirected blow, the hammer where-with the blows are delivered to said die-holder, thereby serving to protect the hand of the operator from injury which might otherwise be caused by such misdirected blows.

The top of the die-holder 9 is centrally recessed for the reception of an anvil block 13 of hardened steel or other highly resisting material, to receive the blows of the hammer and prevent the wear of the die-holder to which it would be subject if such blows were delivered directly upon the metal of which said die-holder itself is composed. The lower portion of the die-holder presents a beveled annular face 14, and said die-holder has, in its under face, the recess for the reception of the die, which recess is preferably provided, at its base, with a pair of tapered cylindrical disks 15 and 16, upon which the die has its bearing, as shown in Figs. 1, 2, and 4, although the die may, in some cases, rest directly against the base of the recess in the under face of the die-holder, as shown for instance in Fig. 3, the recess in that case being, by preference, shallower than when the beveled backing disks are employed.

The die is secured in place in the die-holder by means of a surrounding mass 17 of hard wax or other suitable material. From an impression of the mouth a model or initial die, such for instance as shown at 7<sup>a</sup> in Fig. 3, is prepared from Portland cement or a hard dental plaster, and in preparing metal trial plates for rubber work and for all moderately thin gold or other metal plates, this plaster model is set in the recess in the die-holder either with or without the use of the tapered backing plates 15 and 16, and is held in the recess by the hard wax or other suitable filling 17 as shown in said Fig. 3. The plate to be formed, without preliminary shaping, is laid upon the rubber dam which confines the plastic matrix 2 in the recess of the matrix block; the model is held in position on the plate and the latter is driven by the model into the matrix material by blows of the hammer delivered upon the hardened anvil block 13.

When a flat piece of malleable metal is struck with a hammer the metal is condensed at the point where the blow is delivered and expanded laterally, and when a succession of blows is delivered in one spot the effect of this expansion causes the metal to turn up at the margin of the condensed area so as to form an irregular shaped cup. Similarly, when a model or die first acts upon the metal plate only the high points of the die touch the metal, the margins being free, consequently the effect of a succession of blows upon the die-holder is to spread the metal over these high points of the die causing the free margins to turn up. As the metal plate is forced down into the matrix material 2 the latter escapes over the convex beveled face at the top of the matrix block but is retained by the rubber dam 6, and if, after a few blows, the plastic mass is pressed back into the matrix, the metal plate and die again placed in position, and a few more blows delivered upon the die-holder without at any time permitting the die to sink deeply into the mass, the metal will be more and more spread over the high points of the die, until the margins are turned up sufficiently to meet the sides of the die. By this time the beveled face 14 of the die-holder will, as shown in Fig. 3, have approached so closely to the convex beveled face 4 at the top of the matrix block that further escape of the plastic matrix material 2 at this point will be difficult because of the frictional resistance which it has to overcome, and the pressure of the plastic mass upon the upturned sides of the metal plate will therefore be an inward pressure tending to force said upturned portions of the plate into undercut portions of the sides of the die, this inward pressure of the plastic mass being aided by the concave formation of the walls 3 which bound the recess formed in the matrix block for the reception of the mass of plastic material constituting the matrix. By virtue of the control of the plastic mass thus rendered possible the operator is enabled to complete the entire operation of swaging metal as heavy as sixteen gage aluminum, commencing with a flat plate and causing its adaptation to every configuration of a model or die, without the aid of any other tool, and without any previous formation of the plate by the use of the horn mallet or other device commonly resorted to for this purpose. When dealing with the heavier plates of gold, gold alloy, or other metal used in dentistry, however, I prefer not to rely wholly upon the cement or plaster model but to form therefrom a sand mold without cores and regardless of undercuts and to cast therein a metal die, such for instance as that represented at 7 in Figs. 1 and 2. This prepara-

tory die is set in the die-holder with or without the tapered plates 15 and 16, and secured therein, as described, and the forming of the metal plate is proceeded with in the same manner as before set forth, but, when the plate has been formed to the metal die, the completion of the shaping operation is effected by the use of the plaster die or model 7<sup>a</sup>, into all undercut portions of which the plate is forced, as shown.

The beveled plates 15 and 16 provide a means for reducing the effective depth of the recess in the die-holder when adjusted so that the thickened portion of one plate corresponds with the thin portion of the other plate, as shown in Figs. 1 and 2, or they may be set so as to dispose the die at an angle in the holder by placing both of the thickened portions of the plates together, as shown for instance in Fig. 4, such inclination of the die being of advantage in the swaging of partial plates, by effecting a more even distribution of force at the face of the die, and preventing the plate from sliding out of position upon said face of the die.

The mixture of fullers' earth and glycerin which constitutes the matrix material employed in my improved swaging device does not become hard with age, its character is not affected by the varying conditions of the weather, it does not pack or rebound, and it can be readily changed to suit any condition of use, being stiffened by sifting in additional powdered earth while in the act of swaging, or softened by adding a little glycerin or working in a little freshly mixed compound.

Whether the die is seated directly upon the base of the recess in the die-holder or upon the interposed beveled plates 15 and 16 the blows of the hammer are transmitted to the die through an interposed and continuous metallic medium, hence the full force of each blow is effective in the shaping of the plate, no energy being lost, as when the force is transmitted through a plastic or compressible medium.

The operation of swaging a plate with a swaging device such as that constituting the subject of my invention must necessarily be a progressive one; beginning with the high points of the die and with the plastic material free to escape at the commencement of the operation, any kinks or folds of the plate due to the shaping operation being at once visible to the operator, and, as the holder is free to be held at any angle, the die can be so adjusted as to spread these folds or kinks without any resort to the use of the horn mallet as an aid in the operation, and, when the plate has passed the point where kinks or folds are likely to be made, and the edges of the plate have been suitably trimmed, the die can be driven

straight down until further escape of the plastic mass between the beveled edges of the die-holder and matrix is prevented by reason of the frictional resistance, the flow of the plastic mass being then in the direction of least resistance, that is, toward the undercuts in the sides of the die, consequently the plate will be forced laterally into these undercut portions of the die and the complete shaping of the plate will thus be effected at one operation.

The uniform distribution of the force of the hammer blows effected in my improved swaging device is evidenced by the fact that I am able to swage light plates wholly upon a model or die of so inexpensive a material as Portland cement or special dental plaster and to swage plates as heavy as sixteen gage aluminum, twenty-four gage brass, or the heaviest plates of gold or its alloys used in dentistry upon such a die when used in connection with a preceding metal die, and effect absolute adaptation of the plate to the finest lines of the model without chipping or fracture of the latter.

I claim:—

1. Dental swaging apparatus having a die carrier, a matrix block with a recess having concave side walls and a mass of plastic material in said recess, whereby, when the plate to be fitted is forced by the die into said mass of plastic material, the latter will be forced laterally inward by the concave walls of the recess in the matrix block.

2. Dental swaging apparatus having a die carrier, a matrix block having a recess therein, and a mass of plastic material, contained in said recess, the upper portion of the matrix block and the lower portion of the die carrier bearing such relation to each other that as said die carrier descends, a passage of progressively decreasing size will be formed between the same and the matrix block for the escape of plastic material from the recess of the latter.

3. Dental swaging apparatus having a die carrier with a beveled lower face, a matrix block with a recess therein having an outwardly beveled upper face, and a mass of plastic material contained in said recess, the beveled faces of the die carrier and matrix block bearing such relation to each other that as the die carrier descends, the surplus plastic material can escape between said beveled faces.

4. Dental swaging apparatus having a die carrier, with a beveled lower face, a matrix block having therein a recess with concave side walls and a beveled upper face, and a mass of plastic material contained in said recess, the beveled faces of the die carrier

and matrix block bearing such relation to each other that, as said die carrier descends, the surplus plastic material will escape between said beveled faces.

5. Dental swaging apparatus having a matrix block with a recess for the reception of plastic material, a loosely fitting die and a retaining sheet secured to the matrix block and serving to receive the plastic material which escapes between the die carrier and matrix block.

6. Dental swaging apparatus having a die holder with a recess for the reception of the die, plastic material for confining the die in said recess, and a metallic backing interposed between the die holder and the die, whereby a substantially continuous mass of metal is presented between the base of the die and the point upon which the blows of the hammer are delivered.

7. Dental swaging apparatus having a die holder with a recess therein, a die in said recess, and beveled means interposed between the base of the die and the base of the recess and adjustable to change the angle of the die in the die holder.

8. Dental swaging apparatus having a die holder with a recess therein, a die contained in said recess, and a pair of beveled disks interposed between the base of the die and the base of the recess, and serving, by adjustment of one in respect to the other, to change the angle of the die in the holder.

9. Dental swaging apparatus having a forming die bearing upon a metallic seat in that member of the apparatus upon which the blows of the hammer are delivered, and plastic material for securely confining the die to said seat.

10. Dental swaging apparatus in which are combined a matrix block with a recess for the reception of plastic material, said matrix block having an external groove therein, a sheet of elastic material for retaining said plastic material, an elastic clamp for confining the outer portion of said sheet of elastic material within the external groove of the matrix block, and a die holder having a portion for entering the recess of the matrix block and bearing such relation thereto that surplus plastic material from the recess can escape between the die holder and matrix block and will be retained by the expansion of the elastic material.

In testimony whereof, I have signed my name to this specification, in the presence of two subscribing witnesses.

PIERCY B. McCULLOUGH.

Witnesses:

HAMILTON D. TURNER,  
ELSIE FULLERTON.