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APPARATUS FOR MAKING DENTAL RESTORATIONS.

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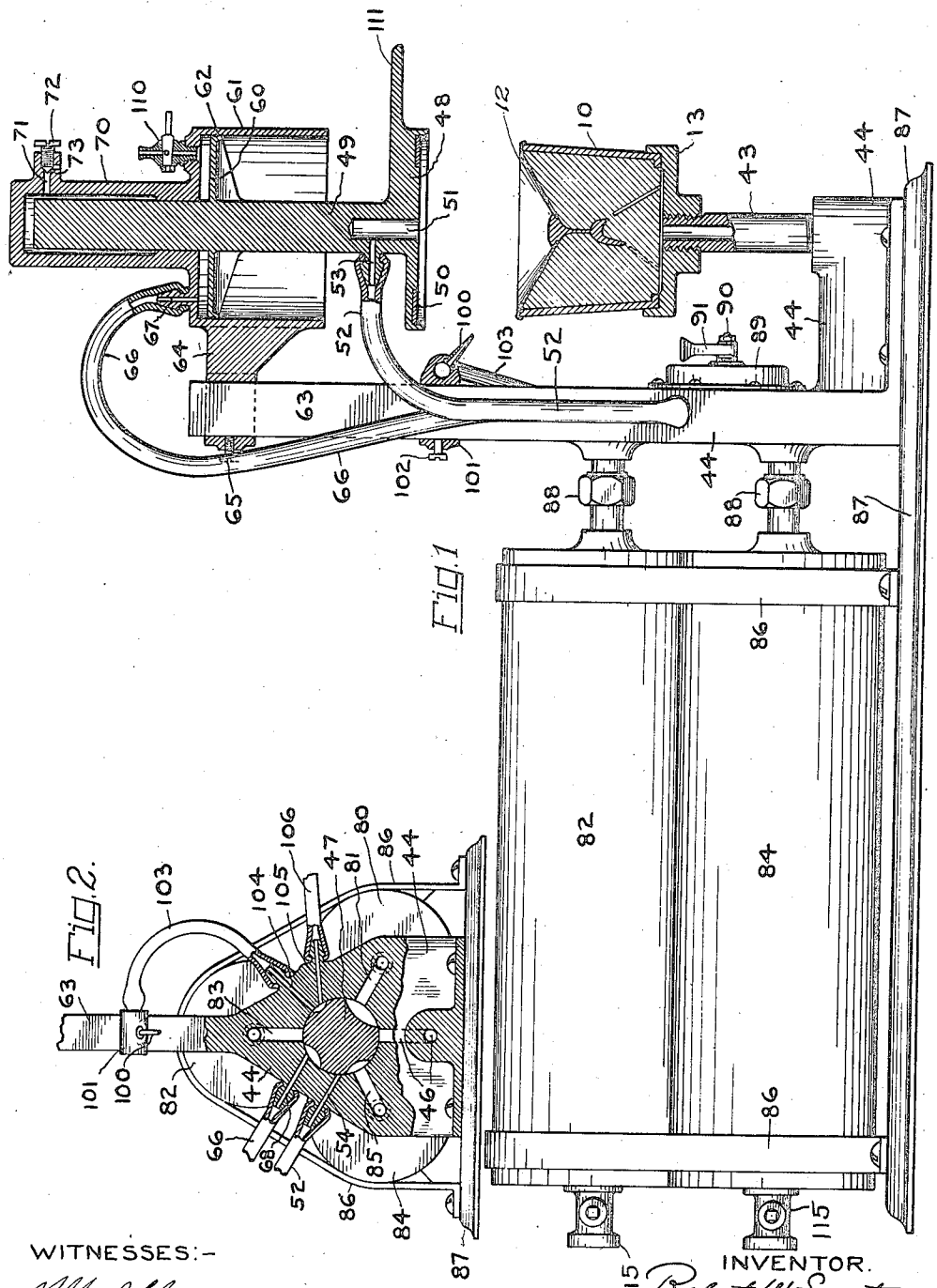


Fig. 1

Fig. 2

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To all whom it may concern:

Be it known that I, ROBERT W. SWEETNAM, a citizen of the United States, and a resident of Toledo, Ohio, have invented a certain new and useful Apparatus for Making Dental Restorations; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the characters of reference marked thereon, which form a part of this specification.

My invention relates to apparatus for forming dental restorations such as inlays, bridges, plates, etc. It particularly has for its object to produce an apparatus that will make castings which substantially conform to the shape of the parts to be restored.

The investment material being compressible, the cast may be made larger than the pattern by the outward pressure thus transmitted to its interior while the metal is still in liquid form.

The invention may be contained in many constructions, all of which come within the purview of my claims hereinafter appended. To show the practicability of constructions embodying my invention, I have selected certain constructions as examples and shall describe them hereinafter. The constructions selected are illustrated in the accompanying drawings.

Figure 1 illustrates an apparatus embodying my invention, parts being shown in section for clearness of illustration. Fig. 2 illustrates a sectional view of the valve which controls the passageways leading to and from different parts of the apparatus shown in Fig. 1.

The pressure brought to bear upon the surface of the metal of the sprue of the mold may be greatly increased so as to force the metal and mold it in the matrix while it is moldable. This may be accomplished by the apparatus shown in Figs. 1 and 2, wherein is shown a means for withdrawing the air from the flask and a means for pressing the air upon the top of the flask. A means is also provided for bringing the pressure on the top of the metal at a regulated period of time after the air has begun to be removed from the interior of the flask. In the apparatus shown in the Figs. 1 and 2, a mold is formed in the flask 10. The sprue of the mold may be covered with a layer of non-porous material or covering 12. This will effectually prevent air from being forced down through the investment material and will permit the formation of a vacuous condition in the cells of the porous material contained in the flask 10. The vacuum plate 13 is supported on a pipe 43 which also forms a pedestal. The pipe 43 is supported upon the frame 44 which is provided with a passageway 46 leading to the valve 47. The top of the flask 10 is covered by a compression plate 48 supported on the end of the plunger 49. The compression plate 48 is provided with a packing ring 50 of asbestos or other suitable fire resisting material which fits over the upper edge of the flask 10 and the outer edge of the non-porous coating wafer cover 12 contained in the sprue of the mold. The packing ring 50 is positioned in a suitable annular channel contained in the compression plate 48. The compression plate 48 and the plunger 49 are provided with passage way 51 leading to the center of the pressure plate.

The plunger 49 is connected with a flexible tube 52 and a passage way 53 connects the passage way 51 of the interior of the tube 52. The tube 52 is connected to the frame 44. A passage way 54 Fig. 2 connects the interior of the tube with the valve 47 located in the frame 44. When the plate 48 is placed upon the upper edge of the flask 10 air may be forced through the tube 52 at any desired pressure to the top of the metal. The metal will be forced into every part of the matrix. The coating or covering will prevent the dissipation of the pressure and also prevent penetration of the air into the cells of the investment material and through the material to the vacuum plate 13 below.

A means may be provided for forcing the compression plate 48 against the outer edge of the flask 10 which will thereby make an exceedingly tight connection between the compression plate 48 and the outer edge of the flask 10 and will also provide a means for holding the compression plate squarely

on the top of the flask 10. Furthermore this means may be regulated so that opportunity will be given for the vacuum to act up through the investment material contained in the flask 10 before the air pressure is brought to bear upon the surface of the metal located in the sprue of the mold. The plunger 49 is connected to a relatively large piston 60, which moves in a cylinder 61 and is provided with a packing ring 62. The frame 44 is extended upward to form a pedestal or stanchion 63. The cylinder 61 is supported by means of an adjustable bracket 64 upon the stanchion 63. The stanchion 63 is square and bracket 64 is provided with a square opening adapted to receive the stanchion 63. A screw 65 is located in the bracket 64 which may be used to clamp the bracket 64 and the cylinder 61 in position. The upper end of the cylinder 61 is connected with a tube 66 by means of the passage way 67 which leads to the interior of the tube 66. The other end of the tube 66 is connected to the frame 44 and communicates with the passage way 68 which connects the interior of the tube with the valve 47. Air may be forced through the tube 66 into the chamber formed above the piston 69 in the cylinder 61 and the piston 60 will be forced outward. This will carry the compression plate 48 down upon the flask 10 and will tightly press the upper edge of the flask 10 and the outer edge of the coat or covering 12 against the annular washer or packing ring 50 and thus tightly hold or seal the connection between the compression plate 48 and the flask 10. It will also operate to press the flask 10 on to the vacuum plate 13 and thus coöperate in making a sealing connection between the flask 10 and the compression plate 48.

A means may be provided for preventing compression plate 48 being brought down with a jar against the flask 10. This means also may be used to regulate the period of time between the time when the air is first withdrawn from the vacuum plate 13 and the time when the air pressure is brought to bear upon the metal located in the sprue of the mold. This will give time for the vacuum to work up into and around the investment cup and remove all the air so that when the pressure is brought to bear upon the metal the metal will have entered into all parts of the cavity. The time will be so extended that the metal will still be in a moldable condition. The metal may thus be held under pressure while it is changing to the solid state and while it is being further cooled.

The plunger 49 may extend up into a cylinder 70 located centrally with respect to the cylinder 61. The upper end of the cylinder 70 may be suitably closed or capped. A vent 71 is formed in the cylinder 70. It connects the interior of the cylinder with the atmosphere. A screw 72 is provided which regulates the opening of the vent 71. The end of the screw 72 seats itself on a seat 73 surrounding the vent 71. The opening of the vent 71 may be adjusted by the screw 72. When the piston 60 is driven down by the air coming in through the tube 66 the air will gradually enter into the cylinder 70 and permit the plunger 49 to descend, carrying with it the compression plate 48 to the edge of the flask 10 so that the compression plate 48 will be carried down slowly and through a regulated interval of time to the upper edge of the flask 10 whereupon the air passing in through the tube 52 will press upon the surface of the metal contained in the sprue of the mold which transmits the pressure to the metal contained in the matrix.

A means may be provided for disconnecting gas from the blow pipe, provided a blow pipe is used for melting the metal pressed in the sprue on the mold, which will at the same time connect the vacuum plate 13 with a tank or a pump or other apparatus having vacuum capacity, and connect the compression plate 48 and the cylinder 61 with an air pressure tank, or with a pump or other apparatus having compressed air. The compression plate 48 and the cylinder 61 may be connected with containers having different air pressures.

In the figures I have shown the vacuum tank 80 which is connected to the valve 47 through the passage way 81 and the high pressure tank 82 which is connected to the valve 47 through the passage way 83 and the low pressure tank 84 which is connected to the valve 47 by means of the passage way 85. The tanks 80, 82 and 84 are secured by suitable straps or standards 86 to the base 87 to which also the supporting structure 44 is secured. Suitable couplings 88 connect the tanks 80, 82 and 84 with the passage ways 81, 83 and 85, formed in the casting 44. The valve 47 is seated in the frame 44 and is maintained in position by cap 89. It is operated through the stem 90 by means of a suitable arm 91. The valve 47 is rotated by the arm 91. The valve 47 is provided with a disk having suitable passage ways adapted to register and interconnect certain of the passage ways formed in the supporting structure 44. If it is desired to cut off the blow-pipe by the operation of the valve 47, the blow-pipe 100 may be supported on the stanchion 63 by means of the sliding rectangular supporting clamp 101 provided with an adjusting screw 102 which will secure the pipe 100 to the stanchion 63 in a proper position relative to the flask 10. The gas may be connected to the blow-pipe

100 by means of the tube 103. The tube 103 is connected to the frame 44 and passage way 104 connects the interior of the tube 103 with the valve 47. The frame 44 may also be provided with a passage way 105 which will make connection with the interior of the tube 106 which may be connected with the gas system or main or any other source of combustible material which may be used for melting the metal located in the sprue of the mold.

When the metal has been melted by the action of the blow-pipe 100, the lever 91 may be turned so as to rotate the valve disk 47 whereupon the gas connection between the tubes 103 and 106 will be cut off. This may be accomplished by rotating the disk of the valve 47 a short distance to the right. If rotated far enough it will open a communication with the passage way 46 and the passage way 81 which will establish a communication between the vacuum tank 80 and the vacuum plate 13. If desired, the valve may be constructed so that the movement of the valve to open connection between the vacuum tank 80 and the vacuum plate 13 will also open the communication with the air tanks and the compression plate 48 and the cylinder 61 or so constructed that the three connections may be opened in sequence as the valve 47 is turned short distances, step by step. If the three passages are opened at once, the air will be drawn from the flask 10 and also air will pass into the cylinder 61, and drive the piston slowly downward.

If desired, the connection between the cylinder 61 and the tank 82 may be restricted so that it will require time for the air to fill the space in the cylinder 61 above the piston 60 or the screw 72 may be so adjusted as to allow the air to enter the cylinder 70 very slowly so that there will be considerable interim of time between the closing of the compression cap 48 upon the flask 10 or the valve 110 may be opened so as to regulate the effective pressure on the piston 60. As soon as the compression cap 48 is closed on the mold air will press upon the surface of the metal in the sprue, whereupon the molten metal will be pressed into the cavity and also whereby the metal in a moldable and semi-fluid condition while hot, will be pressed with great pressure into the parts of the mold. This will greatly reduce shrinkage and prevent distortion and entirely remove the possibility of globular formation and produce a substantially perfect cast.

When the cast is cooled, the compression cap 48 together with the piston 60 and the plunger 49 may be raised by closing the valve 47, and also opening the valve 110 which will allow air to escape from the cylinders 61 and 70 when the compression plate 48 is lifted. This may be lifted by lifting on the ear 111 which forms a part of the compression plate 48 and the plunger 49. When the plunger or compression plate and the piston are raised, the valve 72 may be closed which will hold the plunger in its uppermost position until the plunger is operated the second time.

The tanks 80, 82 and 84 may be provided with stop cocks and nipples 115 which will permit connection with the pipes for forcing air into tanks 82 and 84 and withdrawing air from the tank 80.

The constructions selected and described may be greatly varied in the arrangement and connection of their parts and the substitution of elements having equivalent functions, without departing from the spirit of the invention which is described in the language of the elements shown.

What I claim as new, and desire to secure by Letters Patent is as follows:—

1. In combination, an investment flask containing a mold in the investment material, a vacuum plate for supporting the flask, a cap for closing the flask, means for withdrawing the air from the vacuum plate and for driving air to the top of the flask, and means for regulating the period of time between the first withdrawal of the air from the vacuum plate and the closing of the cap.

2. In combination, a flask, a vacuum plate for supporting the flask, a cap for covering the flask, means for driving air under pressure in to the cap, and means for regulating the time between the first withdrawal of the air from the vacuum plate and the closing of the cap.

3. In combination, a flask, a vacuum plate for supporting the flask, a cap, a piston and cylinder for closing the cap on the flask, tubes connecting the cap and the cylinder and the vacuum plate with sources of air pressure and vacuum, and a valve for regulating the passages of the said tubes.

4. In combination, a flask, a vacuum plate for supporting the flask, a cap for covering the flask, means for drawing air from the vacuum plate and phlegmatically operated means for closing the cap, a blow-pipe, a tube for directing gas to the blow-pipe, and a valve for controlling passages in the tube.

5. In combination, a flask, a vacuum plate for supporting the flask, a cap for covering the flask, a plunger and piston and cylinder for closing the cap on the flask, a check valve for controlling the operation of the plunger, tanks connected to the cylinder, the cap and the vacuum plate, and a valve for controlling the connections to the tank.

6. In combination a flask, a vacuum plate for supporting the flask, a compression cap

for covering the flask, containers for air above and below atmospheric pressure, a valve, tubes having passage-ways connecting the said containers with the said cap, and plate and a valve having passage-ways for controlling the said connections.

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

ROBERT W. SWEETNAM.

Witnesses:
S. T. KLOTZ,
F. E. AUL.