

April 27, 1937.

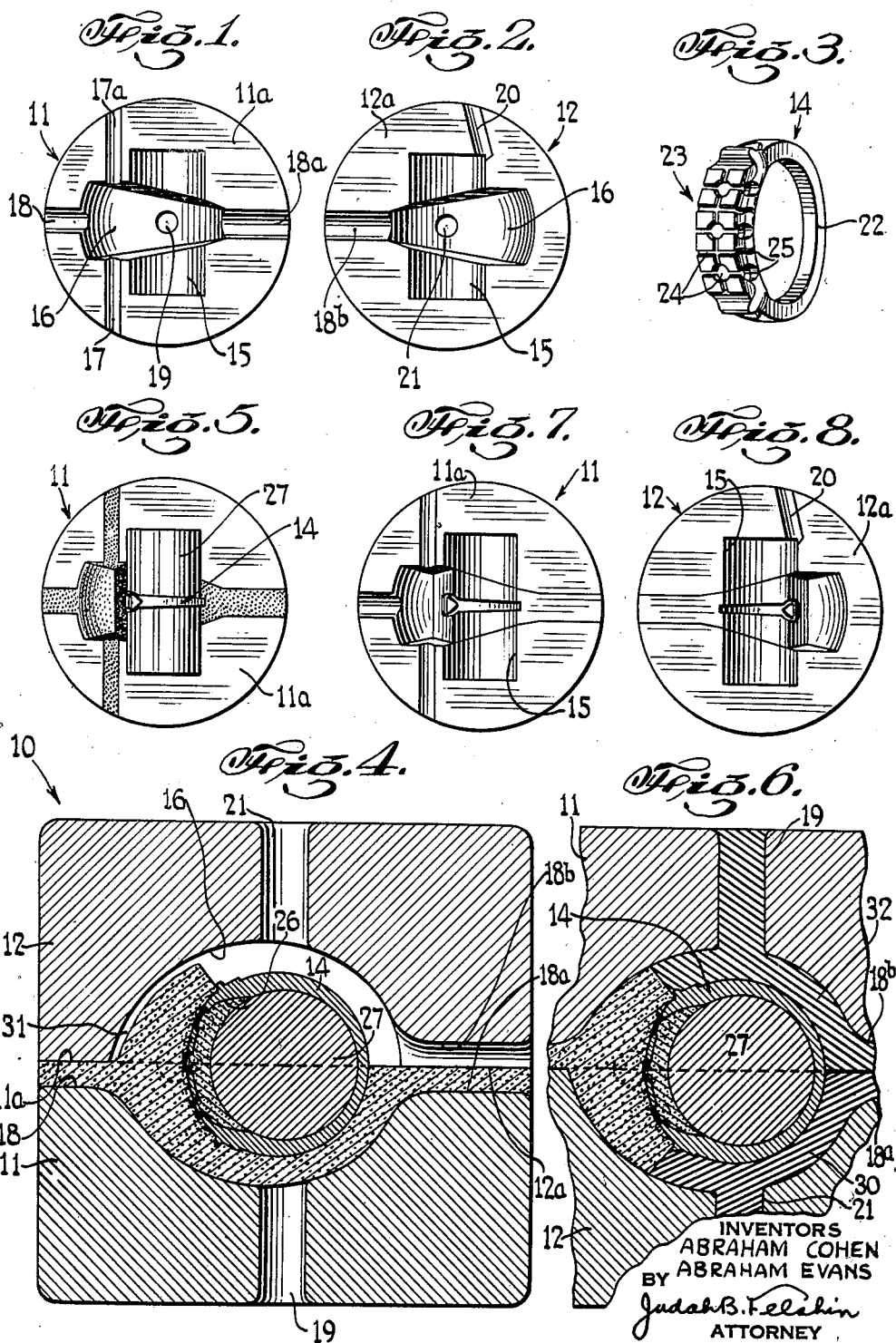
A. COHEN ET AL

2,078,562

CASTING

Filed Dec. 15, 1936

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Fig. 9.

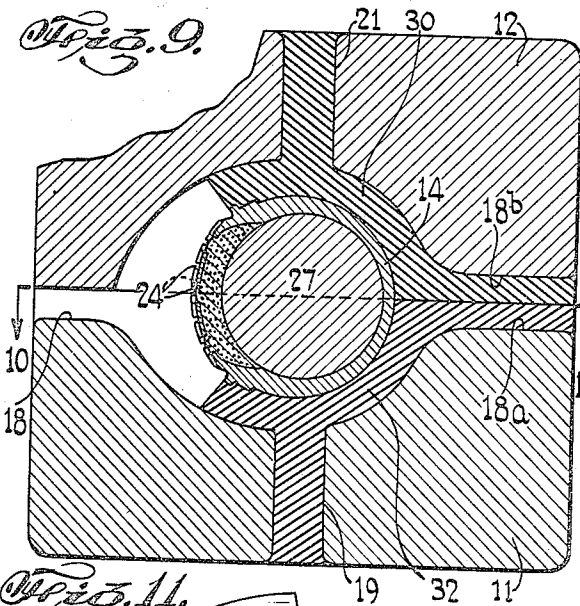


Fig. 10.

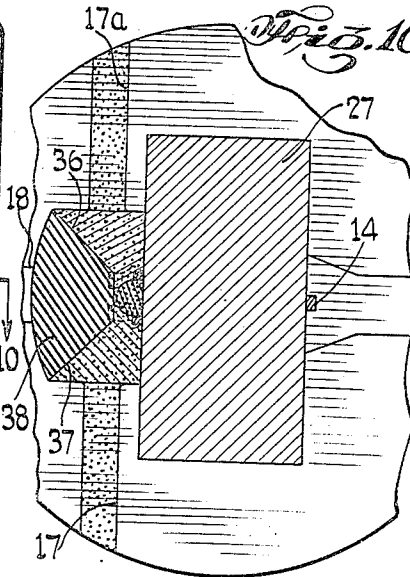


Fig. 11.

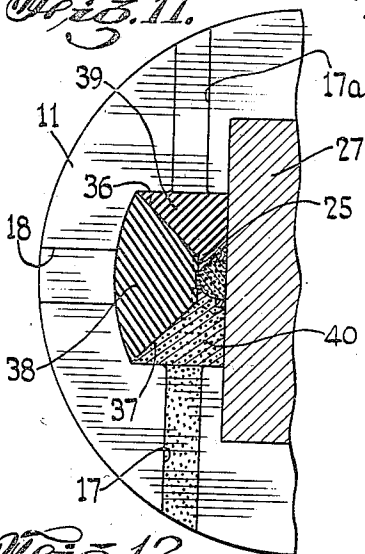


Fig. 13.

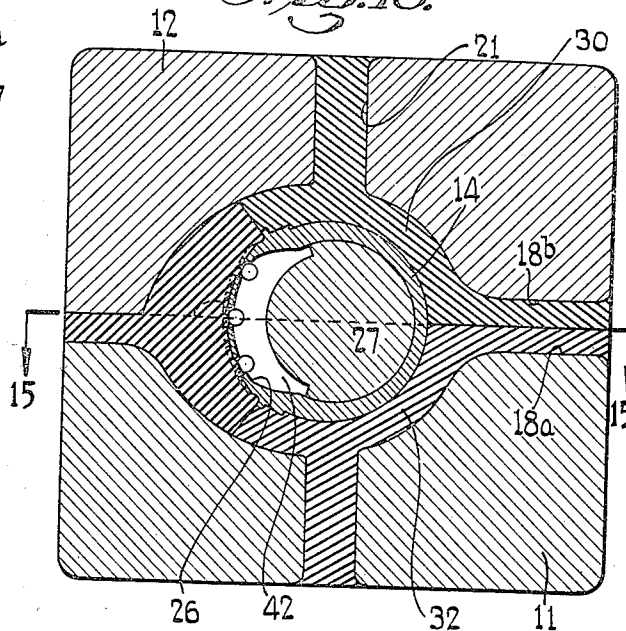


Fig. 12.

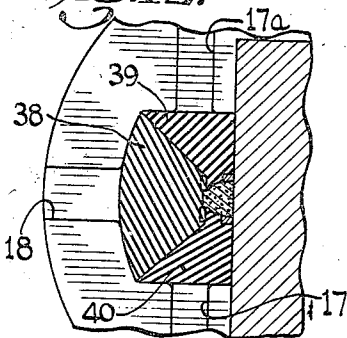
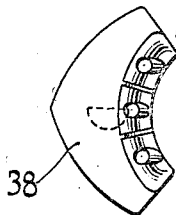


Fig. 14.



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Fig. 16.

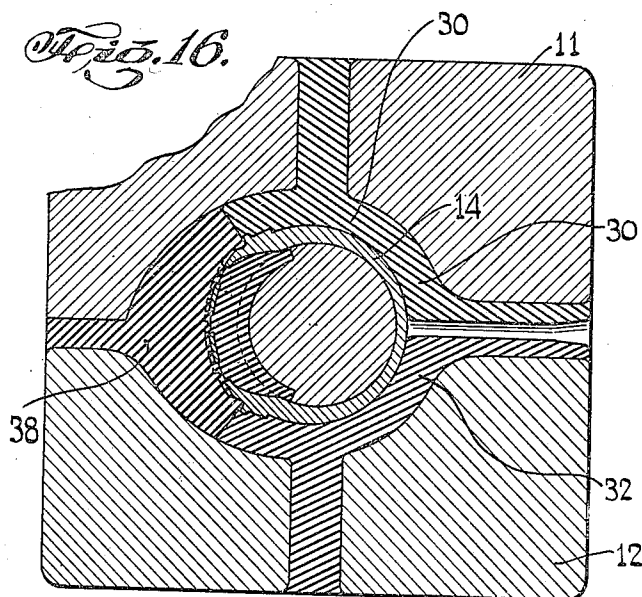


Fig. 15.

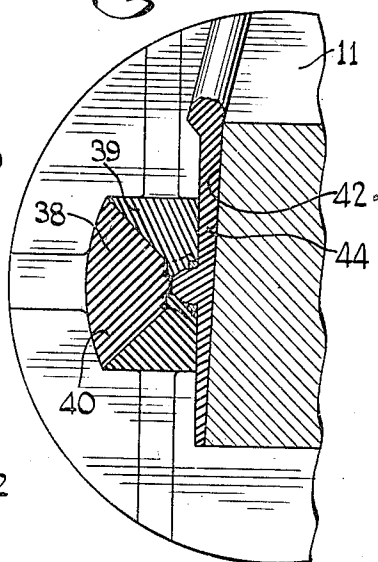


Fig. 17.

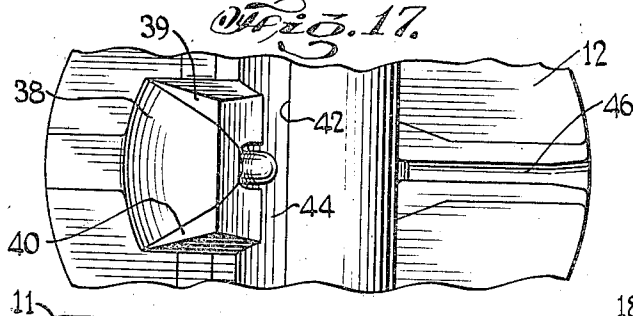


Fig. 18.

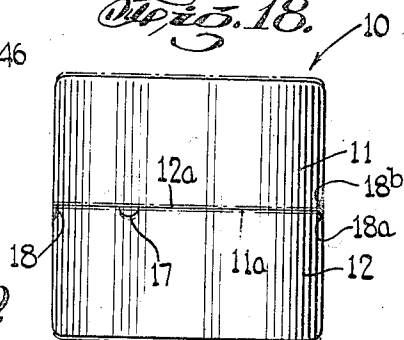


Fig. 19.

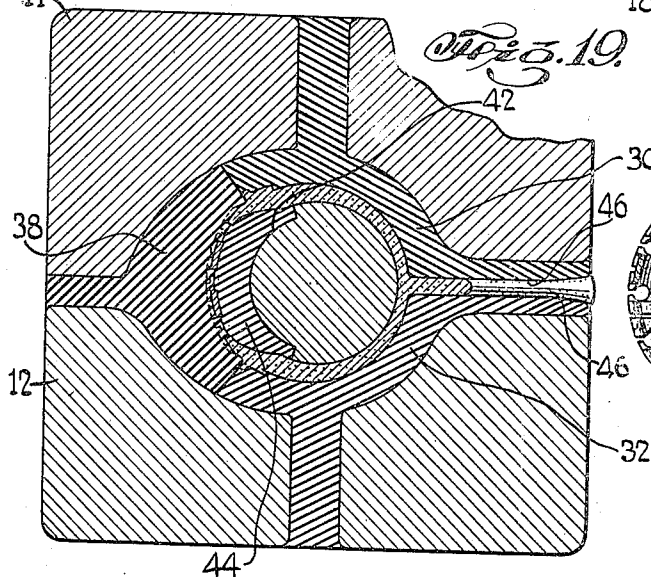
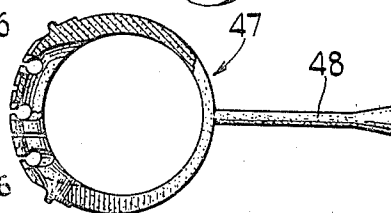


Fig. 20.



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CASTING

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Application December 15, 1936, Serial No. 115,964

11 Claims. (Cl. 22—114)

This invention relates to casting, and is particularly directed to a method of making a mold for casting wax or other fusible patterns adapted to be invested for casting metal articles.

5 An object of this invention is to provide a highly improved, simple and economical process of the character described for making an accurate sectional mold in which patterns made of material having a low melting point may be cast for use in investment casting process for casting metal articles.

A further object of this invention is to provide a highly improved, practical and efficient sectional mold for casting molded articles.

15 Other objects of this invention will in part be obvious and in part hereinafter pointed out.

The invention accordingly consists in the features of construction, combinations of elements, and arrangement of parts which will be exemplified in the construction hereinafter described, and of which the scope of application will be indicated in the following claims.

In the accompanying drawings, in which is shown one of the various possible illustrative embodiments of this invention,

25 Fig. 1 is a top plan view of the bottom casing employed in carrying out our improved process;

Fig. 2 is a bottom plan view of the upper complementary casing;

30 Fig. 3 is a perspective view of a model of a ring, illustrating the article for which a mold is to be made in accordance with our improved process;

35 Fig. 4 is an elevational, axial, cross-sectional view of the complementary casing portions assembled with the mandrel and the ring model of Fig. 3, and illustrating the method of making the mold section for one-half of the ring shank;

40 Fig. 5 is a top plan view of the bottom mold casing with the mandrel and ring mounted in position and the clay applied, as shown in Fig. 4 of the drawings;

45 Fig. 6 is a view similar to Fig. 4 with the mold casing turned upside down and illustrating the method of making the mold section for the other half of the ring shank;

50 Fig. 7 is a top plan view of the mold casing shown in Fig. 5 with the mandrel and ring removed, but with the mold section for the bottom half of the ring shank therein;

Fig. 8 is a bottom plan view of the other mold casing with the sectional mold for the other half of the ring shank therein;

55 Fig. 9 is an elevational, cross-sectional view of the mold casings illustrating the method of mak-

ing a mold section for the top of the ornamental portion of the ring;

Fig. 10 is a cross-sectional view taken on line 10—10 of Fig. 9;

Fig. 11 is a view similar to Fig. 10, but illustrating the method of making the mold section for a side of the ornamental portion of the ring;

Fig. 12 is a view similar to Fig. 11, but illustrating the step of making the mold section for the other side of the ornamental portion of the ring;

Fig. 13 illustrates the further step in making the mold section for the frazing portion of the ring;

Fig. 14 is a side elevational view of the mold section for the top of the ornamental portion of the ring;

Fig. 15 is a cross-sectional view taken on line 15—15 of Fig. 13 and showing the mold for the frazing portion of the ring;

Fig. 16 is an elevational, cross-sectional view of the mold casings assembled with all of the mold sections;

Fig. 17 is a top plan view of the bottom mold casing with the top casing removed together with its mold section for half the ring shank;

Fig. 18 is an elevational outside view of the mold casings prior to being pressed together with the mold sections and ring model therein;

Fig. 19 is an elevational, cross-sectional view illustrating the method of casting a wax ring with sprue thereon; and

Fig. 20 is a side elevational view of the wax ring pattern with sprue, cast with our improved mold.

Referring now in detail to the drawings, 10 designates a mold casing employed in carrying out our improved process for making mold sections for casting out of material having a low melting point, such as wax, patterns of articles of jewelry, or other metal articles which may be used in the usual investment casting process for casting such articles.

The mold casing 10 comprises complementary upper and lower symmetrical, cylindrical casing sections 11 and 12 having meeting contacting faces 11a and 12a. In the meeting faces are similar cavities or cut-out portions symmetrical about the meeting plane or faces 11a, 12a.

For the purpose of illustration, our improved process will be described and illustrated as applicable to the making of molds for casting patterns of rings, for example, such as the ring 14 shown in Fig. 3 of the drawings, although the process may be employed for making molds used in the manufacture of various other articles of jewelry

or other metal articles. The cavities or depressions or cut-out portions in each of the faces 11a, 12a consist of semi-cylindrical aligned portions 15 and an enlarged central cut-out portion 16 disposed between the semi-cylindrical cut-out portions 15. Said cut-out 16 may be narrow at one end and wide at the other. The face 11a of the casing section 11 may be formed with a plurality of grooves 17, 17a, 18 and 18a communicating with the sides and the ends of the cut-out 16. The casing section 11 may also be formed with an axial through passage 19. The casing section 12 may be formed in the face 12a thereof with a groove 18b registering with the groove 18a in the face 11a; and also with a groove 20 communicating with one of the semi-cylindrical portions 15 of said casing section, preferably that portion thereof adjacent the wider part of cut-out 16. The casing section 12 may also be formed with an axial through passage 21.

In accordance with our invention, a model 14 of the article to be ultimately cast is employed. The model may be made of brass or any other suitable material. The ring model 14 has a shank portion 22 and an ornamental portion 23. The ornamental portion has openings or cut-outs 24 at the outer periphery and openings or cut-outs 25 at the sides. The ring model 14 is also formed with a recess or frazing 26 on the inner surface of the ornamental portion 23. The ring model 14 is placed on the central portion of a cylindrical mandrel 27 which fits within the recesses 15 between the casing sections.

In carrying out our process, the casing sections are separated and the mandrel 27 with the ring model 14 thereon is placed on the lower casing section 11 with half the ring below the face 11a and half above. Thereafter all of the spaces in the lower casing section 11, including the grooves 17, 17a, 18 and 18a are filled with a soft substance such as modeling clay. The clay is also built up around the exposed upper half of the ornamental portion 23 of the ring, to the beginning of the shank portion, as illustrated in Fig. 5 of the drawings. Before the ring is placed on the mandrel, however, the cavity or frazing 26 is also filled with modeling clay. The clay is worked flush with the top surface 11a, except where the clay surrounds the upper half of the ornamental portion 23. The top casing section 12 is then placed on the lower casing section 11 in complementary relation thereto. It will be noted that all of the space between the casing sections is blocked out with the exception of the space surrounding the upper half of the ring shank and groove 18b. An alloy is then poured through the opening 21 to fill the groove 18b and the space surrounding the upper half of the shank 22; that is, the portion of the shank which projects into the cut-out 16 of the casing section 12. The alloy used may be an alloy of bismuth, tin and lead. Preferably, the alloy should have a melting point of about 200 degrees Fahrenheit and such as will expand somewhat when cooled, and which is fairly soft or pliable, for the purpose to appear hereinafter.

In Fig. 4 of the drawings is shown the casing sections prior to pouring the mold section 30 for one-half of the shank portion of the ring. The clay surrounding the upper part of the ornamental portion 23 of the ring need not completely fill the cut-out space 16. Whatever alloy, therefore, is poured between this portion of the clay and the bottom of the cut-out 16 of the casing section 12 in the space indicated by numeral 31, in Fig. 4, may be later cut away.

The mold section 30 may be left in the casing section 12 and forms a block-out while pouring succeeding mold sections. (As will appear hereinafter, as each mold section is poured, the remaining space between the mold casing sections 11, 12 and surrounding the ring is blocked out either by clay or mold sections already made, so as to leave only the space in which the alloy is poured. As each mold section is completed, it is used as a block-out either together with other mold sections or with clay block-outs.)

The two casings are then turned upside down. The casing section 11 which is now on top is removed. The clay is also removed from the bottom section 12 and any alloy which has poured within the space 31 is cut away. Clay is then reinserted to fill the space in cut-out 16 surrounding the ornamental portion of the ring. The clay is then removed from that portion of cut-out 16 of the casing section 11 which surrounds the shank of the ring and from the groove 18a. The clay is also cleared from the axial opening 19. The casing sections 12 and 11 are then placed together in complementary relation.

We now have clay only in the space surrounding the ornamental portion 23 of the ring and within the frazing portion 26 of the ring. This clay together with mold section 30 forms a block-out when pouring the next mold section. The alloy is now poured through the axial opening 19, forming a mold section 32 for the other half of the shank portion of the ring. A thin layer of machine oil or powdered rouge mixed with water or other separating means may be used on the exposed surfaces of the mold section 30 before the mold section 32 is poured to prevent the two mold sections from fusing. (The same separating means may be employed throughout the process as the other mold sections are poured, to separate adjacent mold sections.) In Fig. 6 there is shown the mold sections 30 and 32 in the casing sections 12 and 11 respectively. Said mold sections 30 and 32 may remain permanently within the casing sections 12 and 11.

Thereafter the clay may be removed from the space surrounding the outer side of the ornamental portion 23 of the ring, as shown in Fig. 9 of the drawings. The clay is left at the sides of the ornamental portion of the ring, as illustrated in Fig. 10 of the drawings, the inclined planes 36 and 37 indicating the planes of separation between the space in which the mold section is to be poured for the outer side of the ornamental portion of the ring. This section, designated by numeral 38, is poured through the groove 18. For the purpose of forming the mold section 38, the clay is removed from the openings 24 of the ornamental portion of the ring. The clay within the frazing portion 26, however, prevents the alloy from pouring within said frazing portion. When the mold 38 is formed, it may then be pulled away from the ring model 14. After the mold section is formed, it is replaced between the casing sections, and the clay is removed from one side of the ornamental portion of the ring and also from the groove 17a, the mold sections 30, 32 and 38 remaining and serving as block-outs, together with the clay at the other side of portion 23 of the ring.

The mold section 39 is then poured. Before forming the mold section 39, the clay is cleared from the openings 25 at the adjacent side of the ornamental portion of the ring and the alloy is likewise prevented from entering the frazed por-

tion 26 of the ring by the clay within said frazed portion.

Thereafter the clay is removed from the other side of the ornamental portion of the ring and from the groove 17 and from the openings 25 at the adjacent side of the ornamental portion of the ring. There is then poured the mold section 40 in the space so cleared.

The two mold casings 11 and 12 are then separated. The mandrel 27 is removed and a longitudinal portion of the mandrel adjacent the frazing portion of the ring is removed by filing, cutting, or in any other suitable manner, to form a groove 42, preferably tapering from one end to the other of the mandrel. The groove 42 communicates with the groove 20 of the casing section 12. The ring model 14 is then replaced on the mandrel with the clay removed from the frazing portion 26 of the ring, as shown in Fig. 15 of the drawings. Said frazing portion 26 now communicates with the groove 42. All of the previously made mold sections 30, 32, 28, 39 and 40 are reassembled together with the grooved mandrel 27 and the ring model. Alloy is then poured through the groove 20 between the casing sections to form the mold section 44 shown in Fig. 15 of the drawings, to fill the groove 42 and the mandrel and the frazing cavity 26 of the ring model.

It will now be noted that all the mold sections have been made, the mandrel 27 serving as a mold section for the inner surface of the ring. Since the alloy is such as expands upon cooling, when the casing sections 11, 12 are assembled with all of the mold sections, the mandrel and the ring model, the two casing sections will be somewhat spaced. Pressure may then be applied to force the casing sections 11, 12 together tightly for pressing the mold sections into close contact with the various portions of the ring model to form smoother and more accurate mold surfaces.

It will be noted that the mold sections 30 and 32 may remain permanently within the casing sections 11, 12, but the mandrel 27 and the mold sections 38, 39, 40 and 44 are removable and may be readily assembled together or disassembled. The ring model may then be removed and all the mold sections again assembled together. The portions of the mold sections 30, 32 within the registering grooves 18, 18a may then be formed with registering grooves 46 so that when the casing sections are assembled together with the mold sections and the mandrel, but without the ring model, wax or other substance of low melting point may be poured through the opening formed by the registering grooves 46 for casting, in wax, a pattern 47 of the ring 14 with sprue 48 thereon. The ring model 14 need not be further used, as any number of wax ring patterns 47 may be cast by the use of our improved mold.

To permit the wax rings to be more easily removed, a fine lubricant may be spread on the inner surfaces of the mold sections. The wax pattern may be invested in casting investment material as in the well known process of investment casting. The investment flask is then heated in the usual manner and the wax eliminated and the precious metal heated and forced into the mold by either centrifugal force or pneumatic means. Before investment, the wax patterns are preferably washed in a soap solution to remove the lubricating oil. Otherwise when the investment material is painted around the wax pattern said material will not sufficiently adhere thereto.

Although the invention has been illustrated as applied to the making of mold sections used in

the casting of rings, it will be understood that the process may be applied to other articles of jewelry or metal articles, it being a dominant feature of the invention that a mold section is made for each part of the model which will permit the mold sections to be separated from the model after said mold section is cast. The number of mold sections, therefore, depends upon the shape and configuration of the model.

It will be noted that the ring model 14 has openings 24 which are not parallel to one another, but are inclined substantially radially. However, since these openings are sufficiently wide and shallow, the projections formed on the mold section 38 in entering such openings will not prevent the mold section from being separated from the ring model without distortion. However, were said openings 24 smaller and longer or at a greater inclination to one another, the mold section 38 could be made in two or more parts to permit each mold section to be more readily separable from the ring model.

Pressing the mold casing sections together also produces a seal for the space in which the model is located after the model is removed, the various mold sections being pressed together at their meeting surfaces to produce such result. When pouring the wax, there is no chance of wax pouring into any crevices or spaces between the mold sections. The wax is introduced into the mold under pressure, preferably pneumatic pressure.

Instead of casting the various mold sections in the casing sections, the mold sections may be made in the following manner: Molten wax may be poured over a part of the model and as it chills pressed against said part with a spatula to form a negative impression. The wax is then removed and invested to cast a mold section in the usual investment casting process. This process may be repeated for making mold sections for various parts of the model. The various mold sections may then be placed into the casing sections. Alloy may then be poured in through the various grooves in the casing sections to fill whatever space there may be in the casing sections between the mold sections made in the investment process and the inner surfaces of said casing sections. As heretofore, the casing sections may then be pressed together to press the mold sections against the model and produce a sharp, accurate result.

It will thus be seen that there is provided a device in which the several objects of this invention are achieved, and which is well adapted to meet the conditions of practical use.

As various possible embodiments might be made of the above invention, and as various changes might be made in the embodiment above set forth, it is to be understood that all matter herein set forth or shown in the accompanying drawings is to be interpreted as illustrative and not in a limiting sense.

Having thus described our invention, we claim as new our desire to secure by Letters Patent:

1. A process of the character described consisting in placing a model of the ultimate article to be cast between mold casing sections having registering depressions forming a space surrounding said model, blocking out all of said space with a plastic material, except that portion of the space which is adjacent a portion of the model for which a mold section is to be made, and then pouring a casting material into said portion of said space to form a mold section for said portion of the model, then while leaving the model and

mold section already cast in place, removing an adjacent portion of the blocking out material to expose a different portion of the model and pouring the casting material into the space formed by removing the blocking out material to form a separate mold section for said last portion of the model contiguous to the first mold section.

2. A process of the character described consisting in placing a model of the ultimate article to be cast between mold casing sections having registering depressions forming a space surrounding said model, blocking out all of said space with a plastic material, except that portion of the space which is adjacent a portion of the model for which a mold section is to be made, and then pouring a casting material into said portion of said space to form a mold section for said portion of the model, then, while leaving the model and cast mold section in place, removing an adjacent portion of the blocking out material to expose a different portion of the model and pouring the casting material into the space formed by removing the blocking out material to form a separate mold section for said last portion of the model contiguous to the first mold section, and so on until mold sections are formed for every part of the model, then separating the mold casing sections, withdrawing the model and then replacing the mold sections and pouring through a suitable opening a melted material of low melting point into the space formerly occupied by the model, to form a casting pattern with a sprue thereon.

3. A process of the character described, consisting in placing a model of the article ultimately to be cast between mold casing sections having registering depressions forming a space surrounding said model, blocking out with a plastic modeling material all of said space with the exception of a portion thereof adjacent a portion of the model, and then pouring a melted metal alloy into the space which has not been blocked out, to form a mold section for a portion of the model, then, while leaving the model in place, removing a portion of the blocking out material, to expose a different portion of the model, and pouring casting material into the space formed by removing said portion of the blocking out material, to cast another separate mold section.

4. A process of making a sectional mold for a ring, consisting in placing a model of the ring on a mandrel, placing the mandrel between a pair of mold casing sections having registering depressions to receive the ends of the mandrel and registering depressions forming a space surrounding the model of the ring, filling all of the space between the two mold sections, with the exception of a portion adjacent a portion of the ring model, with a soft substance, and then pouring metal into the space which has not been filled to form a mold section for a portion of the ring.

5. A process of the character described, consisting in placing a complete model of the article ultimately to be cast, between mold casing sections having registering depressions forming a space surrounding the model, then successively blocking out all but different, adjacent portions of said space to successively leave remaining unblocked portions of said space surrounding different, adjacent portions of the model, and successively pouring casting material into each space remaining unblocked, whereby separate mold

sections may be formed for the different parts of the model, at least some of which sections may be removed from the casing sections, and leaving each mold section already cast in place while pouring succeeding casting mold sections and leaving the model in place while casting all of the mold sections, then separating the mold sections, withdrawing the model and reassembling the mold sections and casing sections, and pouring into the space formerly occupied by the model, melted wax, to cast a wax pattern.

6. A process for making a sectional mold for a ring formed with a cavity on the inner surface thereof, consisting in filling the cavity of a model of the ring with a soft substance, placing the model on a close-fitting mandrel, placing the mandrel between a pair of mold casing sections having registering depressions to receive the ends of the mandrel, and registering depressions forming a space surrounding the model of the ring, filling all of the space between the two mold casing sections with a soft substance, with the exception of a portion of the space surrounding the ring model, then pouring molten metal into the space which has not been filled to form a mold section for a portion of the ring, then successively removing different portions of the filling material to expose different parts of the ring and successively filling each space formed by removing the soft material, with a molten metal to successively form mold sections for different parts of the ring surrounding the mandrel, leaving the mold sections already formed in place within the mold casing sections when making succeeding mold sections, then removing the mandrel and the soft substance which fills the cavity in the ring model, and placing the ring on another mandrel having a longitudinal groove communicating with said cavity, replacing the mandrel with the ring model thereon and the mold sections within the mold casing sections and pouring molten metal into the longitudinal groove of the mandrel and into the cavity of the ring model to form a mold section for said cavity.

7. In combination, a plurality of complementary mold casing sections, a mandrel having a longitudinal groove in part of the outer surface thereof, said groove being tapered longitudinally, the meeting faces of said mold casing sections having registering depressions to receive the ends of the mandrel and registering depressions forming a space surrounding the central portion of the mandrel, a mold section for a ring comprising a portion filling the tapering groove in the mandrel, and a portion projecting thereon having the shape of the interior fraying of a ring, and a plurality of contiguous mold sections between the mold casing sections and in the space surrounding the central portion of the mandrel, and comprising molds for different parts of a ring.

8. In combination, a pair of complementary mold casing sections, a removable mandrel disposed between said casing sections, said mold casing sections having registering depressions in the meeting faces thereof to receive the ends of the mandrel, and registering depressions forming a space surrounding an intermediate portion of said mandrel, and a plurality of contiguous mold sections in said space and surrounding said mandrel.

9. A process of the character described, consisting in placing a model between a pair of mold casing sections having registering depressions in the meeting surfaces thereof, forming a space

surrounding the model, then successively pouring separate contiguous mold sections for various parts of the model out of an alloy which expands upon cooling, whereby to separate said mold casings somewhat, and which is softer than the material from which the model is made, and then pressing said mold casing sections together for pressing said mold sections against the model to cause plastic deformation of the mold sections.

10 10. A process of the character described, consisting in placing a complete model of the article ultimately to be cast between mold casing sections having registering depressions forming a space surrounding the model, then blocking out all of said space with a plastic modeling material, except a portion of said space adjacent a portion of the model, then pouring a casting material into said portion of said space to make a mold section for said portion of said model, then successively removing successively adjacent portions of the plastic material for blocking out all but different successively adjacent portions of said space to successively leave remaining unblocked, portions of said space surrounding successively adjacent portions of the model, and successively pouring casting material into each space remaining unblocked, to form separate mold sections for the different parts of the model, and leaving

the mold sections already cast in place and using said mold sections already cast together with the remaining plastic material as block-outs while pouring succeeding mold sections, and also leaving the model in place while making all of the mold sections.

11. A process of the character described, consisting in placing a model between mold casing sections having registering depressions forming a space surrounding the model, then blocking out all but a portion of said space with a plastic material, to leave remaining unblocked a portion of said space surrounding a portion of the model, and pouring into said space remaining unblocked, a melted alloy of substantially 200 degrees melting point and which is adapted to expand upon cooling and which is softer than the material from which the model is made, to form a mold section for said portion of the model, then removing a portion of the blocking out material to expose a different portion of the model, and then, while leaving the model in place pouring the same alloy in the space formed by removal of the plastic material to form another mold section.

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