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SAFETY PLUG FOR PRESSURE COOKERS

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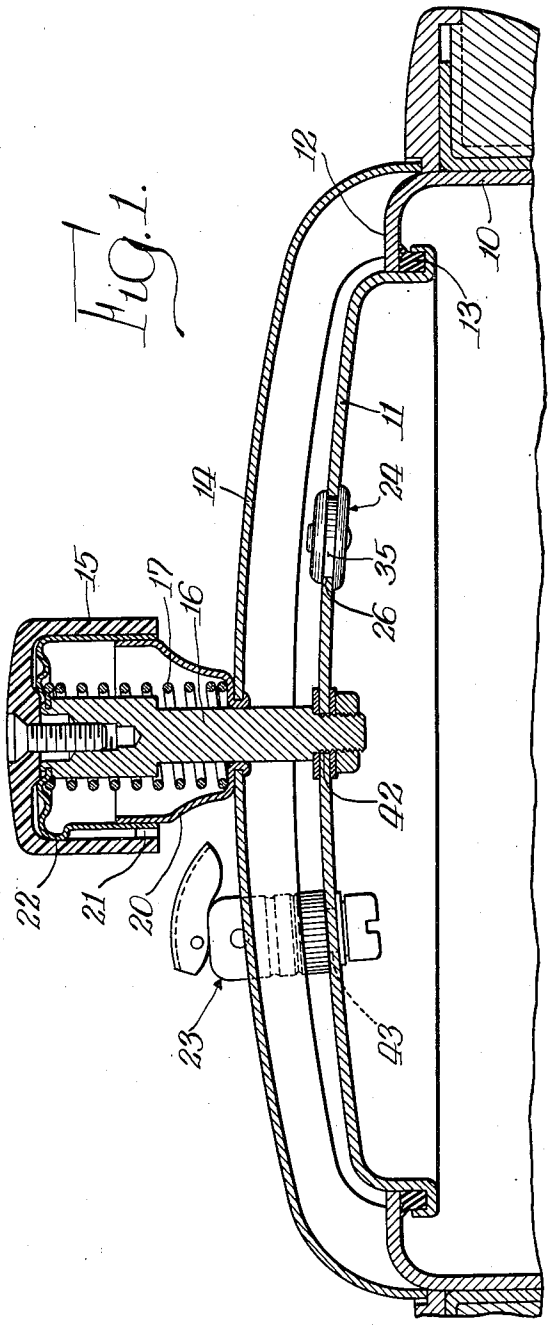


Fig. 1.

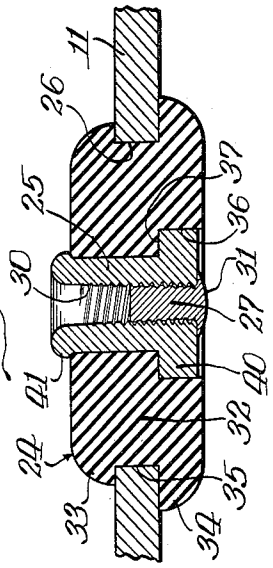


Fig. 3.

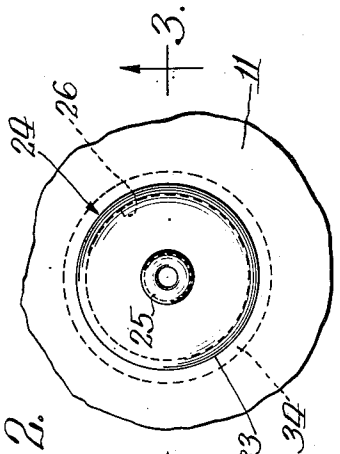


Fig. 2.

INVENTORS.
Myron J. Zimmer,
BY Edmund L. Dushey,
Davis, Lindsey, Hibben & Rogers
Attys.

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SAFETY PLUG FOR PRESSURE COOKERS

Myron J. Zimmer, Wood Dale, and Edmund L. Duskey, Western Springs, Ill., assignors to Ekco Products Company, Chicago, Ill., a corporation of Illinois

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11 Claims. (Cl. 220—44)

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The invention relates to safety plugs for limiting the pressure attained in a pressure cooker, particularly in a cooker of the type adapted for home use.

The general object of the invention is to provide a novel safety plug for a pressure cooker of the foregoing type, which operates either on excessive pressures or excessive temperatures.

Another object is to provide a novel safety plug for a pressure cooker, having two different forms of pressure releasing means, thus definitely insuring release of excessive pressure, should either of such means fail to act.

A further object is to provide a novel safety plug for a pressure cooker, which includes a release fundamentally dependent on temperature for its operation and a release dependent upon pressure alone.

Still another object is to provide a novel safety plug for a pressure cooker, which combines two releasing means in a single assembly having a size substantially the same as that employed for a plug providing a single release.

A still further object is to provide a novel safety plug for a pressure cooker for home use, which includes a fusible metal release so mounted that it does not involve the customary threaded connection with the cover and can easily be replaced by the user merely by forcing it into the aperture in the cover provided therefor.

Other objects and advantages will become apparent from the following description taken in connection with the accompanying drawings, in which:

Figure 1 is a fragmentary vertical sectional view of a pressure cooker having a cover provided with a safety plug embodying the features of the invention and showing the cover of the cooker in closed position.

Fig. 2 is a fragmentary plan view of the cover of the pressure cooker and showing the plug in position therein.

Fig. 3 is an enlarged sectional view taken on the line 3—3 of Fig. 2 and showing certain parts of the plug exaggerated to illustrate a feature of the invention.

In pressure cookers of the type adapted for home use, a spring-operated pressure release is usually provided, which permits relief of the pressure in the cooker when the pressure therein reaches a predetermined value. The release device usually comprises some form of valve which is held seated by a spring and is adapted to be opened against the force of the spring by the pressure in the receptacle. Because of the fact

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that food particles may lodge in the passages leading to such valves and render the valve inoperative, a safety plug is usually employed, such plug being mounted in the cover and being of a character which cannot normally be rendered inoperable from contact with food in the receptacle. Such safety plugs are usually of two forms, one comprising a resilient rubber disk retained in an aperture in the cover and adapted, when the pressure reaches a predetermined value above that for which the spring-operated valve is set, to become distorted and be forced or blown out of the aperture in the cover, thus relieving the pressure in the receptacle. The other form of plug frequently employed is of the fusible metal type, in which a small slug of fusible metal is mounted in a sleeve secured in an aperture in the cover. The fusible metal is of such character that it will soften at a temperature corresponding to the boiling point of water at a predetermined pressure. When such predetermined pressure and temperature are reached within the receptacle, the fusible metal softens sufficiently to be blown out of the sleeve in which it is mounted by the pressure within the receptacle and thus relieve the pressure therein.

Both types of safety plugs may, through an aging process or from misuse, be rendered inoperable to relieve the pressure at the desired value. Thus, the resilient rubber type of plug may, through age and constant subjection to high temperature, become so hard or so adherent to the metal of the cover that it cannot be forced through the aperture in the cover except by a pressure substantially higher than desired. The fusible metal may from misuse become so jammed in its mounting sleeve that it may not operate properly. It is true, of course, that the occasions when such difficulties arise are rare and under normal conditions either of these forms of safety plugs is sufficient. However, because of the great damage and injury that could result from permitting excessive pressures to be attained in a pressure cooker, it is of utmost desirability to insure operation of the safety plug under all circumstances.

The present invention provides a safety plug embodying the features of both of the former types and so combining them in a single structure that they may be easily handled in manufacture and in use. Thus, we may provide a safety plug of the fusible metal type, in which a slug of fusible metal is mounted in a metallic sleeve located within an aperture in the cover of the cooker. The sleeve, of course, has to be sealed to the cover to prevent leakage therebetween and to be able

to attain a pressure within the receptacle. Ordinarily, a gasket of flexible material is employed between the metal sleeve and the cover to effect a sealing relation therebetween.

With the present invention, the sealing means between the metal sleeve and the cover is enlarged and made of a resilient material so that, with a predetermined pressure in the receptacle, the sealing means will be distorted sufficiently to be forced through the aperture in the cover and thus relieve the pressure in the receptacle. The fusible metal on the other hand is preferably of such character and is so mounted in its sleeve that it will be softened sufficiently to be forced out of the sleeve at a temperature corresponding to the boiling point of water at a different predetermined pressure in the receptacle. Such safety plug is intended to be used in a cooker along with the spring-operated valve type of release so that there is provided, first, a spring-operated valve adapted to open at one predetermined pressure, the resilient sealing means of the safety plug adapted to be forced out of the cover at a somewhat higher predetermined pressure, and the fusible metal adapted to soften and be forced out of its sleeve at a still higher predetermined pressure. The invention, however, is not limited to a safety plug in which the resilient sealing means is adapted to be released at a pressure lower than the fusible metal plug. The arrangement may be such that the fusible metal plug is released at a lower pressure than the resilient sealing means.

To illustrate the invention, we have shown in Fig. 1 of the drawings one type of pressure cooker, but it is to be understood, of course, that our invention is not limited to this particular type and may be used in cookers of other types. In Fig. 1 of the drawings, the receptacle is indicated at **10** and the cover at **11**. In this particular cooker, the receptacle is provided at its top with an inwardly turned flange **12** having an elliptical opening therethrough, and the cover **11** carries a resilient gasket **13** adapted to engage the underside of the flange **12** to seal the receptacle. The cover **11**, in order to be removed, is adapted to be lowered sufficiently to move the gasket **13** out of contact with the flange **12** and then to be rotated through 90° so that the short diameter of the cover is aligned with the long diameter of the opening through the flange **12**, and the cover may then be tipped to remove it from the receptacle. The cover is supported by a bridge member **14** adapted to rest at its ends on the periphery of the receptacle **10**, and the cover is adapted to be rotated by a knob **15**. The knob **15** is connected to the cover **11** by means of a stem **16**, and a spring **17** is interposed between the bridge member **14** and the knob **15** tending to lift the cover so that the gasket **13** is in sealing engagement with the flange **12** of the receptacle. The bridge member **14** may be provided with a cup-shaped member **20** having interlocking means indicated at **21**, with a sleeve **22** mounted within the knob **15**, so that the cover may be locked in a lowered position relative to the bridge member **14**. Such locking means is disclosed in the Myron J. Zimmer application Serial No. 598,725, filed June 11, 1945, and now Patent No. 2,531,717, but forms no part of the present invention.

A spring-operated valve type of pressure release, indicated generally at **23**, may be mounted on the cover **11**. Such release is preferably mounted so that it occupies a position adjacent the bridge member **14** when the cover is in sealing

engagement with the receptacle. The cover, when turned by the knob **15** to move it out of alignment with the receptacle opening, of course carries the pressure release **23** with it and thus there is space between the two sides of the bridge member **14** for such turning movement of the pressure release without interference.

The safety plug embodying the features of the invention is indicated in the drawings at **24**. Such safety plug, as heretofore mentioned, embodies two modes of operation to permit release of pressure at two predetermined values so that, in case anything renders one of such modes inoperative, the other mode is available for operation. To this end, the safety plug **24** comprises a metal sleeve **25** adapted to be located in an aperture **26** in the cover **11**. The metal sleeve is adapted to receive interiorly a slug **27** of fusible metal. Such fusible metal is composed of various well-known metals adapted to soften and eventually fuse at known temperatures. By using predetermined proportions of such metals, the plug **27** may be such that it will operate at a predetermined temperature. In the present instance, such predetermined temperature is that corresponding to the boiling point of water at a predetermined pressure. Thus, the fusible metal plug will soften sufficiently to be blown out of the sleeve **25** at a predetermined pressure within the receptacle **10**.

In the preferred construction shown in Fig. 3, the interior of the sleeve **25** is tapered as at **30** and threads are cut in the taper so that full threads are formed at the lower end of the sleeve and the threads thereabove are reduced by the taper to such an extent that at the top of the sleeve no threads at all appear. The fusible metal, after being placed in sleeve **25**, is swaged so that part of the metal thereof is forced into the threads at the lower end of the sleeve **25** and a portion thereof is more or less riveted over the lower end of the sleeve **25**, as indicated at **31**. When the plug **27** softens, the swaged portion **31** at the lower end of the sleeve can be easily distorted, under the pressure within the receptacle, and the portion of the fusible metal forced into the threads will also be distorted so that the plug will be forced upwardly through the sleeve by the pressure. By the tapered character of the threads within the sleeve, upward movement of the plug therethrough is more easily effected the farther up the plug **27** is moved. Thus, once a pressure sufficient to start the plug moving is attained, the plug will be forced all the way through the sleeve and out of the top thereof without danger of its becoming jammed in the upper portion of the sleeve. This insures definite operation of the pressure release at the desired pressure. While we have shown the interior of the sleeve **25** as being threaded, it is, of course, obvious that any other form of roughening of such interior would provide the necessary action. However, threading of the sleeve is a simple operation to perform and, therefore, to facilitate manufacture, it is employed.

As heretofore mentioned, fusible-metal safety plugs are usually mounted in the cover of the receptacle with a gasket of resilient material interposed between the metal sleeve and the cover, so that a definite seal will be effected therebetween. In the present instance, a resilient seal is interposed between the sleeve **25** and the cover **11**, but such seal is so formed that it is given the additional function of constituting in itself a pressure release, such release occurring at a pressure differing from that under which

the plug 27 will be released. In the present instance, such seal is provided by means of a resilient rubber disk 32 centrally apertured to receive the sleeve 25 and adapted to be inserted and retained in the aperture 26 in the cover until distorted by pressure sufficiently to be blown out of the aperture 26. The disk is preferably made of a synthetic rubber which will not be affected by heat within the temperature ranges herein contemplated and is resistant to oil and grease, such as the synthetic material known as "neoprene."

The disk 32 in its preferred form is provided with an upper flange 33 which overlaps the marginal portion of the cover about the aperture 26 only sufficiently to permit the plug 32 to be retained therein under ordinary handling. The flange 33 is preferably made as small as possible so that the plug 32 may be inserted in the aperture 26 from the inside of the cover 11 without having to distort the plug 32 to any great extent. The plug 32 also includes a lower flange portion 34 which engages the under surface of the cover 11 about the aperture 26 and provides the desired seal. The two flanges 33 and 34 thus provide a peripheral groove 35 in the disk 32 in which the edge of the cover 11 is seated, the root diameter of the groove being such that the plug snugly engages the edge of the metal. Under normal pressures within the receptacle, the flange portion 34 is forced against the under face of the cover 11 and effects a seal therewith, the pressure thereby maintaining the desired sealing relation. However, when the pressure exceeds a predetermined value, such pressure will distort the flange portion 34 and the material adjacent thereto sufficiently to force the disk 32 upwardly through the opening 26 to relieve the pressure in the receptacle.

It has been found that if the distortion of the plug necessary to permit its release from the opening 26 is substantially confined to distortion of the flange portion 34 and the material adjacent thereto, a more uniform operation is obtained. Thus, all plugs manufactured of a given material and in a given mold will operate at substantially the same value. To confine the distortion necessary for release of the disk member 32 from the cover, the central aperture in the disk 32 in which the sleeve 25 is positioned is countersunk as at 36 to provide a shoulder 37 which lies in substantially the same plane as the under surface of the cover 11 adjacent the opening 26. The sleeve 25 is provided with a flange 40 at its lower end fitting within the countersunk end 36 of the disk 32 in engagement with the shoulder 37. The pressure in the receptacle, of course, is applied to the inner end of the sleeve 25 and the plug 27, in addition to being applied to the inner face of the disk 32. Force due to such pressure exerted on the plug 27 and sleeve 25 is transmitted through the flange 40 to the shoulder 37. Since such force is exerted on the disk 32 in the same plane with the lower face of the cover 11, the material of the disk 32 within the aperture 26 and thereabove does not have to be distorted in order to be forced through the aperture 26. Only the flange portion 34 and the material immediately adjacent thereto need be distorted, so that uniform operation of disks of this character is thereby obtained. The upper end of the sleeve 25 is also provided with a small flange or bead 41 sufficient to retain the sleeve within the disk 32. The bead 41 is preferably rounded so as to facilitate insertion of the sleeve

25 into the disk 32 from the inner face thereof, the disk 32 having a snug fit about the main body of the sleeve 25.

The combining of the two safety releases into one assembly has an added feature when the various parts of the cover are considered. The cover, as will be noted, is centrally apertured as at 42 for the stem 16. At the left side of the cover, as shown in Fig. 1, the cover is also apertured at 43 for the spring-operated pressure release 23. The safety plug 24 is preferably mounted under the bridge member 14 so that when either the disk 32 is blown out of the aperture 26 or the fusible metal plug 27 is blown out of the sleeve, they will strike the bridge member 14 instead of being blown at some distant point in the room or into the face of the person using the cooker. The bridge member 14 thus serves as a guard when either of these parts is blown out of the cover. With such positioning of the safety plug 24, the aperture 26 is generally aligned with the apertures 42 and 43. If the fusible metal plug and resilient disk 32 were mounted separately in the cover, this would involve still another aperture in such line and there would result a general weakening of the cover along that line.

The total forces involved are rather substantial. Thus, assuming that the spring-operated release 23 is set for 15 pounds and assuming the area of the cover 11 is approximately 30 square inches, the total force on the cover when this pressure is attained is in the neighborhood of 450 pounds. Assuming that the disk 32 is constructed to release at a pressure of 25 pounds per square inch, the total force on the cover is then in the neighborhood of 750 pounds. If the fusible metal plug 27 is adapted to be released at a pressure of, say, 35 pounds per square inch, the total pressure on the cover is in the neighborhood of 1050 pounds. It is evident from these figures that the force exerted on the cover is relatively large so that any weakening of the cover might result in distortion thereof under such pressure. Any distortion of the cover cannot be tolerated, of course, because it would tend to produce leakage of pressure between the gasket 13 and the flange 12 of the receptacle. By combining both the fusible metal plug 27 and the resilient disk 32 into one structure, one aperture through the cover is eliminated so that the cover will not thereby be weakened to any substantial extent.

The inclusion of a fusible metal release as a part of the present plug provides a feature inherent in the use of such metal. For example, should a slight leak develop in or about the cover, the desired pressure in the receptacle may not be obtained but the water placed in the receptacle or included in the food therein will be permitted to boil away, leaving the receptacle dry. Under such circumstance, continued application of heat to the cooker would, of course, burn the food by causing an excessively high temperature within the receptacle. Such condition would not be readily detected except by the odor resulting therefrom. The fusible metal, however, will soften at a predetermined temperature, even though no great amount of pressure is present. The fusible slug 27 will, therefore, soften and may drop into the receptacle to open the sleeve 25. The odor of the overheated food can then pass out through the sleeve and will be readily detected before the receptacle is damaged by excessive heat.

From the foregoing, it is apparent that we have provided a novel safety plug for a pressure cooker, in which two releasing means are provided. The rubber disk 32 will be released as a result of pressure along. The fusible metal, however, will be released either under the influence of the temperature corresponding to the boiling point of water attained under a predetermined pressure or will be released under the attainment of an excessive temperature alone without excessive pressure.

We claim:

1. A pressure relief plug for a pressure cooker, comprising a resilient disk member adapted to be placed in an aperture in the cover of the cooker and having a peripheral groove adapted to receive the marginal portion of said cover about said aperture, said disk having a central bore, a sleeve secured in said bore, and a fusible member mounted in said sleeve, said disk being adapted to be forced out of said aperture at a predetermined pressure in said cooker and said fusible member being adapted to be softened sufficiently to be forced out of said sleeve at a temperature corresponding to a different predetermined pressure.

2. A pressure relief plug for the cover of a pressure cooker, comprising a metal sleeve, a fusible metal plug mounted in said sleeve and adapted to be released by softening at a temperature corresponding to a predetermined pressure, and a resilient rubber disk having a central aperture in which said sleeve is mounted, said disk being adapted to be positioned in an aperture in the cover with a peripheral groove in the disk to receive the marginal portion of the cover about said cover aperture.

3. A pressure relief plug for the cover of a pressure cooker, comprising a centrally apertured resilient rubber supporting disk adapted to be placed in an aperture in the cover of the cooker and having peripheral flanges adapted to engage opposite faces of the cover about said cover aperture, a metal sleeve mounted in and extending through the central aperture in said disk and having flange portions at opposite ends engaging the faces of the disk to hold the sleeve within the disk aperture, and a fusible metal plug mounted in said sleeve and adapted to be released by softening at a temperature corresponding to a predetermined pressure.

4. A pressure relief plug for the cover of a pressure cooker, comprising a centrally apertured resilient rubber supporting disk adapted to be placed in an aperture in the cover of the cooker and having peripheral flanges adapted to engage opposite faces of the cover about said cover aperture, a metal sleeve mounted in and extending through the central aperture in said disk and having flange portions at opposite ends engaging the faces of the disk to hold the sleeve within the disk aperture, and a fusible metal plug mounted in said sleeve and adapted to be released by softening at a temperature corresponding to a predetermined pressure, the outer flange on the disk being only sufficient in size to prevent dislodgement of the plug in handling the cover and the inner flange on the disk being sufficient in size to hold the plug in place up to a predetermined pressure, the flange portion on the outer end of said sleeve being rounded in form to facilitate insertion of the sleeve through said disk.

5. A pressure relief plug for a pressure cooker, comprising a resilient rubber disk adapted to be inserted in an aperture in the cover of the cooker and having a flange portion adapted to engage the inner surface of the cover about said aperture, said disk having a central aperture countersunk at its inner end to provide a shoulder lying in substantially the same plane as the cover-engaging surface of said flange portion, a metal sleeve fitting snugly in said central aperture and having a flange fitting in the countersunk end thereof in abutment with said shoulder, and a fusible metal plug mounted in said sleeve, the pressure on said sleeve and plug being applied to said shoulder whereby, when said disk is forced out of the aperture by pressure, only the portion of said disk adjacent to and including said flange portion need be distorted.

6. A pressure relief plug for a pressure cooker, comprising a metal sleeve adapted to be located in an aperture in the cover, a fusible metal plug mounted in said sleeve, and resilient means interposed between said sleeve and the cover to provide a seal between said sleeve and said cover, said means being distortable under pressure to permit release of said means through said aperture.

7. A pressure relief plug for a pressure cooker, comprising a metal sleeve adapted to be located in an aperture in the cover, a fusible metal plug mounted in said sleeve, and an annular resilient rubber member interposed between said sleeve and the cover to provide a seal therebetween and being distortable under pressure to permit it to be forced through said aperture.

8. A pressure relief plug for a pressure cooker, comprising a supporting member adapted to be located in an aperture in the cover of the cooker and having a tapered bore with its smaller diameter at its inner or lower end, said bore being threaded with constant diameter threads whereby the depth of the threads decreases toward the top of the bore, and a fusible metal plug mounted in the lower end of the bore and swaged to enter the threads at said lower end, the decrease in depth of the threads toward the top of the bore facilitating release of the plug when softened and forced outwardly by pressure in the cooker.

9. A pressure relief plug for a pressure cooker, comprising a supporting member adapted to be located in an aperture in the cover of the cooker and having a tapered bore with its smaller diameter at its inner or lower end, said bore having grooves of constant root diameter whereby the depth of the grooves decreases toward the top of the bore, and a fusible metal plug mounted in the bore with the metal of the plug formed into said grooves, the decrease in depth of the grooves toward the top of the bore facilitating release of the plug when softened and forced outwardly by pressure in the cooker.

10. A pressure relief plug for a pressure cooker, comprising a supporting member adapted to be located in an aperture in the cover of the cooker and having a bore extending therethrough, and a fusible metal plug mounted in said bore, the surface of said bore being transversely roughened to provide inward projections separated by depressions and the metal of the plug being formed into said depressions to hold the plug against movement in the bore, the diameter of said projections increasing toward the top or outer end of said bore to facilitate release of the plug when softened and forced outwardly by pressure in the cooker.

11. A pressure relief plug for a pressure cooker, comprising a centrally apertured resilient rubber disk adapted to be placed in an aperture in the

cover of the cooker and having peripheral flanges adapted to engage opposite faces of the cover about said aperture, and a metal plug located in the central aperture of said disk and movable axially of said disk by a predetermined pressure in the cooker to release the pressure.

MYRON J. ZIMMER.
EDMUND L. DUSKEY.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
670,794	Lott	Mar. 26, 1901
1,142,902	McNutt	June 15, 1915
1,750,335	Taylor	Mar. 11, 1930
2,173,999	Grundstrom	Sept. 26, 1939
2,224,296	Hoffman	Dec. 10, 1940
2,301,724	Vischer, Jr.	Nov. 10, 1942