Aug. 12, 1947. C. J. HUEBER ET AL 2,425,325

PRINTING PLATE AND CARRIER THEREFOR

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FIG. 1.

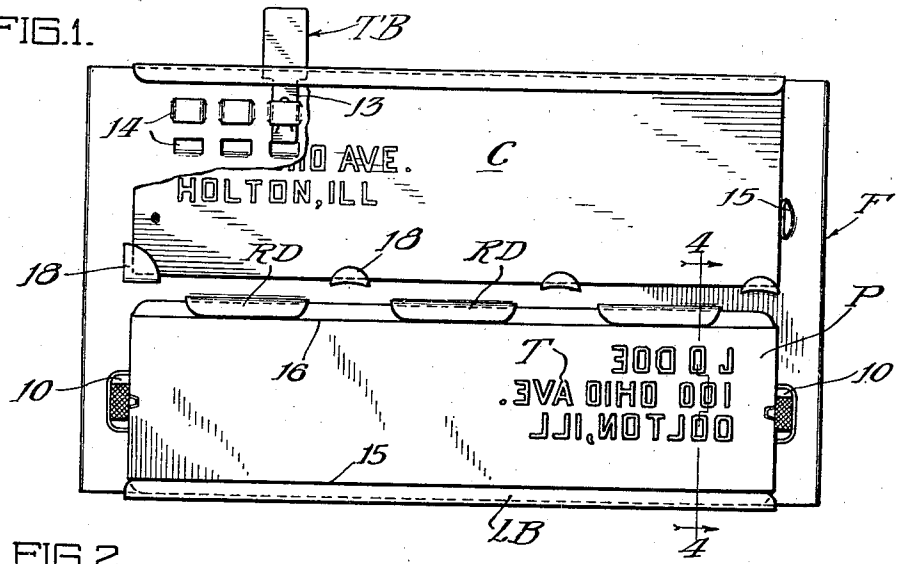


FIG. 2.

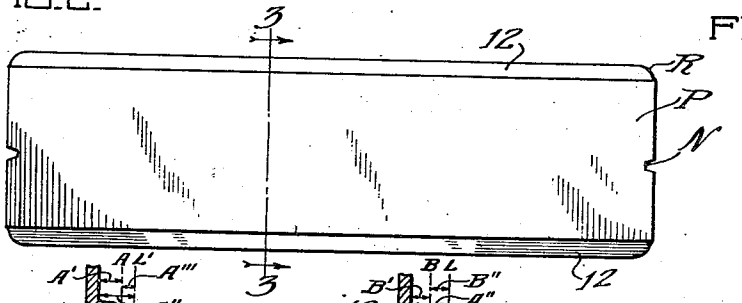


FIG. 3.

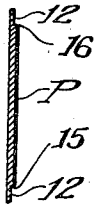


FIG. 5.

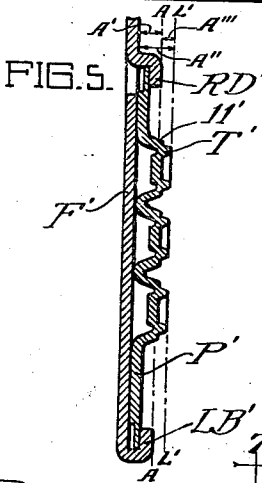


FIG. 4.

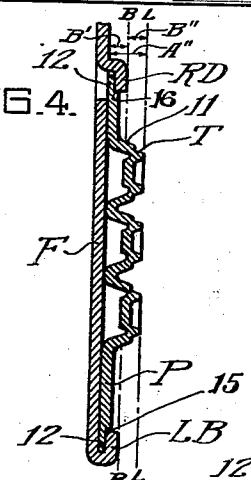


FIG. 7.

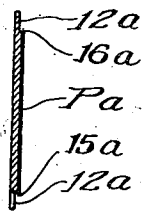
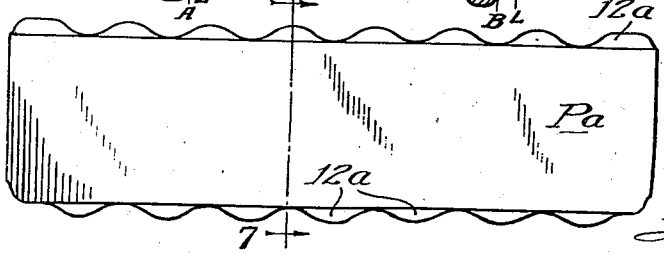


FIG. 6.



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PRINTING PLATE AND CARRIER THEREFOR

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FIG. 8.

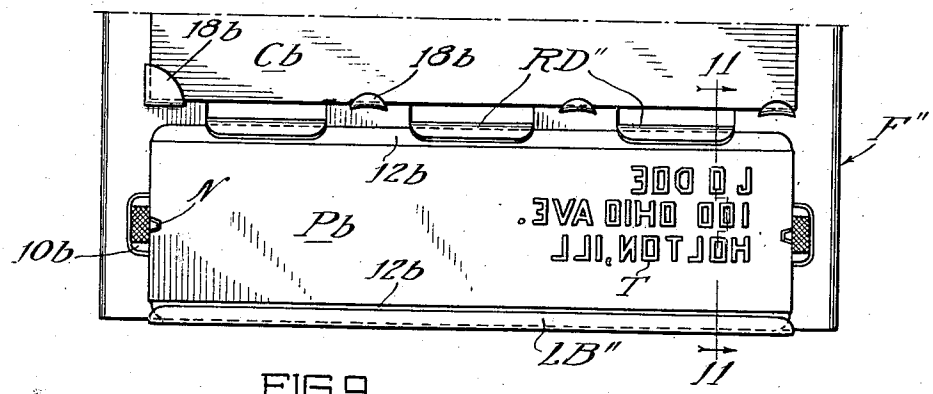


FIG. 9.

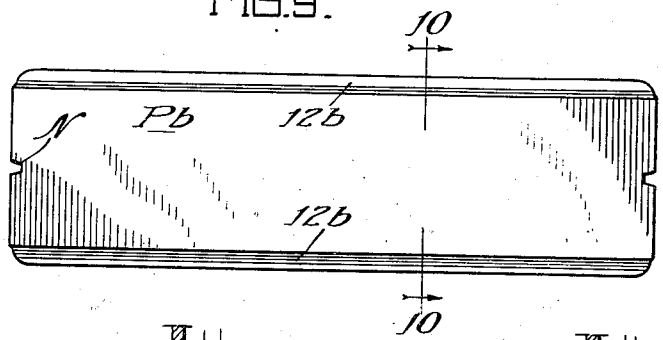


FIG. 10.

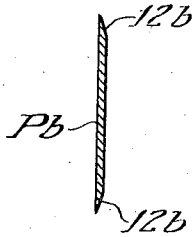


FIG. 11.

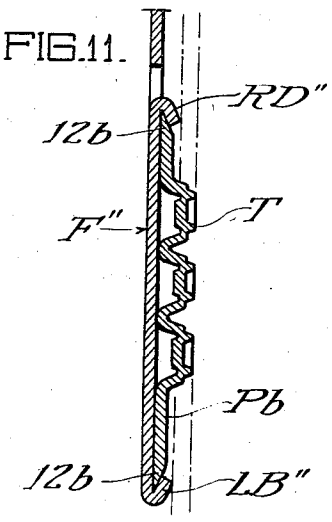
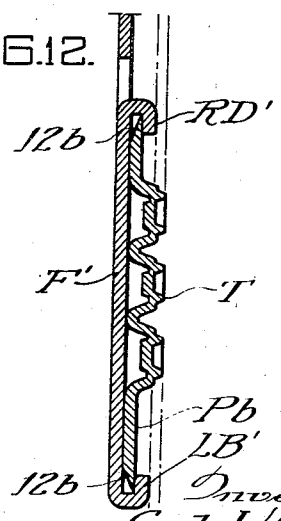


FIG. 12.



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PRINTING PLATE AND CARRIER THEREFOR

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FIG. 13.

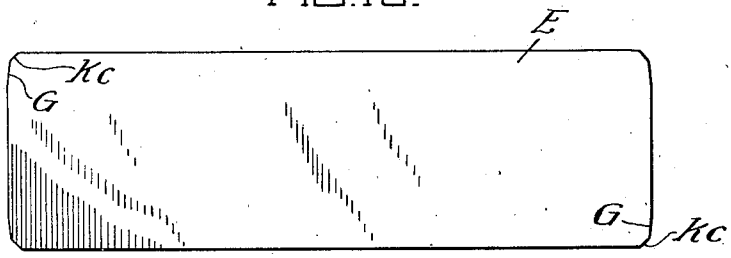


FIG. 14.

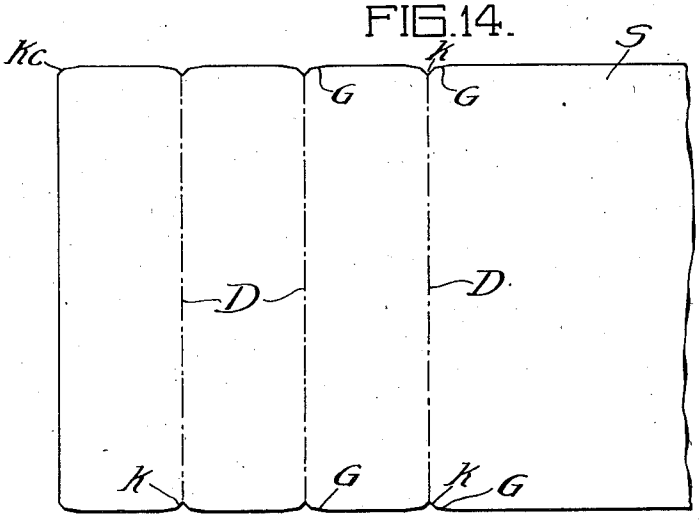


FIG. 16.

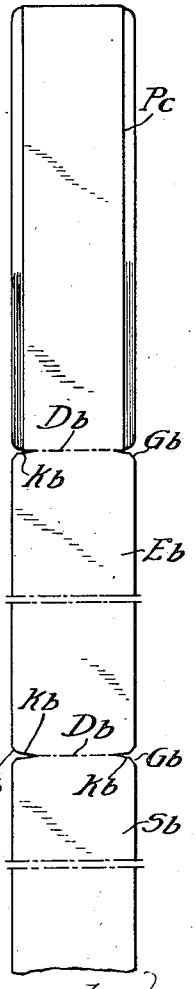
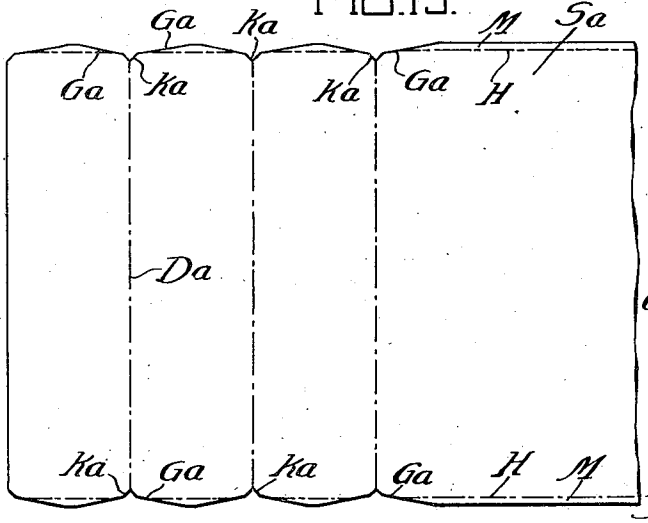


FIG. 15.



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PRINTING PLATE AND CARRIER THEREFOR

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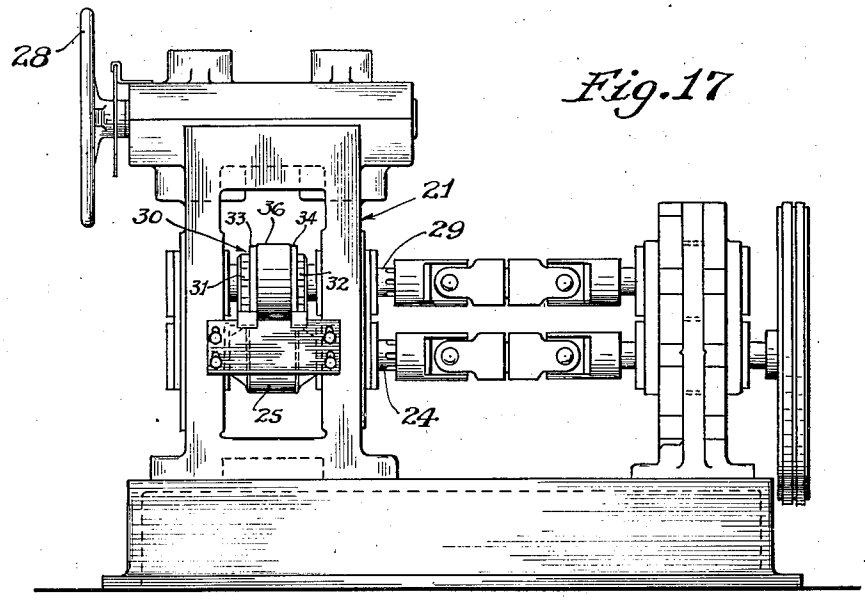

Fig. 17

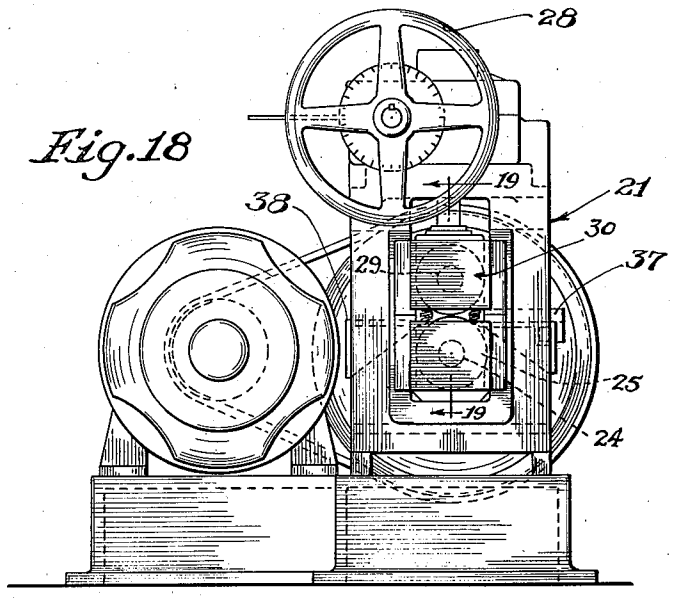

Fig. 18

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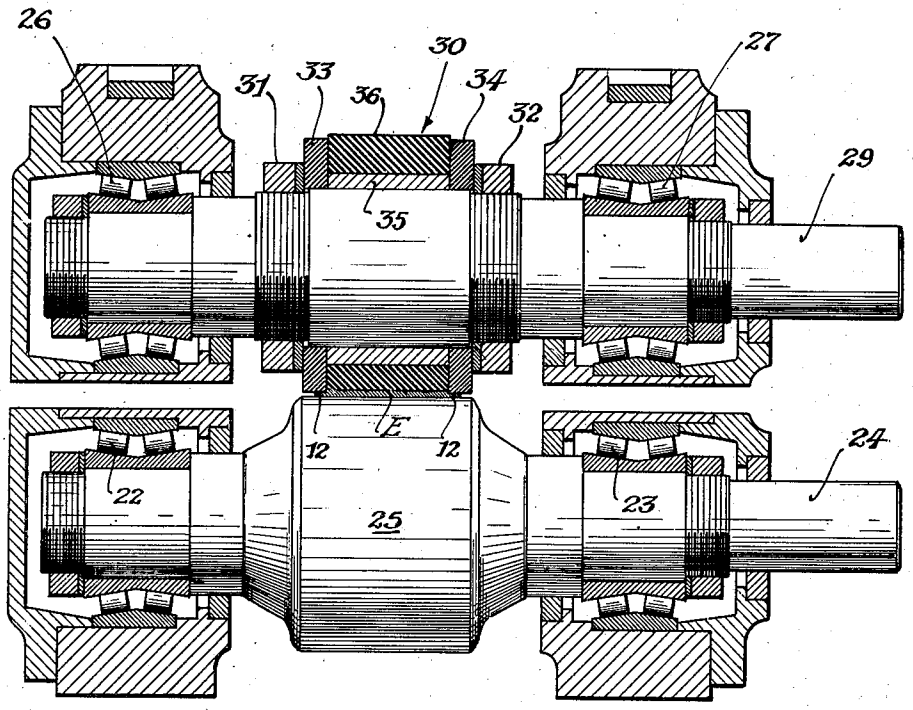
Fig. 19



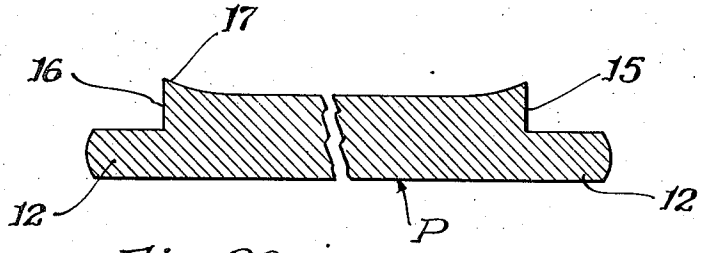


Fig. 20

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Patented Aug. 12, 1947

2,425,325

UNITED STATES PATENT OFFICE

2,425,325

PRINTING PLATE AND CARRIER THEREFOR

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Application May 3, 1945, Serial No. 591,738

11 Claims. (Cl. 101—369)

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This application is in part a continuation of our copending application Serial No. 450,318, filed July 9, 1942.

This invention relates to printing devices which embody a frame or carrier on which at least one embossable printing plate is releasably retained and the invention primarily has to do with printing plates of this kind and the retention thereof on the frames or carriers therefor.

It has been found that the most satisfactory way in which type characters may be embossed on printing plates of the kind to which this invention pertains is to press the material of such a plate upwardly, in the course of a type embossing operation, so as to form a protuberance including a flat top whereby what in effect is a panel is afforded. Such a panel lies in spaced relation with the adjacent face of the plate and the desired type character is formed to appear in relief on this panel and thus both type character and the portion of the plate that is deformed to afford the panel appear in relief on one face, and in intaglio on the opposite face, of the plate. The portions affording the panels on which type characters are embossed to appear in relief in side-by-side relation merge one into the other whereby a continuous panel is afforded on the plate and on which the type characters are arranged in spaced apart relation. The relief faces of type characters so embossed on a printing plate lie in a plane that is spaced well above the adjacent face of the plate and are thereby so presented as to enable neat, clear-cut, and otherwise satisfactory impressions to be made therefrom, as through the intermediary of an inked ribbon or when otherwise inked and, moreover, a relatively large number of impressions may be made from such type characters in a single impression operation when a plurality of sheets arranged in superimposed relation with carbon sheets interposed therebetween are pressed onto the type characters.

Embossed printing plates of the aforesaid kind are usually substantially rectangular in outline and are customarily retained on the frames or carriers therefor by retaining devices that are struck up onto a face of such a frame and these retaining devices are formed so as to overlie selected edges of the plate. It is of course essential that printing plates be firmly retained on the frames and for this reason, particularly those retaining devices adapted to overlie marginal edges of the plates, have been arranged to overlie relatively substantial portions along the marginal edges of the plates. Furthermore, the re-

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taining devices that are struck up from the material of the frame are formed to include portions that are spaced from the adjacent face of the frame in such an amount as to enable the plate to be freely slid under such portions of the devices wherefore these devices lie above a face of the plate that is retained thereby.

Now while the relief faces of type characters embossed on a printing plate in the manner described above lie in a plane that is spaced well above the adjacent face of the plate it has been observed that these relief faces of the type characters usually project but a slight distance above those retaining devices for the plate that are afforded on the frame and which overlie the marginal portions of the plate. Hence, particularly when relatively heavy impressions are made from the type characters, as when impressions are made on a manifold arrangement of alternate sheets of paper and carbon paper, it has been found that impressions are sometimes made from the retaining devices on the frame that overlie the marginal edges of the plate, as aforesaid, as well as from the type characters, and this sometimes produces rather unsightly impressions. This may also occur even when impressions are merely made through an inked ribbon onto a sheet, particularly if the operator of the machine, in which the impressions are made from the printing device, is careless and so adjusts the impression making mechanism that excessive pressure is exerted thereby in the impression operation.

Therefore, among the important objects of the present invention is to enable an embossed printing plate to be retained on a frame therefor in such a novel manner that the likelihood of impressions being made from retaining devices on the frame for the plate will be obviated.

Printing plates of the kind to which this invention relates have been of substantially uniform thickness throughout the area thereof, as these plates have been made heretofore, and it has therefore been necessary to space those portions of retaining devices on the frame, under which the printing plates are to be fitted from the adjacent face of the frame in an amount slightly greater than the thickness of the plates so that the plates could be expeditiously fitted thereunder and yet be properly retained on the frame. It is, of course, essential that the plates be of sufficient thickness to afford the rigidity required to withstand the necessary handling thereof and also that required for the type characters embossed thereon, which is to say, it has been nec-

essary to employ plates of such thickness that when type characters are embossed thereon and these type characters are subjected to impression pressure in the course of printing operations, the type characters will not be flattened or otherwise mutilated. However, type characters are not embossed in the portions of the plates which are adapted to be inserted in the retaining devices afforded therefor on the frames for so to do would interfere with insertion and removal of the plates into and from the frames.

Hence other important objects of this invention are to impart a novel configuration to at least selected of the portions of a printing plate that are to cooperate with retaining devices afforded therefor on the frame of a printing device in order that such retaining devices may be so arranged as to not project objectionably above the face of the plate on which type characters embossed thereon appear in relief; and to afford a novel relation between the portions of a printing plate and the retaining devices on the frame or carrier of a printing device that are adapted for cooperation therewith of such nature that it will not be necessary to space the retaining devices from the adjacent face of the frame in an amount equal to the entire thickness of the plate, wherefore such retaining devices may be spaced well below the relief faces of type characters embossed on the plate, whereby the making of objectionable impressions from such retaining devices may be avoided.

Further objects are to afford novel portions of relatively reduced thickness on those parts of a printing plate that are adapted for cooperation with retaining devices on a printing device frame; to form novel flanges on selected marginal portions of a printing plate that are of a thickness less than that of the remainder of the plate; to so taper at least selected marginal portions of a printing plate that the thickness of such portions will be reduced with respect to the thickness of the remainder of the plate; and to afford novel retaining devices, on printing device frames, that are selectively formed to cooperate with marginal portions of the aforesaid character on printing plates whereby the extent of such retaining devices above the adjacent faces of the frames may be so reduced as to enable relatively heavy impressions to be made from type characters embossed on plates retained by such devices without having impressions made from the retaining devices.

Yet further and more specific objects are to swage predetermined configuration along those marginal edges of printing plates that are adapted for cooperation with retaining devices on printing device frames that are formed to overlie such edges; to swage as by rolling portions along selected marginal edges of printing plates and thereby afford portions that are of reduced thickness in relation to the thickness of the remainder of the plates; to roll flanges of a thickness less than that of the remainder of printing plates along selected marginal edges of such plates; to roll beveled or tapered portions along selected marginal edges of printing plates and thereby reduce the thickness of such portions in relation to the thickness of the remainder of the plates; to enable swaged portions of the aforesaid character to be formed either before or after the strip of material, from which such printing plates are cut, is divided to afford the printing plates; to swage portions of the aforesaid character on a printing plate by a coining, extruding or like operation; and to insure that printing plates embodying novel portions of the aforesaid character will be of the desired configuration and outline after a swaging operation has been effected thereon.

Inasmuch as many millions of the printing device frames that are now in use embody retaining devices which are formed to cooperate with printing plates that are of uniform thickness throughout the area thereof, it is advantageous to provide printing plates which may be used with such frames even though such plates may also be used with frames that embody retaining devices that are formed to cooperate with portions of reduced thickness along selected marginal edges of printing plates, for so to do will enable the novel printing plates of this invention to be used with either of such printing device frames. This will enable users of printing devices of the character to which this invention pertains to mix frames of both the aforesaid kinds into the collections of such printing devices owned by such users, and yet such users will be able to employ a common arrangement in the printing plates used in such frames.

Hence, another important object of this invention is to provide novel printing plates that may be used either with printing device frames embodying plate retaining devices that are adapted for cooperation with plates which are of substantially uniform thickness throughout the area thereof or with printing device frames embodying retaining devices that are adapted for cooperation with portions of reduced thickness along selected marginal edges of printing plates, and an object ancillary to the foregoing is to so swage novel portions of reduced thickness along selected marginal edges of printing plates of the aforesaid character that one of the faces of such portions will be at least substantially flush with one of the faces of the printing plates while the other faces of such portions will lie below the plane of the opposite face of such plates.

Printing plates formed in the just described manner may be used with printing device frames embodying retaining devices adapted for cooperation with printing plates that are of uniform thickness throughout the area thereof by so embossing the type characters on plates of this character that the type characters will appear in relief on the faces of such printing plates that lie at least substantially flush with the portions of reduced thickness at the marginal edges of the plates. Moreover, printing plates of the aforesaid character may be used with printing device frames embodying retaining devices that are adapted to cooperate with novel portions of reduced thickness along the selected marginal edges of the plates by so embossing the type characters on such plates that these type characters will appear in relief on the faces of the plates opposite those lying at least substantially flush with the novel portions of reduced thickness at the marginal edges of the plates, and to enable the foregoing to be accomplished is still another object of this invention.

Further objects are to insure that printing plates of the aforesaid character will be free of sharp edges and corners; and to so effect the swaging opertions by which novel portions of the aforesaid character are formed on printing plates as to insure against distortion of the plates and the formation of sharp edges or corners thereon.

Yet another object of this invention is to afford novel portions of reduced thickness along

selected edges of printing plates in instances where such edges are continuous from end to end and also in instances where such edges of the plates are interrupted, as where such edges embody a serrated or a serpentine configuration.

In those instances where printing plates of the aforesaid character have been of substantially uniform thickness throughout the area thereof and these printing plates have been retained on the frames or carriers of printing devices by depressible tongues adapted to cooperate with one of the opposite ends of such printing plates and retaining devices arranged to overlie opposite marginal portions of such plates, parts of such retaining devices adapted for cooperation with opposite edges of such plates have been so spaced one from the other that when the marginal portions along the opposite edges of the printing plates were disposed beneath the retaining devices such oppositie edges of the plates cooperated with the spaced apart parts of the retaining devices in such a way as to prevent undesired relative movement between the printing plates and the retaining devices on the faces of the frames or carriers. To realize this, the parts of the retaining devices adapted for cooperation with opposite edges of the plates have been located in accurately spaced relation one with the other and this has also entailed maintaining the dimensions between such opposite edges of the plates rather accurately. Since the printing plates of the present invention will be used in place of plates that have been used heretofore, it is yet another object of this invention to enable the dimensions between opposite swaged edges of printing plates of this invention to be accurately maintained.

Moreover, when flanges of reduced thickness are swaged along opposite edges of printing plates of the aforesaid character by rolling, coining, extruding or like operations, shoulders are defined adjacent to, but inwardly of, opposite edges of the plates at the inner edges of such flanges, and since in swaging operations of the aforesaid character, it is possible to accurately maintain the dimensions between the shoulders adjacent to opposite edges of the plates, the retaining devices on the frames of the printing devices on which such plates are to be mounted may be arranged to cooperate with such shoulders, and to enable this to be realized in a novel and effective manner is yet another object of this invention.

Yet further, when flanges of reduced thickness are swaged along opposite edges of printing plates of the character to which this invention pertains and especially when such flanges are swaged by a rolling operation, some crowding of metal adjacent the shoulders at the inner edges of the flanges results and this has the effect of increasing the height of such shoulders so as to thereby afford adequate abutment edges against which the ends of the retaining devices on the frames of the printing devices may abut, and still other objects of the present invention are to enable this advantageous result to be realized.

Other and further objects of the present invention will be apparent from the following description and claims and are illustrated in the accompanying drawings which, by way of illustration, show preferred embodiments and the principle thereof and what we now consider to be the best mode in which we have contemplated applying that principle. Other embodiments of the invention embodying the same or equivalent principle may be used and structural changes may be made as desired by those skilled in the art without departing from the present invention and the purview of the appended claims.

In the drawings,

Fig. 1 is an elevational view of a printing device embodying the present invention;

Fig. 2 is an elevational view of one form of the novel printing plate of the present invention;

Fig. 3 is a sectional view taken substantially on the line 3—3 on Fig. 2;

Fig. 4 is a sectional detail view, drawn to an enlarged scale, taken substantially on the line 4—4 on Fig. 1;

Fig. 5 is view similar to Fig. 4 but showing the novel printing plate illustrated in Fig. 2 mounted in a printing device frame of the character embodying retaining devices adapted for cooperation with a printing plate of uniform thickness throughout the area thereof;

Fig. 6 is a view similar to Fig. 2 but showing another form of this invention;

Fig. 7 is a sectional view taken substantially on the line 7—7 on Fig. 6;

Fig. 8 is a fragmentary elevational view of a printing device including yet another embodiment of this invention;

Fig. 9 is an elevational view of another form of the novel printing plate of the present invention;

Fig. 10 is a sectional view taken substantially on the line 10—10 on Fig. 9;

Fig. 11 is a sectional detail view, drawn to an enlarged scale, taken substantially on the line 11—11 on Fig. 8 and which view is similar to Fig. 4 except that the form of the novel printing plate shown in Fig. 9 is illustrated in Fig. 11 whereas the novel form of printing plate illustrated in Fig. 2 is shown in Fig. 4;

Fig. 12 is a view similar to Fig. 11 but showing the novel printing plate illustrated in Fig. 9 mounted in a printing device frame of the character embodying retaining devices adapted for cooperation with a printing plate of uniform thickness throughout the area thereof whereby Fig. 12 is related to Fig. 11 in the manner in which Fig. 4 is related to Fig. 5;

Fig. 13 is an elevational view of a typical blank from which a printing plate such as that illustrated in any of Figs. 2, 6 or 9 may be formed;

Fig. 14 is an elevational view illustrating one manner in which blanks such as that shown in Fig. 13 may be produced from a strip of suitable material;

Fig. 15 is a view similar to Fig. 14 and illustrating another manner in which blanks of the aforesaid character may be produced;

Fig. 16 is another view similar to Fig. 14 and illustrating yet another manner in which blanks and printing plates of the aforesaid character may be produced; and

Fig. 17 is a side elevational view of a rolling apparatus that may be employed to swage the novel printing plates of the present invention;

Fig. 18 is an end elevational view of the apparatus shown in Fig. 17;

Fig. 19 is a fragmentary vertical sectional view through the rolls and the bearings of the apparatus shown in Figs. 17 and 18 and taken substantially on the line 19—19 on Fig. 18; and

Fig. 20 is a sectional view drawn to a greatly enlarged scale of a swaged printing plate of the present invention.

For the purpose of illustrating preferred embodiments of this invention we have shown, in

Fig. 1 and related views in the accompanying drawings, a printing device which is of the character to which Gollwitzer Patent No. Re. 22,249, patented January 12, 1943, pertains. It is to be understood, however, that this particualr printing device is merely illustrative of a wide variety of printing devices in which the present invention may be embodied for this invention may be embodied in a printing device of the character to which Mohler Patent No. 1,812,894, patented July 7, 1931, pertains or in the modified form of this particular printing devices that is disclosed in Berthelsen Patent No. 1,929,472, patented October 10, 1933. It will, therefore, be appreciated that the present invention may be embodied in a wide variety of printing devices and that the particular form of the printing device is not a part of our invention except in so far as the printing plate and the retaining devices on the frame of the printing device, that are arranged for cooperation with the printing plate, are concerned. Furthermore, the novel prinitng plate of the present invention may be used in any of the various styles of printing device frames now in use, including those shown in the above referred to patents, without requiring any modifications thereof, as will be explained more fully hereinafter. However, in the preferred form of this invention, the printing device frame will include retaining devices that are arranged for cooperation with the swaged marginal edges of the novel printing plate of the present invention, this particular arrangement being explained more fully hereinafter, and printing devices embodying frames including this arrangement are disclosed in the copending applications of Carl J. Hueber, Serial No. 450,320, filed July 9, 1942, and Serial No. 596,991, filed June 1, 1945.

The printing device shown in the accompanying drawing includes a substantially rectangular frame F that has a bead LB along the lower longer edge thereof which is afforded by folding the medial part of this marginal edge over onto the face of the frame so as to be spaced therefrom as, for example, in the manner illustrated in Fig. 4. Furthermore, retaining devices RD are struck up from the face of the frame F on which the bead LB is disposed and these devices are so formed that portions thereof extend in substantially parallel but spaced apart relation with the adjacent face of the frame. The bead LB and the retaining devices RD are arranged in spaced apart but parallel relation with each other so that the novel printing plate P of the present invention may be slid onto the face of the frame intermediate the bead and the retaining devices so as to have the longer marginal edges thereof respectively passed beneath the portions of the bead LB and retaining devices RD that overlie but which are spaced from the adjacent face of the frame, and in this way the plate P is held against the face of the frame F. Yieldable tongues 10 of the character, for example, disclosed in any of the aforesaid patent Nos. 2,030,865, 1,812,894 and 1,929,472, are formed in the frame F in such position that the shoulders afforded thereon cooperate with the shorter edges of the substantially rectangular plate P to thereby hold the plate against movement longitudinally in the retaining devices RD and bead LB. When either of the tongues 10 is depressed, the adjacent portion of the plate P may be slid thereover and thereupon the plate may be removed from the frame F. Similarly, when a plate as P is to be inserted into the frame, the leading portion

thereof is engaged with one or the other of the tongues 10 so as to depress the same and thereby permit the longer marginal portions of the plate to be passed into the retaining devices RD and bead LB. Once the plate is properly positioned on the frame F the depressed tongue springs up into retaining position and thereafter the plate P is held against longitudinal movement on the face of the frame F. The retaining device RD and the bead LB cooperate with portions of the plate to be effective to not only hold the plate in face-to-face engagement with the front face of the frame F but also to prevent movement of the plate transversely on the face of the frame, the manner in which this is accomplished being described hereinafter.

Type characters T are customarily embossed on a printing plate as P in, for example, an embossing machine of the character disclosed in Duncan Patent No. 1,519,904, patented December 9, 1924, or in a similar apparatus. When a printing plate embossed in this manner is mounted on a frame as F, in the manner hereinabove described, for example, the relief faces of such type characters lie in a plane such as that represented by the broken line L—L, Fig. 4, which plane is spaced from the adjacent face of the frame, for example, in the amount of the dimension A''.

Plates suitable for such embossing are commonly made of sheet metal or sheet plastic material having suitable embossing properties and of sufficient thickness and innate strength to resist deformation of printing characters embossed thereon when subjected to printing pressure in a printing apparatus. The thickness of such plates however must not exceed that which will impair the embossing of printing characters on the plates to appear in relief on one face thereof and in intaglio on the opposite face especially when such printing characters are embossed on the plates in embossing machines of the kind referred to hereinabove and in common use. In practice it has long been known that plates of the aforesaid character should not be substantially more than .030'' in thickness and printing plates of the aforesaid character as these have been long used in the art and have ranged in thickness between .012'' and .020''.

Impressions may be made from the relief faces of such type characters either by directly applying ink thereto and thereafter forcing a sheet to receive the impression into engagement with such faces of the type characters or by interposing an inked ribbon intermediate the faces of the type characters and the sheet onto which the impression is to be made. Moreover, several sheets may be superimposed one upon the other, with carbon paper disposed intermediate the various sheets, so that it is necessary that appreciable pressure be utilized in such printing operations and in the past there have been instances where impressions have not only been made from the type characters but also from the retaining devices and the bead on the frame which are effective to retain the plate on the frame. This has been particularly true when the impressions were made through the intermediary of an inked ribbon and carbon paper and in other instances where relatively heavy pressure is exerted in the printing operation.

The reason for such objectionable impressions having been made may be readily ascertained by referring to Fig. 5 where a frame F', similar to the frame F, is shown in section and which has

a bead LB' and retaining devices RD' formed thereon, the bead LB' and retaining devices RD' being of the character heretofore provided on printing device frames, these being located on the frame F' in the manner in which the bead LB and retaining devices RD are located, this being shown in Fig. 1. By referring to Fig. 5, it will be noted that the bead LB' and the retaining devices RD' are so spaced from the adjacent face of the frame that the marginal portions of a printing plate of uniform thickness throughout the area thereof may be slid therebelow in, for example, the manner hereinabove described. Hence, the exposed faces of these retaining devices and beads lie in the plane of the line A—A that is spaced above the adjacent face of the plane in the amount of the dimension A'. The relief faces of the type characters T', on the printing plate P' that is retained on the frame F', lie in the plane of the line L'—L' which is spaced from the adjacent face of the frame F' in the amount of the dimension A''. As shown in Fig. 5, in such circumstances, the plane represented by the line L—L is spaced above the plane represented by the line A—A in but a relatively short amount represented by the dimension A'''. It is by reason of this relatively short dimension A''' that objectionable impressions as aforesaid are sometimes made from the exposed faces of the retaining devices as RD' and bead LB'.

However, by referring to Fig. 4 it will be seen that the retaining devices RD and bead LB are so formed on the frame F that the exposed faces thereof lie in the plane of the line B—B which is spaced from the adjacent face of the frame in the amount of the dimension B'. By comparing the disclosures in Figs. 4 and 5 it will be seen that the dimension B' is materially less than the dimension A'. Moreover, the faces of the type characters on the plate P shown in Fig. 4 lie in the plane of the line L—L which is spaced from the adjacent face of the frame in the amount of the aforesaid dimension A''. Therefore, since the plane of the line B—B is disposed much closer to the adjacent face of the plate than is the plane of the line A—A, the space between the planes represented by the lines L—L and B—B, which is to say, the dimension B'', is much greater than the corresponding dimension A''' in Fig. 5. Stated otherwise, the faces of the retaining devices RD and the bead LB in the form of the frame shown in Fig. 4 are spaced below the faces of the type characters very much more than are the faces of the retaining devices RD' and bead LB' shown in Fig. 5 and by reason of this it has been found that objectionable impressions are not made from the faces of retaining devices as RD and the bead as LB particularly because of the aforesaid spacing and the fact that the material of the impression making member is not sufficiently yieldable to force a sheet that is to receive an impression from the type characters downwardly into engagement with the faces of the retaining devices as RD and bead as LB when these parts are arranged in the manner shown in Fig. 4.

In order that the retaining devices as RD and bead LB may be arranged in the manner shown in Fig. 4, it is necessary that the marginal portions of the plate as P that are adapted to cooperate with such means be of less thickness than the remainder of the plate P. Hence what, in effect, are flanges 12 are swaged along the marginal portions of the longer edges of the rectangular plate P. Desirably such flanges are formed

by passing the marginal portions of the plate P through sets of rolls that are effective to roll such flanges on the plate. However, if desired, flanges of the aforesaid character may be afforded by effecting a coining, extruding or like operation on the plates. Furthermore, as will be explained hereinafter with reference to Fig. 16, such flanges may be swaged, as by rolling, coining, extruding or like operations, on the edges of the strip that is to be divided into plates as P prior to the time the strip is so divided. In this respect, however, it is desirable that the free edges and the exposed corners of whatever portions are formed on a printing plate of the aforesaid character be of such nature that the likelihood of cutting or otherwise injuring the operators handling the same will be avoided. To this end the free edges of the portions swaged on the plates are desirably rounded and this may be realized by swaging the aforesaid portions of the plates by a rolling, coining or extruding operation, resort being had to such an operation since the desired configuration cannot be properly obtained when the aforesaid portions are afforded on the plate by a cutting operation.

Particularly when the plates are to have the aforesaid novel configuration imparted thereto by a swaging operation, such as a rolling, coining or extruding operation, the plates may be produced from a strip of material such as that shown in Figs. 14, 15 or 16. To first refer to Fig. 14, the strip S there illustrated, which may be sheet metal or the like and which may be coated in the manner and for the purpose understood in the art, is of a width corresponding to the desired longer dimension of the substantially rectangular plates, such strip being adapted to be divided at the intervals indicated by the broken lines D to afford rectangular plates substantially embodying the desired shorter dimension of the plates. Furthermore, and preferably prior to the time the strip as S is divided at positions such as indicated by the lines D, V-shaped notches K are formed therein to have the apices of the notches along one edge of the strip S aligned with and directed respectively toward the apices of the notches along the other edge of the strip, the severance of the strip being adapted to be effected between each such set of aligned apices, as indicated by the lines D, to thereby afford blanks as E, Fig. 13.

Moreover, and especially when formed portions are to be afforded along the edges of a plate as P by a rolling, coining or extruding operation which will result in some flow of the metal as the operation progresses, it is desirable that the strip as S have tapered portions as G formed thereon to lead from the free edges of the notches K. The degree and extent of such tapered portions is such that when the metal of a blank as E is caused to flow in the course of a rolling, coining or extruding operation effected thereon, the edge into which such a tapered portion leads will lie in a straight line. Thus, we have observed that if portions as G are not afforded and a blank as E is subject to a rolling, coining or extruding operation in which the material of the blank is caused to flow, projections extend outwardly from the edges at the ends of the portion subjected to the operation. Projections of this nature are undesirable on printing plates, particularly in instances where the plates are to be mounted in end to end relation, and otherwise since such projections prevent the plates from embodying edges which lie in straight lines and in true right angular relation one with the other.

Therefore, by providing notches as K and tapers as G, blanks as E are afforded which, when subjected to a rolling, coining or like operation, afford printing plates as P which have straight-line edges. Moreover, when the strip as S is divided as aforesaid, the notches as K afford beveled corners Kc on the blank as E whereby, when the portion extended between such corners is subjected to a rolling, coining or like operation, rounded corners as R are afforded on a plate as P. Furthermore, if corners as Kc are not afforded, objectionable projections as aforesaid may be formed in the rolling or like operation. Moreover, plates as P formed from blanks as E by a rolling, coining or extruding operation are free of sharp edges and corners and may be handled with safety, such edges being formed in the course of the rolling or like operation.

Blanks as E may be severed from a strip as S by a shear operation or, if desired, by using a suitable blanking die. However, and especially where a blanking die is to be employed, the blanks as E may be cut from a strip as S*a*, Fig. 15. Such a strip includes marginal portions M and must be cut along the lines H to afford blanks as E of the desired length. Such marginal portions M, however, afford convenient places along which to grasp the strip in the course of feeding and like operations. Furthermore, when a strip as S*a* is to be employed, the notches as K*a* are formed therein to open at the place on the strip whereat what will be a shorter edge of a blank as E is disposed, this being represented by a line H. In such circumstances, the tapers G*a* extend from the free ends of the sides of the notches K*a* across the marginal portions M to the adjacent edge of the strip S*a*, such tapers G*a* therefore being longer than the tapers G. When, however, the strip S*a* is cut at the places indicated by the lines H and D*a*, either by shear operations or by operation of blanking die, blanks as E are afforded. Hence, when blanks as E are subjected to a rolling, coining or kindred operation along each of the longer edges thereof between the corners Kc thereon, truly rectangular printing plates P having flanges 12 thereon are afforded and such plates are free of objectionable sharp edges and corners.

When blanks as E are cut from strips as S or S*a*, the swaging operation thereon to produce plates as P is desirably performed after severance of the strips at the places indicated by the lines D and D*a*. However, in some circumstances, it may be desirable to effect the swaging operation prior to the time the strip from which the plates are to be cut is divided and in such circumstances resort may be had to a strip such as S*b* illustrated in Fig. 16. The strip shown in Fig. 16 is of a width substantially corresponding to the shorter dimension of the substantially rectangular plates as P and such a strip is divided at intervals indicated by the lines D*b* which are spaced one from the other in the amount that is to be the longer dimension of plates as P. Furthermore, for the reasons explained hereinabove, notches as K*b* and tapers as G*b* are formed in the edges of the strip S*b* and the notches K*b* along one edge of the strip S*b* have the apices respectively directed toward the apices of the notches K*b* formed along the other edge of the strip, and the strip is severed between such aligned apices and along the lines indicated by D*b*. Of course, if desired, such severance of the strip may be effected to provide blanks as E which may then be subjected to a rolling, coining or like operation in the same manner as that in which blanks as E cut from strips as S and S*a* may be subjected to such an operation.

However, when resort is had to a strip such as S*b*, the operations of forming the notches as K*b* and tapers as G*b* may be effected in the strip as S*b* as the same is being fed to a set of rolls in which a rolling operation is to be effected, or to dies in which a coining or extruding operation is to be effected, and desirably such a swaging operation will be effected on the strip after the notching and tapering operations have been effected and prior to the time the strip is divided at the places indicated by the lines as D*b*. Thus in Fig. 16 we have shown a complete plate P*c* at the leading end of the strip S*b* while what in effect is a blank E*b* is shown adjacent thereto, the swaging operation having been effected on the strip S*b* between the plate P*c* and the blank E*b*. It will be understood that when resort is had to this arrangement a complete plate is formed prior to the time a severing operation is effected at a position such as that indicated by a line D*b*. When resort is had to such a procedure the plate producing operations may be carried out as one continuous operation.

In Figs. 13 to 16, inclusive, we have shown the manner in which plates as P may be produced but it will be understood that if plates in the nature of the plate P*a*, Fig. 6, are desired, then a blanking operation will be effected at the positions indicated by the lines D or D*a* and H or intermediate the positions indicated by the lines D*b* and along the longer edges of the strip S*b*. In such a blanking operation the desired edge configuration, such as that shown on the plate P*a* in Fig. 6, would be imparted to the blanks or plates that are thus afforded. In this respect it will be understood that if the plates are to be produced from a strip as S*b*, then a blanking operation of the aforesaid character will be effected prior to the time the edges of the strip S*b* are subjected to a rolling or like operation.

In those instances where flanges as 12 or 12*a* are to be swaged onto a plate as P or P*a* by a rolling operation, this may be advantageously effected in apparatus like that illustrated in Figs. 17, 18 and 19, which is of the character disclosed in the copending application of Gasper P. Benes, Serial No. 647,899, filed February 15, 1946. This apparatus, which it will be understood is exemplary of apparatus to which resort may be had, includes a stand generally indicated by 21 that embodies spaced apart uprights. Bearings 22 and 23 are provided near the lower ends of the uprights in which the shaft 24 of the lower roll 25 of the rolling apparatus is journaled. Other bearings 26 and 27 are provided in the uprights of the stand 21 respectively above the bearings 22 and 23 and desirably these bearings are contained in cages that are mounted for vertical movement in the uprights of the stand in such a way that manipulation of a hand wheel 28 or the like will cause the bearings 26 and 27 to respectively move relative to the bearings 22 and 23. Desirably the interconnection between a hand wheel as 28 and the cages for bearings as 26 and 27 will be of such nature that material movement of the hand wheel as 28 will be required in order to effect relatively slight movement of the cages for the bearings 26 and 27 so that relatively fine adjustment in the positions of these cages and the bearings mounted therein may be realized.

An upper roll shaft 29 is journaled in the bearings 26 and 27 and the upper roll generally indicated by 30 is mounted on this shaft. As best

shown in Fig. 19, the roll 30 is sectional and the sections thereof are held together by locking nuts as 31 and 32 mounted on screw threaded portions on the shaft 29 on opposite sides of the portion of this shaft aligned with the lower roll 25. The roll 30 includes what in effect are two rolling collars 33 and 34 that are equal in diameter and between which a collar 35 is disposed, the rolling collars 33 and 34 and the collar 35 being keyed to the shaft 29 in an approved manner. A collar 36 of resilient material, such as natural or so-called synthetic rubber, is mounted on the collar 35 and desirably the diameter of the resilient collar 36 is slightly greater than the diameter of the rolling collars 33 and 34.

The collar 35 and the resilient collar 36 are of a width corresponding to the distance between the shoulders as 15 and 16 on a plate as P at the inner ends of the flanges as 12 that are swaged onto a plate as P, which is to say, the inner edges of the rolling collars 33 and 34 are spaced one from the other in an amount corresponding to the distance between shoulders as 15 and 16 on a plate as P or between shoulders as 15*a* and 16*a* on a plate as P*a*.

When blanks as E are to have flanges as 12 swaged thereonto to thereby afford plates as P, the hand wheel 28 is manipulated to space the peripheries of the rolling collars 33 and 34 from the flat periphery of the lower roller as 25 in an amount corresponding to the desired thickness of flanges as 12. As best shown in Fig. 18, a supply table as 37 leads to a point adjacent to the bite between the rolling collars as 33 and 34 and the periphery of the lower roller as 25, and blanks as E are fed over the table, preferably through suitable guides, to insure accurate movement of the blanks as E into the bite between the rolling collars 33 and 34 and the lower roller 25. After passage of the blanks as E through the aforesaid bite these blanks, then in the form of plates as P, pass on to a discharge table as 38 to be collected in a suitable manner.

The guides which are effective to direct the blanks as E are so located that the center line between the longer edges of a blank as E is aligned with the center line between the inner edges of the rolling collars 33 and 34, or stated otherwise, the center line between opposite edges of the collars 35 and 36, for so to do insures that the portions of the blanks as E whereat the shoulders as 15 and 16 are to be formed respectively move into engagement with the inner edges of the rolling collars 33 and 34. Hence when marginal portions along blanks as E pass between the rolling collars 33 and 34 and the periphery of the lower roll 25, flanges as 12 are swaged along the marginal portions of the blank as E and thereby define shoulders as 15 and 16.

It has been explained hereinabove that the diameter of the resilient collar 36 is slightly greater than the diameter of the rolling collar 33 and 34. Therefore, when the marginal portions of the blanks as E are passing between the rolling collars 33 and 34 and the periphery of the lower roll 25, the periphery of the resilient collar 36 is in effect flattened so as to have prolonged contact with the face of the blank as E in the portion thereof that will lie between the shoulders as 15 and 16 in the plate as P. This prolonged contact of the resilient collar or roller 36 with this portion of the plate resists the tendency of the plate to bow in response to the stresses impressed as a result of the swaging of the marginal edges of the blank between the rolling collars 33 and 34 and the periphery of the lower roll 25. In this respect, however, the degree of resiliency of the resilient collar 36 is empirically determined for if the resilient collar 36 is too hard, it will assert what in effect amounts to a rolling operation on the portion of a blank as E in such a way as to cause the blank to bow in a direction opposite to that in which the blank would bow under the influence of the rolling collars 33 and 34. On the other hand, if the resilient collar 36 is not hard enough to resist the effect of the stresses impressed by the rolling collars 33 and 34, then the blanks as E will bow under the influence of the swaging effected by these rolling collars and the lower roll 25. When, however, the resiliency of the collar or roller 36 is properly determined so as to enable the aforesaid prolonged contact thereof with the face of the blanks as E, and when the hardness of this resilient collar is sufficient to balance the stresses accruing from the aforesaid swaging operation, then the blanks as E in the form of plates as P pass on to the discharge table 38 in flat condition.

The swaging of the blanks as E effected between collars as 33 and 34 and the periphery of the lower roll 25 effects flow of the metal thus being swaged outwardly from the longer edges of the blank as E. Hence the dimension between the longer edges of a blank as E is somewhat less than the dimension desired between the longer edges of a plate as P. Inasmuch, however, as the flow of metal which results from the swaging operation will be practically uniform from blank to blank, the dimensions between longer edges of the blanks as E may be readily determined to insure that the resulting plates as P will embody a proper dimension between the longer edges thereof.

Moreover, as blanks as E pass between the rolling collars 33 and 34 and the periphery of the lower roll 25, the material of these blanks is caused to so flow that the taper portions as G are forced into alignment with the intermediate straight portions of the shorter edges on the blank so that straight shorter edges are afforded on the resulting plates as P. Yet further, the flow of the material in the aforesaid swaging operation causes the angularly disposed edges Kc to assume the rounded configuration to thereby afford rounded corners as R at the ends of the flanges as 12.

The swaging effected between the peripheries of the rolling collars as 33 and 34 and the periphery of the lower roll 35 not only gives rise to the aforesaid flow of material, but also produces some crowding of the material upwardly along the inner faces of the rolling collars 33 and 34 which has the effect of increasing the height of shoulders as 15 and 16, for what amounts to a bead as 17, Fig. 20, is produced on the face of the blank engaged with the resilient collar 36 adjacent each shoulder as 16. So to do increases the effective abutment face of the shoulder as 16 and this is utilized in a manner presently to be described when plates as P are mounted on frames as F. The formation of beads as 17 is also advantageous when plates as P are mounted in frames as F' for such beads have the effect of slightly increasing the thickness of the plates in the regions thereof adjacent to the portions thereof that are passed beneath retaining devices as RD'. The beads as 17 are confined to the portions of the plate adjacent to the shoulders 16 and 17 and do not, therefore, extend into the por-

tion of the plate whereat type characters as T are to be embossed.

By reason of the effective abutment faces of shoulders as 15 and 16 that accrue from a swaging operation as above described, the free ends of retaining devices as RD may be accurately spaced from the free edge of a bead as LB and desirably the distance between the free ends of retaining devices as RD and the free edge of a bead as LB is accurately related to the distance between the shoulders 16 and 15 across the plate as P. Therefore, when a plate as P is slid into retaining devices as RD and LB in the manner hereinabove described, the free edges of the free ends of retaining devices as RD and the free edge of a bead as LB respectively move into cooperating relation with the shoulders 16 and 15. Therefore, when a plate as P is properly disposed on the face of a frame as F between the yieldable tongues as 10, the engagement of the free ends of the retaining devices RD with the shoulder as 16 and the engagement of the free edge of a bead as LB with a flange as 15 will be effective to prevent undesired transverse movement of a plate as P on the face of a frame as F.

Inasmuch as the retaining devices as RD and a bead as LB are to be arranged to cooperate with shoulders as 16 and 15 on a plate as P, it is not necessary to accurately space the portions of retaining devices as RD that extend up from the face of a frame as F from the bight of a bead as LB. In this respect it has been determined that it is possible to maintain the distance between the free ends of retaining devices as RD and the free edge of a bead as LB much more accurately than the distance between the portions of retaining devices as RD that project up from the face of a frame and the bight of a bead as LB can be maintained. Yet further, notwithstanding that the flow of material referred to hereinabove, which accrues in the formation of flanges as 12 on a plate as P, will be substantially uniform from blank to blank and plate to plate, when the free ends of retaining devices as RD and the free edge of a bead as LB are arranged to cooperate with shoulders as 16 and 15, as described hereinabove, it is not essential that the dimension between longer edges of a plate as P be accurately maintained since the portions of retaining devices as RD that extend up from the face of a frame as F and the bight of a bead as LB may be related to each other in such a way as to accommodate variations in the dimensions between longer edges of plates as P.

The rolling or other swaging operation to which resort is had to afford the flanges as 12 along edges of a printing plate as P is preferably so performed that corresponding faces of each of the flanges 12 lie at least substantially flush with one face of the plate as P while the opposite faces of such flanges are spaced beneath the opposite face of the plate as P. Then when such a plate is to be used in a frame as F, Fig. 4, the type characters as T are embossed on the plate to appear in intaglio on the face of the plate that is flush with faces of the flanges as 12, this being the face of the plate that is adapted to be engaged with the face of the frame when the plate is mounted on the frame. When the type characters T are so embossed on the plate as P, the relief faces of the type characters will lie in the plane of the line L—L when the plate is inserted into a frame as F and in this instance, as explained hereinabove, the faces of the retaining devices as RD and the bead as LB will lie in the plane of the line B—B, wherefore the faces of the type characters are spaced above the exposed faces of the plate retaining means in the amount of the dimension B'' and therefore, as explained hereinabove, objectionable impressions will not be made from the faces of the retaining devices as RD and the bead as LB when impressions are made by the type characters T.

However, many millions of printing device frames arranged like the frame F', Fig. 5, are in use, and our novel printing plate is advantageously adapted for use in frames of this character even though the advantages to be realized from the lowering of the retaining devices as RD and bead LB, Fig. 4, are not realized when our novel printing plate is used in frames arranged in the manner of the frame F'. It is, however, a distinct advantage to enable the printing plate of this invention to be used with either the arrangement of retaining means shown in Fig. 4 or that shown in Fig. 5, particularly since the users of frames as F' may also use frames as F and, when the printing plate may be used with each such frame arrangement, such users will need only purchase one style or arrangement of printing plate rather than several, each suitable for use with but a single frame arrangement.

When our novel printing plate is to be used in a frame as F', the type characters as T', Fig. 5, are embossed on the plate as F' to appear in relief on the face of the plate that is flush with faces of the flanges 12. In this instance the type characters will appear in intaglio on the face of the plate as P' that lies above corresponding faces of the flanges 12, this being the face of the plate that is engaged with the face of the frame when a printing plate so embossed is mounted on a frame as F'.

It will be understood that the plate P' and the plate P are desirably of the thickness of printing plates of the character normally employed in frames as F' except in the portions thereof whereat the flanges as 12 are formed. However, since the faces of the flanges 12 that are to cooperate with a bead as LB' and retaining devices as RD' lie flush with the face of a plate as P' on which the type characters as T' are embossed to appear in relief, it is manifest that a plate as P' will cooperate with the retaining means therefor on the frame as F' in the same manner as that in which a plate of uniform thickness through the area thereof would cooperate with such plate retaining means.

We have shown the flanges 12 as extending continuously from substantially end to end on the plates P and P', but it will be understood that, without departing from the ambit of this invention, the flanges might be arranged to be continuous and still not extend as aforesaid as, for example, by terminating one or both ends of one or the other or both of the flanges in spaced relation with the adjacent end of the plate. Moreover, the flange may be discontinuous if desired. Thus, by way of illustration, the flange that is to underlie with the retaining devices RD may be interrupted so as to afford portions that will lie beneath the retaining devices when the plate is in proper final position on the frame or carrier but which portions will be spaced one from the other along the edge of the plate. A plate embodying a flange so arranged will enable the plate to be disposed in the desired final position on the frame without being slid thereinto, from the end of the frame in the manner described hereinabove, for with such an arrangement the

plate may be laid onto the face of the frame with one flange thereon in the bead as LB and with the aforesaid spaced apart portions adjacent corresponding ends of the retaining devices whereby the plate may be moved into final position on the frame merely by sliding the spaced apart portions beneath the retaining devices, for example, as explained in Mohler Patent No. 1,831,363, patented November 10, 1931.

Furthermore, flanges as 12 may be formed, if desired, along the marginal portions of plates which are discontinuous in such marginal portions as, for example, flanges as 12 might be afforded along the discontinuous edges of a plate embodying serrated portions such as, for example, those shown on the plate illustrated in Patent No. 1,812,894 referred to hereinabove. Moreover, flanges as 12*a* may be formed along the longer edges of a substantially rectangular plate as P*a* which is of the character to which Gollwitzer Patent No. 1,955,803, patented April 24, 1934, pertains, which is to say, along the portions of the plate embodying a serpentine configuration which, as explained in said Patent No. 1,955,803, facilitates insertion and removal of a plate as P*a* into a frame as F, for example.

Thus by referring to Figs. 6 and 7 it will be seen that the plate P*a* has a serpentine configuration along the longer edges thereof. Flanges as 12*a* may be afforded on a plate as P*a* by rolling the plate in the portions thereof whereat the serpentine configuration is afforded, such configuration being imparted to the plate by a blanking operation effected prior to the rolling or kindred flange forming operation. Of course, if desired, the rolling or kindred swaging operation could be so effected that portions of the plate slightly inwardly of the serpentine configuration could also be swaged but inasmuch as it is the portion of the plate that includes the serpentine configuration that is adapted for cooperation with the retaining devices as RD or the bead as LB, it is not necessary that the rolling or other edge forming operation be continued inwardly of such configuration. Moreover, when the frame on which a printing plate having a serpentine or like configuration along the longer edges thereof includes retaining devices as RD and a bead as LB arranged to cooperate with shoulders like the shoulders 15 and 16, flanges will be swaged onto the plate to properly locate such shoulders irrespective of the extent of the serpentine or like configuration on the plate.

The forms of this invention, as thus far described, are those in which the swaged portions of the plates have been of substantially uniform thickness. However, the advantages that accrue from the present invention may be realized by imparting other configurations to the portions of a plate that are to cooperate with retaining means for the plate provided on a printing device frame or carrier.

Thus, another form of this invention in which those portions of the plate, that are adapted for cooperation with retaining means therefor on the frame or carrier of a printing device, are not of uniform thickness is illustrated in Figs. 8 and 9 and in this instance the aforesaid portions of the plate embody a tapered or beveled configuration. Referring to Figs. 8 and 9, the plate P*b*, there illustrated, is adapted for use on a frame F'' which may, for example, be arranged similarly to the frame F but which of course may be otherwise arranged, as explained hereinabove. However, the plate retaining means on the frame F'' are somewhat different from those on the frame as F since these means on the frame F'' are arranged to cooperate with a plate, such as the plate P*b*, rather than with a plate as P or P*a*. It will be understood in this respect that the retaining means provided on a printing device frame or carrier that are adapted for cooperation with the novel printing plate of the present invention will be arranged to be complementary to whatever configuration is included on the portion of the plate that is to cooperate with such retaining means.

The longer marginal edges of the plate P*b* are swaged by a rolling, coining, extruding or like operation to afford flanges 12*b* which are in the form of tapered or beveled portions, the inclined faces of such flanges preferably extending between opposite faces of the plate, as shown in Fig. 9. Thus, as in the case of the flanges 12, one face of the flanges as 12*b* lie flush with one face of the plate while the other face of such flanges will lie generally below the plane of the opposite face of the plate. Furthermore, it is advantageous that the inclined faces of flanges as 12*b*, which merge with the face of the plate with which corresponding faces of such flanges are to lie flush, be caused to merge with such face of the plate on a slight radius so as to thereby avoid forming a sharp edge along opposite edges of the plate P*b*. Yet further, since flanges as 12*b*, as the flanges as 12, are formed on a plate as P*b* by a rolling, coining or extruding operation, the hereinabove described advantages of this invention flowing from resort to such swaging operations are realized in plates as P*b*. Furthermore, as has been explained hereinabove with reference to Figs. 13 to 16, the flanges as 12*b* may be formed on a strip from which plates as P*b* are to be cut prior to the time the strip is divided to afford such plates, or the flanges may be formed on the plates after they have been cut from such a strip.

Retaining devices as RD'' that are provided on a frame as F'' are arranged to be complementary to the flanges as 12*b* and hence such devices are so formed that the faces thereof disposed adjacent the face of the frame, above which such devices are extended, are disposed to lie in a plane that extends in angular relation with such adjacent face of the frame, the angularity of extent of such faces of the retaining devices being complementary to the angularly disposed face of the flange as 12*b* with which the retaining device RD'' is to cooperate. Moreover, as shown in Fig. 11, a bead as LB'', that is adapted for cooperation with a flange as 12*b*, will also be formed so as to embody an angularly inclined face on the portion thereof juxtaposed the face of the frame above which the bead LB'' projects, the inclination of such face of a bead as LB'' being complementary to the angularity of the inclined face of a flange as 12*b* with which such face on the bead is to cooperate. Desirably as in the case of the bead LB, a bead as LB'' will be formed so as to be continuous but in this respect it will be understood that either a bead as LB or LB'' may be formed so as to be discontinuous should it be found advantageous so to do. The retaining devices as RD'' may, if desired, be located on a frame as F'' in the manner in which the retaining devices RD are arranged on a frame as F.

It will be understood that a configuration or flanges as 12*b* may either be arranged to be continuous, as are the flanges 12 on the plate P, or such flanges may be discontinuous, as are the

flanges 12a on the plate Pa, and of course resort may be had to other modifications in the formation of the flanges or formed portions on a plate as Pb such as have been explained hereinabove with reference to the plate P.

It will be recognized that a plate as Pa, or a plate as Pb, may be used either in the manner shown in Fig. 4 or in the manner shown in Fig. 5, with a frame as F' having the retaining means thereon arranged in such a manner as to cooperate with a plate that is of substantially uniform thickness throughout the area thereof. Moreover, as in the case of a plate as P, a plate as Pa, or a plate as Pb, may also be advantageously used with a frame that has the retaining means thereon arranged for cooperation with portions of reduced thickness on a printing plate. The face from which type characters will be embossed to appear in relief on a plate as Pa or Pb will be determined by the arrangement of the retaining means with which such plate is to be used, this having been explained hereinabove with reference to the plate P.

Moreover, and particularly when a novel printing plate of this invention is to be used on a frame of the character to which the aforesaid Patent No. Re. 22,249 pertains, notches as N are formed in the shorter edges thereof. Of course, a plate embodying such notches may also be used on frames or carriers of the kind to which the aforesaid Patent Nos. 1,812,894 or 1,929,472 pertain. Likewise, notches as N may be omitted from the novel plates of this invention when such plates are to be used on frames such as those to which the two last-mentioned patents pertain.

Furthermore, it will be understood that the notches as N may be formed in a blank as E from which a plate as P is to be produced prior to the time the blank is severed from the strip as S or Sa and it will also be understood that if notches as N are to be provided in a plate produced from a strip as Sb, Fig. 16, the notches as N may be formed in the plate prior to or subsequent to the time it is divided from the strip. Thus it will be seen that since formation of the notches as N entails an extra operation, such operation may be effected in a manner which will be most convenient and economical in the production of plates as P, Pa or Pb.

In so far as the present invention is concerned, it is not important whether or not the printing device frame embodies indexing or classifying means such as the tab TB, Fig. 1, but inasmuch as it is advantageous to include such means in printing devices of the character to which this invention pertains the frame may be advantageously formed to include devices adapted for cooperation with the stem 13 of a tab as TB and we have shown in Fig. 1 tab retaining devices 14. These devices 14 and the arrangement of the tab TB and particularly the stem portion thereof may, for example, be of the character to which Gollwitzer Patent No. 2,049,436, patented August 4, 1936, pertains, but it will be understood that resort might be had to other arrangements for affording indexing and classifying means on a printing device of the character to which this invention pertains.

Desirably the printing device in which the present invention is embodied will also include an index card as C or Cb on which an impression is made from at least selected of the type characters embossed on the plate. Conventionally, an index card of this character is retained on a printing device frame or carrier by suitable retaining means of which the retaining means 18 and 18b are exemplary, the arrangement in any event being such that the index card C is releasably retained on the frame so that the card may be readily changed when a plate is changed.

It will also be understood from the foregoing description that the advantages which accrue from the present invention may be most effectively realized by arranging the plate retaining means on a printing device frame so as to be adapted for cooperation with a predetermined configuration imparted to at least one of the marginal portions of a printing plate, particularly where such predetermined configuration is of such nature that a portion thereof is disposed to lie below one face of the printing plate and desirably that face of the printing plate on which type characters embossed on the plate appear in relief.

Yet further, while we have illustrated and described a printing device frame on which but a single printing plate is to be retained, it is to be understood that the advantages accruing from this invention may be realized by including the novel aspects of this invention in printing plates of the character of which a plurality are adapted to be retained on a single printing device frame, an example of such an arrangement being shown in the patent to Hubbard, No. 1,682,519, patented August 28, 1928, which patent it will be understood is exemplary of a wide variety of printing device frames of the character on which a plurality of printing plates are adapted to be releasably retained. Thus it will be seen that the present invention may advantageously be included in a wide variety of printing devices, for when the present invention is embodied in a printing device it is possible to so arrange the retaining means, that are adapted to overlie at least selected marginal portions of a printing plate or selected marginal portions of a plurality of printing plates, in such a way that the exposed faces of such retaining means may be disposed well below the plane in which the relief faces of type characters embossed on the plate or plates are adapted to lie and thereby the likelihood that objectionable impressions will be made from the exposed faces of such retaining devices will be avoided.

Moreover, it will be appreciated that among the important advantages of the present invention is that the novel printing plates of this invention are desirably swaged by a rolling, coining or extruding operation for so to do insures that the printing plate will be free of sharp edges and corners. Moreover, the plates are advantageously produced in the manner described hereinabove by operations of the aforesaid character from blanks which are so arranged that when these blanks are subjected to an operation of the aforesaid character the plates will embody straight-line edges that will be related one to the other in right angular relationship.

Thus while we have illustrated and described selected emodiments of our invention, it is to be understood that these are capable of variation and modification and we therefore do not wish to be limited to the precise details set forth, but desire to avail ourselves of such changes and alterations as fall within the purview of the following claims.

We claim:

1. A printing device including a carrier, a substantially rectangular flat embossable printing

plate of not substantially more than .030'' in thickness, and means for securing one face of the plate against one face of the carrier and including retaining means adapted to overlie at least selected of the marginal portions of the plate, at least selected of the marginal portions of said plate that are adapted to be disposed under at least selected of such retaining means being formed to be of reduced thickness relative to the other portions of the plate and including face portions that are disposed substantially below the plane of the face of the plate opposite the face thereof disposed against the carrier, the free edges and corners of such formed portions embodying a rounded configuration, and the selected of the retaining means being formed to closely overlie and be in substantially face to face contact with the face portions on said marginal portions of the plate.

2. A printing device including a carrier, a thin flat printing plate of not substantially more than .030'' in thickness, means for securing one face of the plate against one face of the carrier and including retaining means adapted to overlie at least selected of the marginal portions of the plate, a flange of reduced thickness, relative to the other portions of the printing plate, along at least selected marginal edges of the plate that are adapted to be disposed under at least selected of the retaining means, the flange along a selected marginal edge of the printing plate having one face thereof inclined to extend beneath the face of the printing plate opposite the face thereof that is to be engaged with said one face of said carrier, each selected of the retaining means being formed to project over and closely overlie and be in substantially face to face contact with the inclined face of the flange and such selected of the retaining means being formed to be complementary to such inclined face of the flange.

3. A printing device including a carrier, a printing plate of not substantially more than .030'' in thickness and having type characters embossed thereon inwardly of the marginal portions thereof to appear in intaglio on one face of said plate and in relief on the opposite face of said plate, the relief faces of type characters embossed on said plate being disposed in a plane spaced from the adjacent face of the plate, said plate being of reduced thickness along at least one marginal edge thereof said marginal edge of reduced thickness being disposed to lie below the face of the printing plate on which type characters embossed thereon appear in relief, and retaining means on said carrier for retaining the plate on the carrier and embodying at least one element having at least a portion thereof formed to overlie said marginal edge and which portion of such element is formed to be complementary to said marginal edge of the plate, the exposed face of such portion of such element being disposed to lie in a plane spaced below the plane in which the relief faces of the type characters are disposed so that impressions may be made from the relief faces of the type characters without an impression being made from said exposed face of said portion of said element.

4. A printing device including a carrier, a printing plate of not substantially more than .030'' in thickness and having type characters embossed thereon inwardly of the marginal portions thereof to appear in intaglio on one face of said plate and in relief on the opposite face of said plate, the relief faces of type characters embossed on said plate being disposed in a plane spaced from the

adjacent face of the plate, said plate having a portion of reduced thickness along at least one marginal edge thereof that includes a face that is disposed to lie substantially flush with the face of said plate on which type characters embossed on the plate appear in intaglio and which has another face that is inclined to extend below the face of said plate on which type characters embossed on the plate appear in relief, and retaining means on said carrier for retaining the plate on the carrier and embodying at least one element having at least a portion thereof formed to overlie the inclined face afforded on the printing plate and which portion of such element is formed to be complementary to such inclined portion on the plate, the upper surfaces of said retaining devices being disposed substantially below said plane of said relief type characters.

5. A printing device including a carrier, retaining means on one face of said carrier arranged in spaced apart but substantially parallel relation, an embossable substantially rectangular printing plate of sheet material of not substantially more than .030'' in thickness on said carrier and disposed between the spaced apart retaining means to thereby be held against movement in one angular direction on said carrier, and means on said carrier for preventing movement of said plate on said carrier in another angular direction angularly related to the direction in which said plate is held against movement by said retaining means, said plate having a predetermined configuration swaged thereonto along the portions thereof adapted to be received in said retaining means, the portions so swaged onto the plate having a rounded configuration imparted to the free edges and corners thereof and also embodying a part that is disposed to lie below one face of the printing plate as well as a part that is disposed to lie substantially flush with the other face of the plate, said part of said swaged portions lying below one face of the printing plate having a shoulder at the inner edge thereof, said plate being disposed on said carrier with the face thereof with which said part of the predetermined configuration is substantially flush engaged with the carrier, the retaining means having at least a selected portion thereof formed to overlie the portion of the plate adapted for cooperation therewith, and such portion of the retaining means being formed to closely overlie the portion of the predetermined configuration on the plate that is disposed below one face of the printing plate.

6. A flat printing plate of not substantially more than .030 inch in thickness on which type characters may be embossed to appear in relief on one face and in intaglio on the opposite face, and a swaged marginal portion of reduced thickness extended along at least one marginal edge of the plate embodying a rounded free edge having rounded corners at the ends thereof and which portion has at least one face thereof disposed to lie below one face of the plate.

7. A flat printing plate of not substantially more than .030 inch in thickness on which type characters may be embossed to appear in relief on one face and in intaglio on the opposite face, and a flange along at least one marginal edge of said plate including substantially parallel faces and a rounded free edge having rounded corners at the ends thereof, one of the parallel faces of said flange being at least substantially flush with one of the opposite faces of said plate and the other of such faces is disposed to lie below the

plane of the other of the opposite faces of the plate.

8. A flat printing plate of not substantially more than .030 inch in thickness on which type characters may be embossed to appear in relief on one face and in intaglio on the opposite face, and a flange portion along at least one marginal edge of said plate having one face thereof disposed to be at least substantially flush with one of the opposite faces of said plate, the other of the opposite faces of the flange portion being inclined to extend between the free edge of said flange portion and the other of the opposite faces of the plate.

9. A flat printing plate of not substantially more than .030 inch in thickness on which type characters may be embossed to appear in relief on one face and in intaglio on the opposite face, and flanges along opposite edges of said plate that have corresponding faces thereof disposed to lie substantially flush with one face of said plate, other corresponding faces of the flanges being disposed to lie below the other of the opposite faces of said plate, each of such flanges including a rounded free edge.

10. A printing device including a carrier, retaining means on the carrier disposed in spaced apart and at least substantially parallel relation, an embossable printing plate on the carrier having opposite edges thereof respectively disposed for cooperation with the spaced apart retaining means, and means on the carrier for preventing movement on the plate in a direction parallel to the extent of the retaining means, said plate having portions of reduced thickness swaged along opposite edges thereof to provide shoulders on the plate inwardly of said opposite edges, said retaining means being constituted and arranged to include portions that engage the shoulders on the plate when said swaged portions are disposed in said retaining means to thereby hold the plate against movement on the carrier in a direction angularly related to the extent of said spaced apart retaining means on the carrier, the portions of the plate adjacent to said shoulders being of slightly increased thickness by reason of the swaging of said portion on the plate whereby the height of the shoulders is increased and effective cooperation thereof with the retaining means is assured.

11. A flat printing plate of not substantially more than .030 inch in thickness on which type characters may be embossed to appear in relief on one face and in intaglio on the opposite face, and a swaged flange portion along at least one marginal edge of said plate embodying a rounded free edge having rounded corners thereof and which flange portions has one face thereof disposed to be at least substantially flush with one of the opposite faces of said plate and which has the other face thereof disposed to lie below the other of the opposite faces of said plate whereby a shoulder is formed on said plate inwardly of the rounded free edge of said flange portion.

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REFERENCES CITED

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

UNITED STATES PATENTS

Number	Name	Date
530,371	Wade	Dec. 4, 1894
2,100,208	Wood	Nov. 23, 1937
2,131,503	Elliott	Sept. 27, 1938
866,775	Choate	Sept. 24, 1907
1,951,596	Creesy	Mar. 20, 1934
2,305,195	Richter	Dec. 15, 1942
1,151,501	Tomlinson	Aug. 24, 1915
1,921,202	Mungen	Aug. 8, 1933
2,070,591	Gollwitzer	Feb. 16, 1937
1,928,161	Wood	Sept. 26, 1933
1,116,032	De Minico	Nov. 3, 1914
959,725	Duncan	May 31, 1910
692,994	Duncan	Feb. 11, 1902
1,444,103	Boyd	Feb. 6, 1923

FOREIGN PATENTS

Number	Country	Date
330,432	Great Britain	June 12, 1930