Aug. 22, 1939. S. E. ROSENBERG 2,170,646

PERFORATING MACHINE

Filed April 13, 1938 3 Sheets-Sheet 1

Fig. 1.

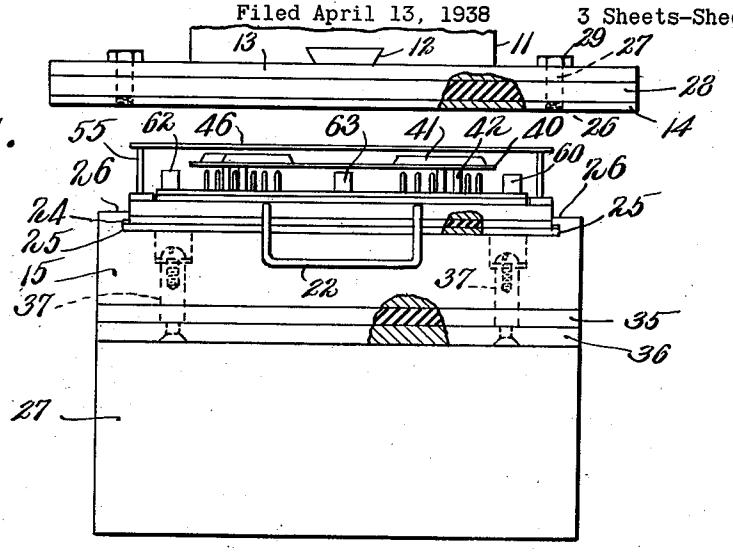


Fig. 3.

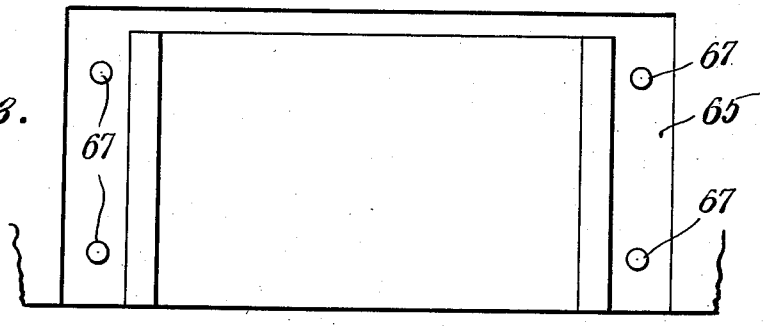
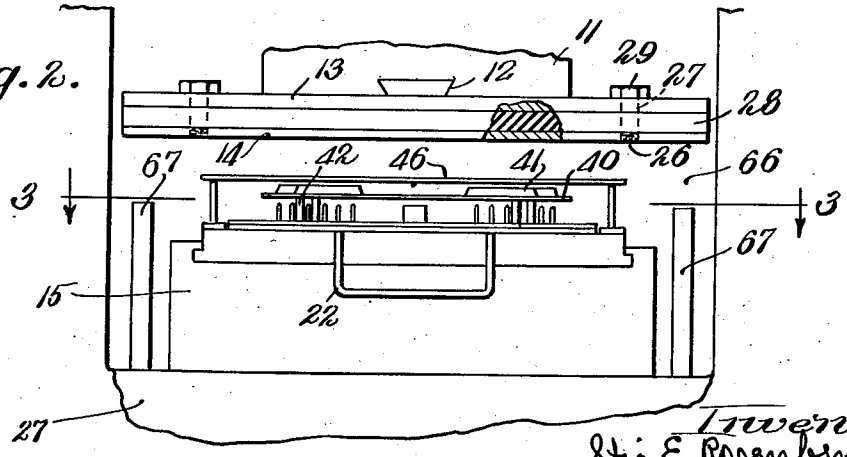


Fig. 2.



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PERFORATING MACHINE

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Fig. 4.

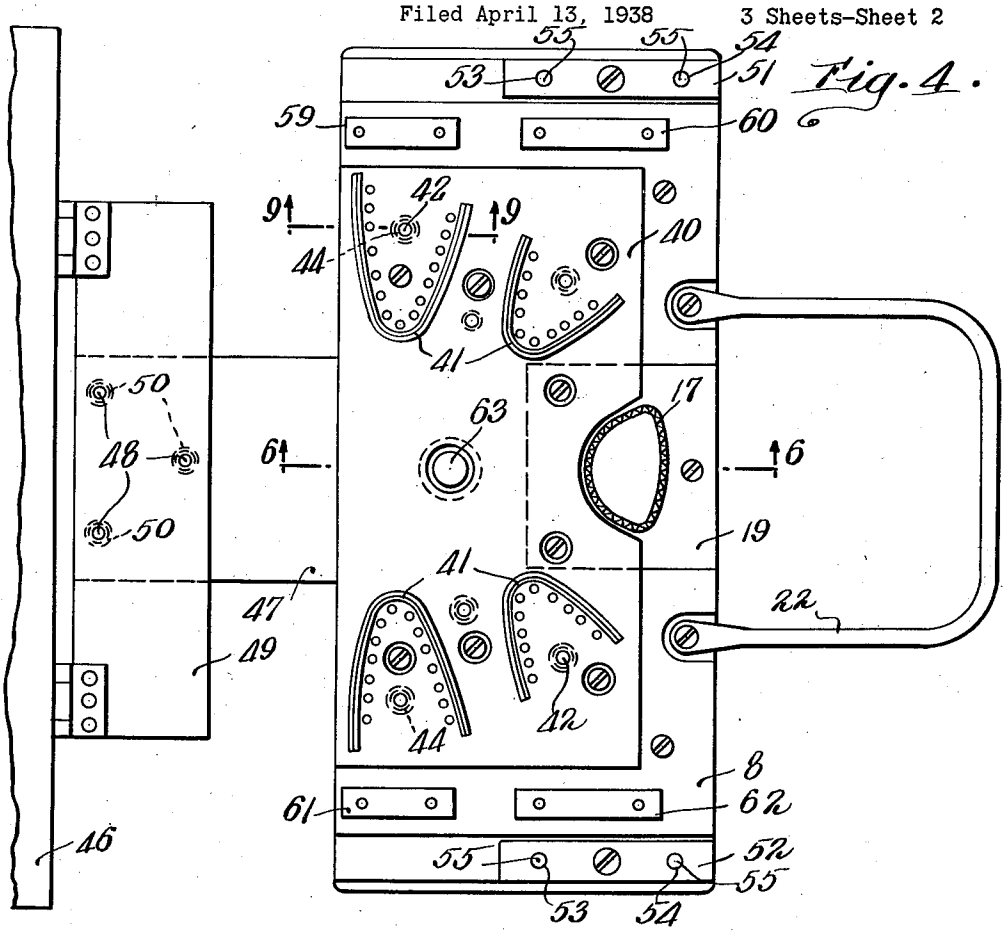


Fig. 5.

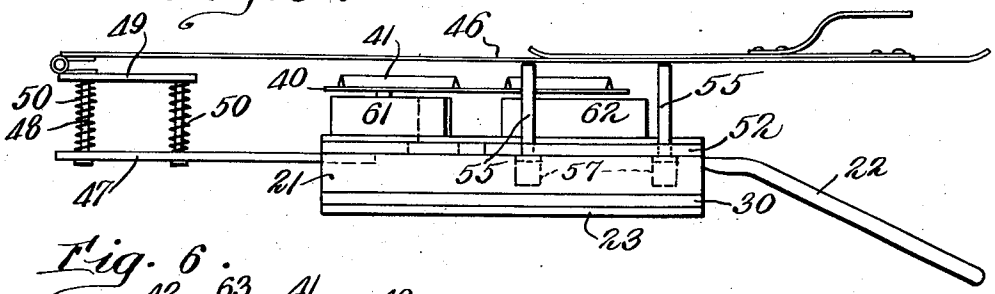
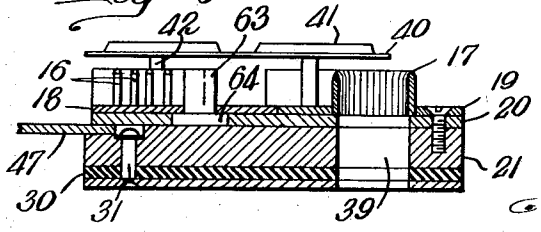


Fig. 6.



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PERFORATING MACHINE

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Fig. 7.

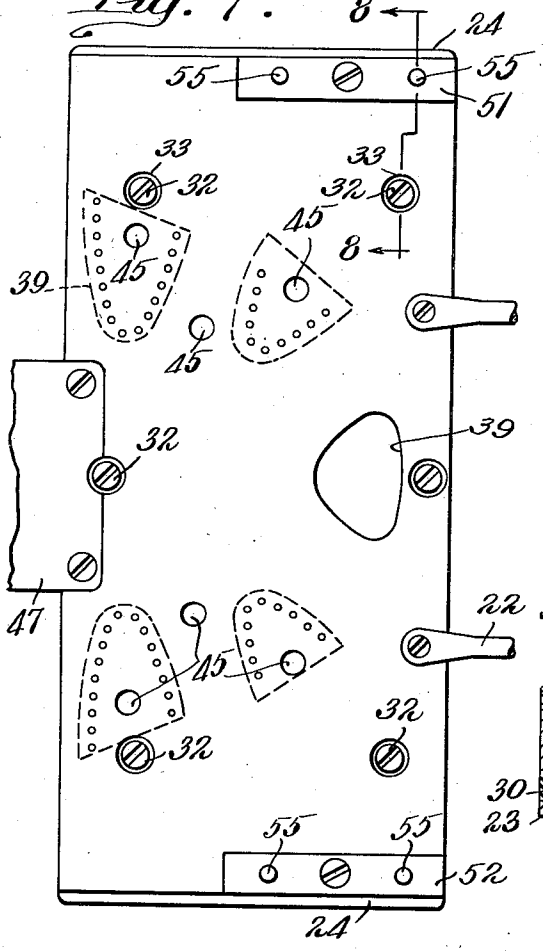


Fig. 8.

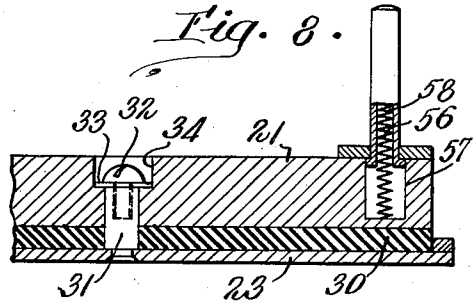
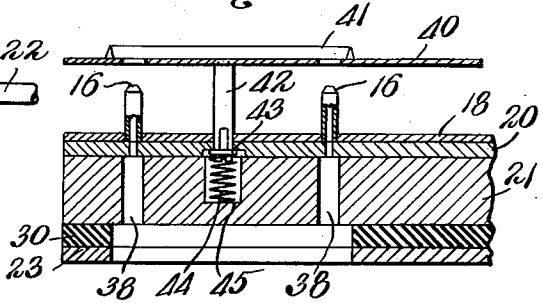


Fig. 9.



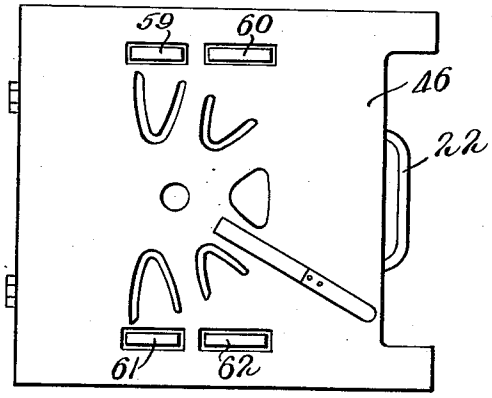


Fig. 10.

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Patented Aug. 22, 1939 2,170,646

UNITED STATES PATENT OFFICE

2,170,646

PERFORATING MACHINE

Stig E. Rosenberg, Brockton, Mass.

Application April 13, 1938, Serial No. 201,699

6 Claims. (Cl. 164—93)

The present invention relates to perforating machines which are used in many industries and which have a wide use in the manufacture of shoes to ornament various forms of shoe uppers and parts thereof.

It is common practice to provide these perforating machines with a perforating die and a die striking plate between which the work is penetrated and pierced by the cutting edges of the die. In order to disclose and define the present invention, a distinction has been made between the action of the cutting edges in passing into the work and the action of the cutting edges in passing through the work. As a result of the first action the work is penetrated. As a result of the second action the work is pierced. The die particularly in the shoe industry, comprises one of a series of dies, the cutting edges of each of which are differently arranged to ornament the work pieces with different designs. In the early days, the cutting edges of each die used in the machine struck and bit into the striking plate, thus rendering it unfit for further use with any die other than the one that impressed the design of its cutting edges thereinto, the repeated use of which die soon ruined the striking plate, thus requiring its replacement. Attempts have been made to prolong the life of the striking plate by providing it with a striking surface sometimes softer and sometimes harder than the cutting edges of the die, with the result that the striking plate required earlier replacement in the first case and reduced the operating life of the cutting edges of the die in the second.

As the size of the dies and the number of cutting edges therein increased, it was proposed to face the striking plate with a sheet of paper into which the cutting edges of the die penetrated. While this paper prolonged the life of the striking plate and permitted it to be used with any die in the interchangeable series, it was necessary to provide the perforating machine with a paper supply roll, a paper rewind roll, and a paper feed for moving the sheet of paper over the striking plate after each cycle of cutting operation in order to produce a fresh paper surface into which the cutting edges penetrated during the next succeeding cycle.

The cost of the paper is high, thus increasing materially the expense of operation. The use of paper in a perforating machine cuts down its efficiency due to shut-downs for the purpose of removing worn-out paper from the rewind roll and substituting a new supply, the leading end of which has to be threaded through the feed mechanism, under the striking plate to the rewind roll. The paper feed mechanism used in a perforating machine has become complicated in the desire of the manufacturer to obtain accuracy and uniformity in the length of the paper feed and in the adjustment of that length, presenting problems annoying both to the manufacturer and user with respect to operation, maintenance and repair. One problem, particularly annoying both to the die and to the shoe manufacturers, resulting from the use of paper in a perforating machine, is due to the pressure adjustment therefor which is provided to enable the operative to vary the stroke of the plunger which operates the striking plate in order that the cutting edges of each of the dies in the interchangeable series may penetrate, but not pierce, the paper backing for the striking plate. This adjustment involves considerable judgment upon the part of the operative in order to produce good work and to avoid injury to the dies, the striking plate or the machine.

The principal objects of the present invention are to produce a perforating machine in which no paper is used, in which no pressure adjustment is provided, and in which the striking plate may be used with all the dies in the interchangeable series without injury to the cutting edges thereof or being marred thereby.

To the accomplishment of at least one of these objects, a feature of the invention contemplates the provision in a perforating machine having a perforating die and a die striking plate, at least one of which is mounted to yield under resistance from the other, between which the work is penetrated and pierced by the cutting edges of the die and means for causing the cutting edges of the die to receive the entire penetrating pressure, of means independent of the cutting edges and coming into action at the moment they pierce the work for shouldering from the cutting edges of the die substantially the entire piercing pressure.

Broadly considered, the perforating die and the die striking plate may be constructed and arranged to move relatively to cause the cutting edges of the die to penetrate and pierce the work in accordance with the various modes of operation adopted by different perforating machine manufacturers. It is preferred, however, to so construct and arrange the perforating die and the die striking plate that the latter in moving downwardly impales the work upon the upstanding cutting edges of the die.

In the broader aspects of the invention, the

means independent of the cutting edges and coming into action at the moment they pierce the work for shouldering from the cutting edges of the die substantially the entire piercing pressure may take any form found desirable or expedient and may be located on the die, the striking plate, independently of either of them, or divided between the die and the striking plate.

Broadly considered, both the die and the die striking plate or either of them may be mounted to yield. To avoid duplication of the yielding feature in each die of the interchangeable series, it is preferred to build the yield into some other readily removable part of the machine, such as the support for the die striking plate or the block which supports the die during the perforating operation.

Accordingly, another feature of the present invention contemplates the provision in a perforating machine having a perforating die and a die striking plate between which the work is penetrated and pierced by the cutting edges of the die, a plunger having a constant stroke for operating the die striking plate, the plate and the plane of the cutting edges of the die being normally spaced apart a distance less than the work piercing stroke of the plunger, and means permitting the die and the striking plate to yield relatively during the penetration of the work by the cutting edges of the die, of means independent of the cutting edges for causing them to kiss the striking plate at the moment the cutting edges pierce the work.

Other features of the present invention reside in certain constructions and arrangements of parts hereinafter described and then set forth broadly and in detail in the appended claims which possess advantages readily understood by those skilled in the art.

The various features of the present invention will be understood readily from an inspection of the accompanying drawings, in which,

Figure 1 is a detail view in front elevation showing the various features of the invention embodied in a perforating machine of the "Brockton" type in which the striking plate in moving downwardly impales the work upon the upstanding cutting edges of the die, the means independent of the cutting edges for causing them to kiss the striking plate at the moment the cutting edges pierce the work being shown as located on the die;

Fig. 2 is a detail view in front elevation showing the opening in the frame of the "Brockton" machine in which the striking plate reciprocates vertically and in which the die and its supporting block are mounted during flat-bed die perforating and combined ink-marking and perforating, the means independent of the cutting edges for causing them to kiss the striking plate at the moment the cutting edges pierce the work being shown as located on the flat ledge on the frame surrounding three sides of the opening therein;

Fig. 3 is a detail view in sectional plan on the line 3—3, Fig. 2, the die and its supporting block having been removed;

Fig. 4 is a detail view in plan of the die, the work support having been removed to show underlying parts;

Fig. 5 is a detail view in left side elevation of the die, the work support having been replaced;

Fig. 6 is a detail view in sectional elevation on the line 6—6, Fig. 4;

Fig. 7 is a detail view in plan of the die, the marking, tube and knife plates having been removed to show underlying parts;

Fig. 8 is a detail view in sectional elevation on the line 8—8, Fig. 7;

Fig. 9 is a detail view in sectional elevation on the line 9—9, Fig. 4, and

Fig. 10 is a detail view in plan (reduced scale) of the work support.

For convenience in disclosure, the various features of the present invention have been illustrated and described as being embodied in the "Brockton" perforating machine, the construction and mode of operation of which is disclosed in my Patents Nos. 2,084,869, 2,093,099 and 2,108,447, issued, respectively, June 22, 1937, September 14, 1937, and February 15, 1938. Generally, the "Brockton" perforating machine, embodying the various features of the present invention, has the same construction and mode of operation as the "Brockton" perforating machine disclosed in my Patent No. 2,084,869, except that the pressure adjustment 35 disclosed in Fig. 3 of this patent has been eliminated to impart a constant stroke to the plunger or platen 21 therein and all mechanism relating to the paper facing for the die striking plate 23 has been removed.

In the embodiment of the invention illustrated in Fig. 1, the downwardly moving platen or plunger 11 of the "Brockton" perforating machine is provided with a groove 12 which receives a tongue on a plate 13 from which the die striking plate 14 is supported. The plunger is reciprocated vertically to cause the die striking plate 14 to impale the work on the upstanding cutting edges of a die which is mounted on a block 15, which is like the block 16 disclosed in Fig. 2 of my Patent No. 2,108,447, February 15, 1938.

For purposes of disclosure, the die is illustrated and described as a combined ink-marking and perforating die of the type disclosed in my pending application Serial No. 194,299, filed March 7, 1938. As usual in this type of die, the perforating tubes 16 and the knife 17, (Fig. 6), are mounted, respectively, in a tube holder plate 18 and a knife holder plate 19 which are supported by a rest plate 20 carried in turn by a die block 21, the front face of which is provided with a handle 22 to facilitate the movement of the die into and out of the machine and from and to a position of pressure to and from a position of clearance.

Supported from the bottom of the die block 21 is a guide plate 23, the opposite side edges of which project beyond the corresponding edges of the block, (Figs. 7 and 8), to form ledges 24 which slide in the guideways 25, (Figs. 1 and 2), of the tracks 26 projecting forwardly from the block 15.

In the "Brockton" perforating machines as heretofore constructed, a pressure adjustment was provided to permit the operative to adjust the length of the stroke of the plunger and thus vary the pressure exerted by the striking plate in impaling the work upon the cutting edges of the die. In accordance with one of the features of the present invention, this pressure adjustment has been removed, and accordingly the plunger 11 has an impaling stroke of a constant length. But the normal distance separating the bottom of the striking plate from the plane of the cutting edges of the dies has been made less than the length of the impaling stroke of the plunger 11, so either the die, the die striking plate, or both of them, must yield to prevent breakage.

For purposes of discloseure, Fig. 1 illustrates the die striking plate 14 as being mounted yieldingly on the plate 13, the die as being mounted yieldingly on the block 15, and the block 15 as being mounted yieldingly on the bed 27, which is like the bed 12 disclosed in my Patent No. 2,108,447, but it will be understood by those skilled in the art that generally only one form of the three yields illustrated in Fig. 1 need be employed at a time, although an unusual operating condition may require more than one of the yields and possibly all three of them. While one of the yields is illustrated as being embodied in the die, it may be more practicable to restrict the location of the yield to another readily removable part of the machine, such as between the plates 13 and 14, (Figs. 1 and 2), or on the bottom of the block 15, (Fig. 1), thus to avoid building a yield into each die of the interchangeable series.

Referring to Figs. 1 and 2, the die striking plate 14 is tapped to receive the screwed ends of bolts 26, the shanks 27 of which pass loosely through the plate 13 and a sheet of rubber 28 interposed between the plates 13 and 14, a head 29 on each bolt 26 serving to limit normally the position of the die striking plate 14 relatively to the plate 13.

Referring to Figs. 8 and 9, a sheet of rubber 30 is interposed between the bottom of the die block 21 and the plate 23. To hold the rubber sheet 30 in place and to permit it to function as a yield, the plate 23 has six posts 31, (Fig. 8), riveted to it, each post passing loosely through the rubber sheet 30 and the die block 21, and internally threaded to receive a screw 32, (Figs. 7 and 8), which clamps a collar 33 against the top of the post. The collar 33 engages the bottom of a recess 34 formed in the die block 21 to limit normally the position of the plate 23 therefrom.

Referring to Fig. 1, a sheet of rubber 35 is interposed between the bottom of the block 15 and a plate 36, the rubber sheet 35 and the plate 36 being secured to the block 15 to form a yield therefor by posts 37 which function like the posts 31, (Fig. 8), and which are secured to the block 15 in a manner similar to that employed in securing the posts 31 to the die block 21.

In order to discharge the pills formed by the perforating tubes 16 and the blank formed by the knife 17 out of the machine, pill conduits 38 (Fig. 9), and a blank conduit 39, (Fig. 6), are formed through the rest plate 20, die block 21, plate 23 and rubber sheet 30. The pills and blank drop down upon the top of the block 15 and are wiped therefrom by the adjacent walls of the pill and blank conduits when the die is withdrawn from its position of pressure towards its position of clearance.

As usual in this type of die, a marking plate 40, (Figs. 1, 2, 4, and 9), carrying marking edges 41 is provided. The plate 40 is provided with six depending posts 42, (Fig. 9), the bottoms of each of which is provided with a collar 43. Each of the posts 42 is supported from the die block 21 by a coiled spring 44 which is interposed between the collar 43 and the bottom of a recess 45, (Fig. 9), formed in the die block. The springs 44 maintain the marking plate 40 in a plane above the cutting edges of the die. The marking plate 40 is provided with suitable holes to permit the passage therethrough of the cutting edges of the tubes 16 when the plate 40 is depressed by the striking plate 14 during the combined ink-marking and perforating operation.

In accordance with the broad feature of the invention disclosed in my Patent No. 2,093,099, the work is mounted upon a combined work support and stripper plate 46, (Figs. 1, 2, 5 and 10), provided with apertures across which the work is drum-headed by the striking plate during the combined ink-marking and perforating operation. The plate 46 is supported from a plate 47 (Figs. 4 and 5), secured to and projecting from the back end of the die block 21.

The plate 47 is provided with three upstanding posts 48 rigidly secured thereto. The upper ends of the posts 48 pass loosely through a cross plate 49 which is supported by springs 50, each of which is coiled around one of the posts 48 and interposed between the top of the plate 47 and the bottom of the plate 49. The work supporting plate 46 is pivoted to the plate 49 for the purpose disclosed in my pending application Serial No. 194,299, filed March 7, 1938.

In order to prevent the work supporting plate 46 from falling down upon the marking edges 41, the die block 21 carries two blocks 51 and 52, (Fig. 4), each having two openings 53 and 54 therein, through each of which a post 55 (Fig. 8), passes loosely. The post 55 is maintained normally in the position of Fig. 8 by a coiled spring 56 interposed between the bottom of a recess 57 formed in the die block 21 and the bottom of a chamber 58 formed in the post, the spring serving to hold normally a shoulder on the bottom of the post against the bottom of the block.

When the work is located on the work supporting plate 46 and the die is moved into the position of pressure, the "Brockton" perforating machine is thrown into operation to cause the striking plate to descend to impale the work upon the cutting edges of the die. During this operation, the cutting edges of the die first penetrate the work and then pierce it. During the penetration of the work by the cutting edges of the die, the entire pressure exerted by the striking plate is transmitted through the work to the cutting edges of the die, but as the cutting edges of the die are buried in the work during the penetration thereof, the cutting edges of the die and the striking plate are protected from injury. If, without more, the cutting edges of the die were to complete the penetration of the work and pierce it, the impact between the cutting edges of the die and striking plate would cause serious damage thereto.

In order that substantially the entire piercing pressure may be shouldered from the die cutting edges at the moment they pierce the work and thus cause them to kiss the striking plate, that is, contact the striking plate in a gentle, harmless manner, the plate 18 is provided with hardened steel means having die striking plate impact surfaces arranged in the same plane as the cutting edges of the die. For purposes of disclosure, these hardened steel means are illustrated as elongated blocks, 59, 60, 61 and 62, and as a cylindrical post 63, in Figs. 1, 4, 5 and 6. The blocks 59, 60, 61 and 62 are secured rigidly to the plate 18 in a location clear of the work. The post 63 operates through registered openings in the work supporting plate 46 and the underlying marking plate 40. The post 63, however, clears the work in order that its upper impact surface may contact the striking plate 14. The bottom of the post 63 is provided with a head 64 which is seated in a recess therefor formed in the plate 20, so that the head may be clamped between the plate 18 and the die block 21.

The shape and location of these hardened steel means, broadly considered, is immaterial so long as they come into action at the moment the die cutting edges pierce the work and shoulder from the cutting edges substantially the entire piercing pressure. When they are mounted on the die, their impact surfaces should be arranged in the plane of the cutting edges of the die. If they were mounted on the striking plate, their impact surfaces would be arranged to contact some fixed part of the die clear of the work at the moment the die cutting edges pierce the work. Preferably, the means for shouldering from the cutting edges of the die substantially the entire piercing pressure are interposed between the striking plate and the die, whether or not they are all on the die or all on the striking plate, or divided between them.

However, in some instance, it may be desirable to locate on the machine frame the means for causing the die cutting edges to kiss the striking plate at the moment the cutting edges pierce the work. To this end, the flat ledge **65**, (Fig. 3), bounding three sides of the opening **66**, (Fig. 2), in the frame of the "Brockton" perforating machine may be provided with four posts **67** rigidly secured thereto. The upper ends of these posts, constituting the die striking plate impact surfaces, are located in the same plane as the die cutting edges, so that when the die is depressed during the penetration of the cutting edges into the work, the impact surfaces on the posts will come into action at the moment the cutting edges pierce the work to shoulder from the cutting edges substantially the entire piercing pressure and thus cause the cutting edges to kiss the striking plate in an innocuous manner. Of course, if the yield were built into the die or its support, the upper ends of the posts **67** would be normally located in a plane just below the cutting edges of the die.

Nothing herein explained is to be interpreted as limiting the various features of the present invention in the scope of its application to use in connection with the particular machine or the particular mode of operation or any combination thereof selected for purposes of illustration and explanation. While the particulars of construction herein set forth are well suited to one mechanical form of the invention and to the uses to which it is put, it is not limited as to these uses, nor to these details of construction, nor to the conjoint use of all its features, nor is it to be understood that these particulars are essential since they may be modified within the skill of the artisan without departing from the true scope of the actual invention, characterizing features of which are set forth in the following claims by the intentional use of generic terms and expressions inclusive of various modifications.

What is claimed as new, is:

1. In a perforating machine, the combination with a perforating die and a die striking plate, at least one of which is mounted to yield under resistance from the other, between which the work is penetrated and pierced by the cutting edges of the die, and means for causing the cutting edges of the die to receive the entire penetrating pressure, of means independent of the cutting edges and coming into action at the moment they pierce the work for shouldering from the cutting edges of the die substantially the entire piercing pressure.

2. In a perforating machine, the combination with a perforating die and a die striking plate between which the work is penetrated and pierced by the cutting edges of the die, a plunger having a constant stroke for operating the die striking plate, the striking plate and the plane of the cutting edges of the die being normally spaced apart a distance less than the work piercing stroke of the plunger, and means permitting the die and the die striking plate to yield relatively during the penetration of the work by the cutting edges of the die, of means independent of the cutting edges for causing them to kiss the striking plate at the moment the cutting edges pierce the work.

3. In a perforating machine, the combination with a perforating die and a die striking plate between which the work is penetrated and pierced by the cutting edges of the die, a plunger having a constant stroke for operating the die striking plate, the striking plate and the plane of the cutting edges of the die being normally spaced apart a distance less than the work piercing stroke of the plunger, and means permitting the die and the die striking plate to yield relatively during the penetration of the work by the cutting edges of the die, of means independent of the cutting edges and interposed between the die and the die striking plate for causing the cutting edges of the die to kiss the striking plate at the moment the cutting edges pierce the work.

4. In a perforating machine, the combination with a perforating die and a die striking plate between which the work is penetrated and pierced by the cutting edges of the die, a plunger having a constant stroke for operating the die striking plate, the striking plate and the plane of the cutting edges of the die being normally spaced apart a distance less than the work piercing stroke of the plunger, and means permitting the die and the die striking plate to yield relatively during the penetration of the work by the cutting edges of the die, of means mounted on the die independent of the cutting edges for causing them to kiss the striking plate at the moment the cutting edges pierce the work.

5. In a perforating machine, the combination with a perforating die and a die striking plate between which the work is penetrated and pierced by the cutting edges of the die, a plunger having a constant stroke for operating the die striking plate, the striking plate and the plane of the cutting edges of the die being normally spaced apart a distance less than the work piercing stroke of the plunger, and means permitting the die and the die striking plate to yield relatively during the penetration of the work by the cutting edges of the die, of rigid means on the machine frame for causing the cutting edges of the die to kiss the striking plate at the moment the cutting edges pierce the work.

6. In a perforating machine, the combination with a perforating die and a die striking plate between which the work is impaled on the cutting edges of the die, and means permitting at least one of them, the die and the plate, to yield under the impaling pressure, of rigid means mounted on the die having a striking plate impact surface arranged in the plane of said edges.

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