April 27, 1943. H. S. FULLERTON 2,317,851

DIE SPOTTING PRESS

Filed July 27, 1940 7 Sheets-Sheet 1

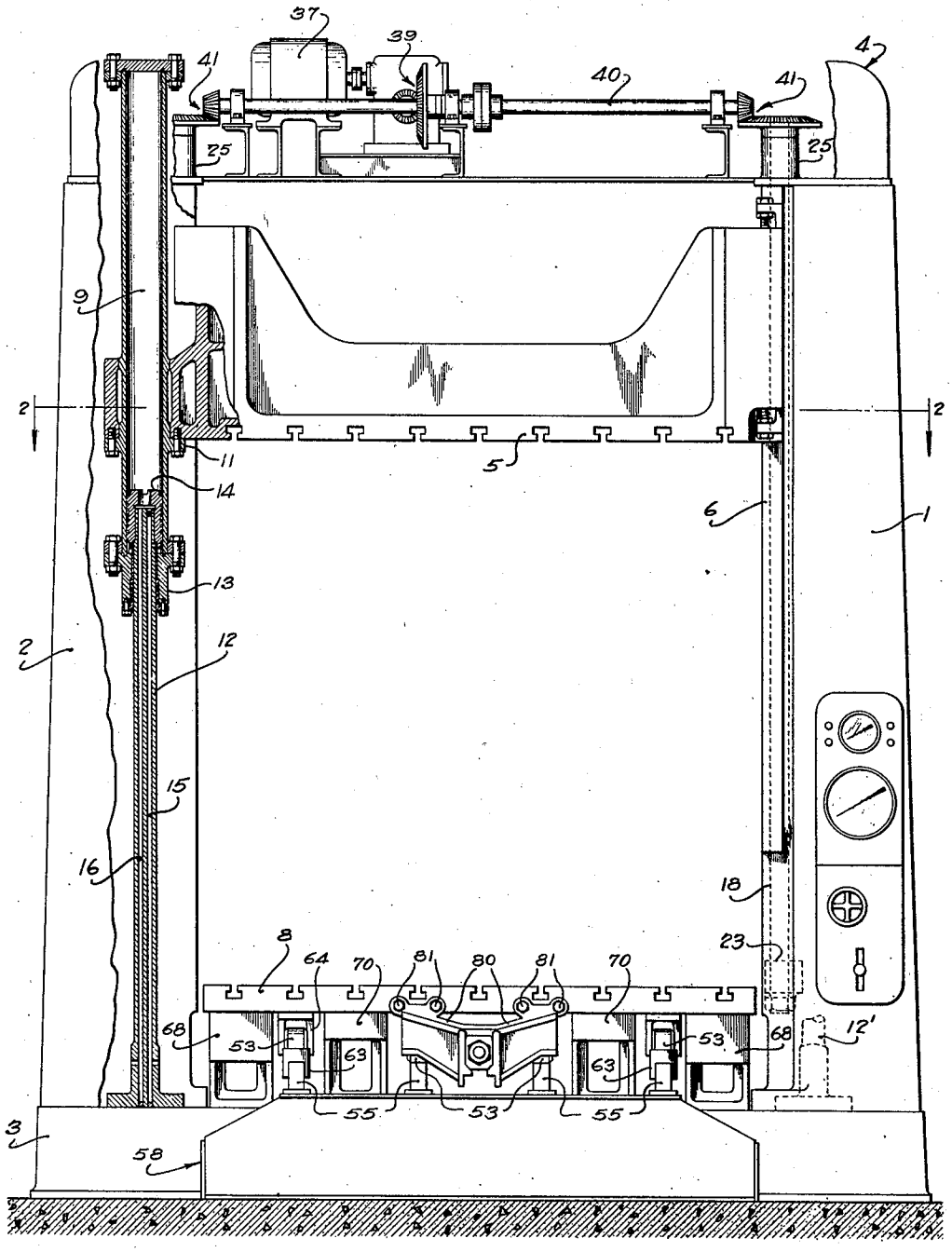


Fig. 1

INVENTOR
HERBERT S. FULLERTON
BY
ATTORNEY

April 27, 1943. H. S. FULLERTON 2,317,851

DIE SPOTTING PRESS

Filed July 27, 1940 7 Sheets-Sheet 2

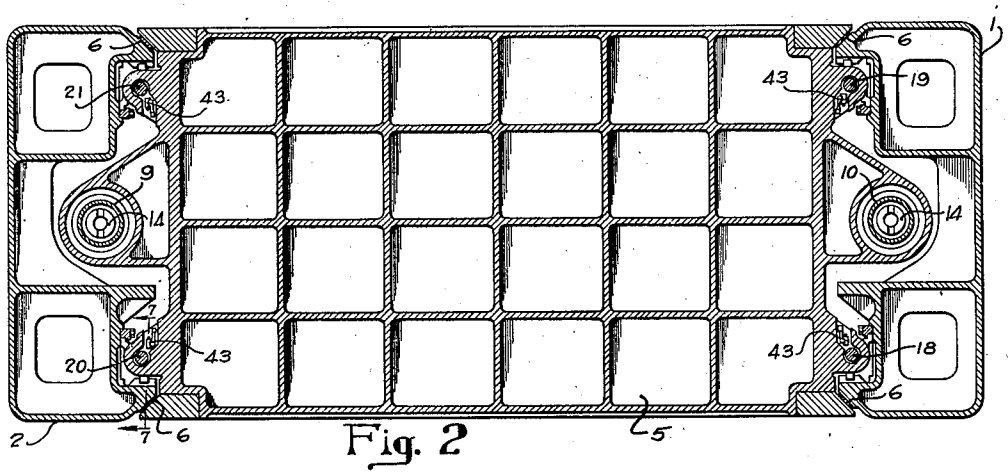


Fig. 2

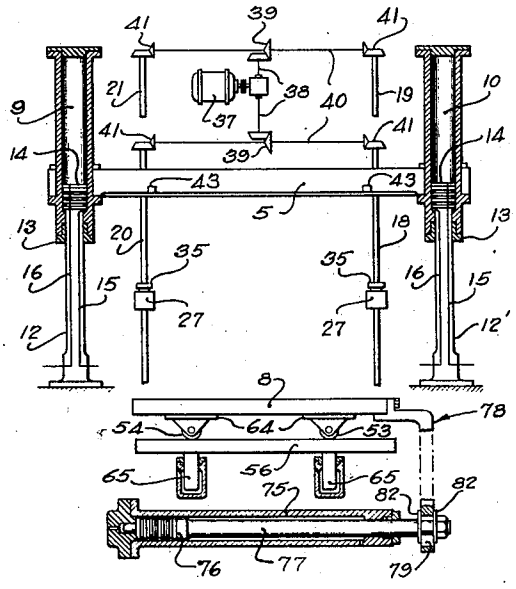


Fig. 3

INVENTOR
HERBERT S. FULLERTON
BY
ATTORNEY

April 27, 1943. H. S. FULLERTON 2,317,851

DIE SPOTTING PRESS

Filed July 27, 1940 7 Sheets-Sheet 3

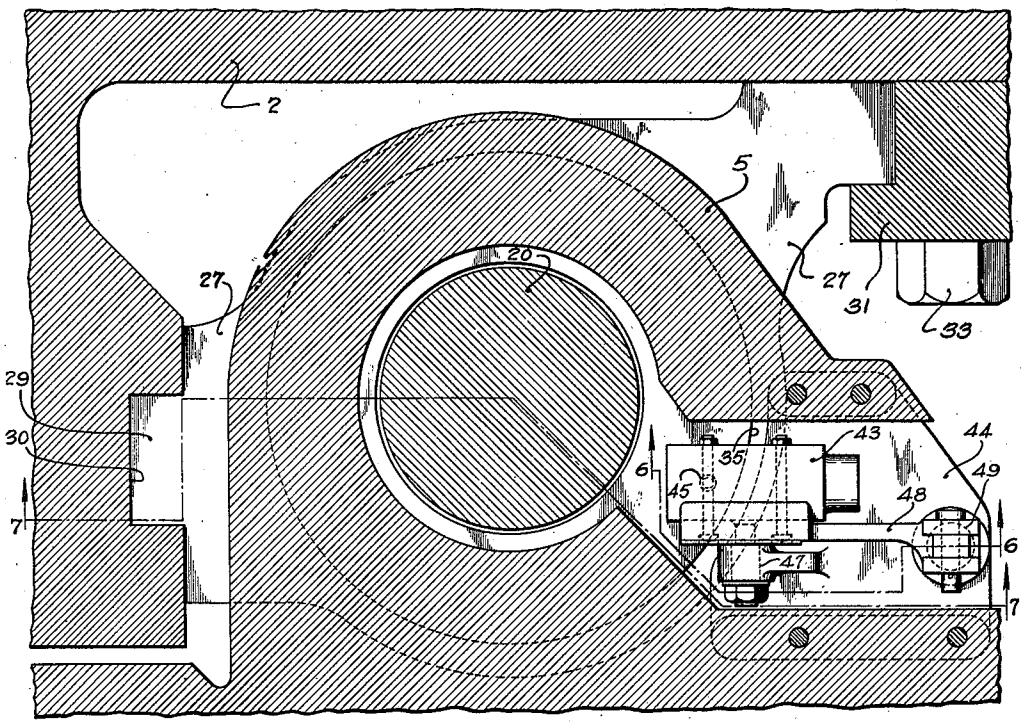


Fig. 5

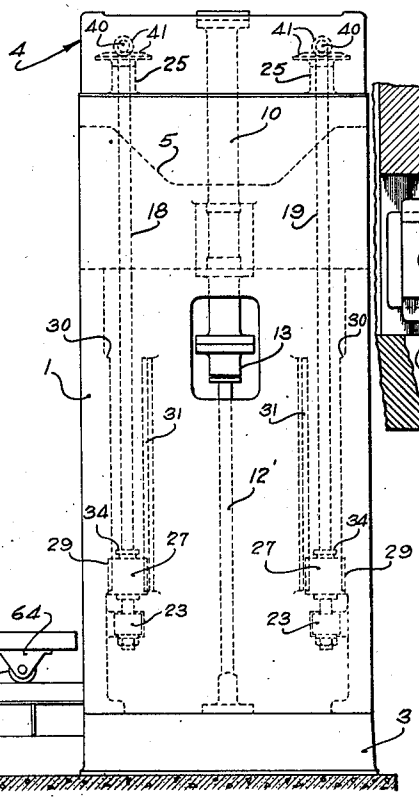


Fig. 4

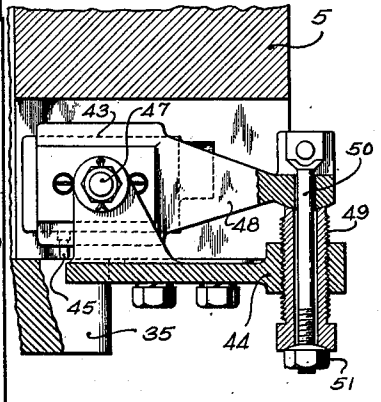
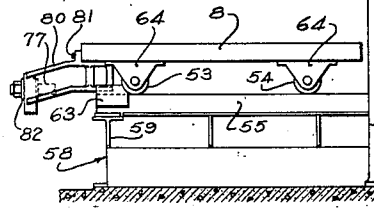


Fig. 6



INVENTOR
HERBERT S. FULLERTON
BY
ATTORNEY

April 27, 1943. H. S. FULLERTON 2,317,851

DIE SPOTTING PRESS

Filed July 27, 1940 7 Sheets-Sheet 4

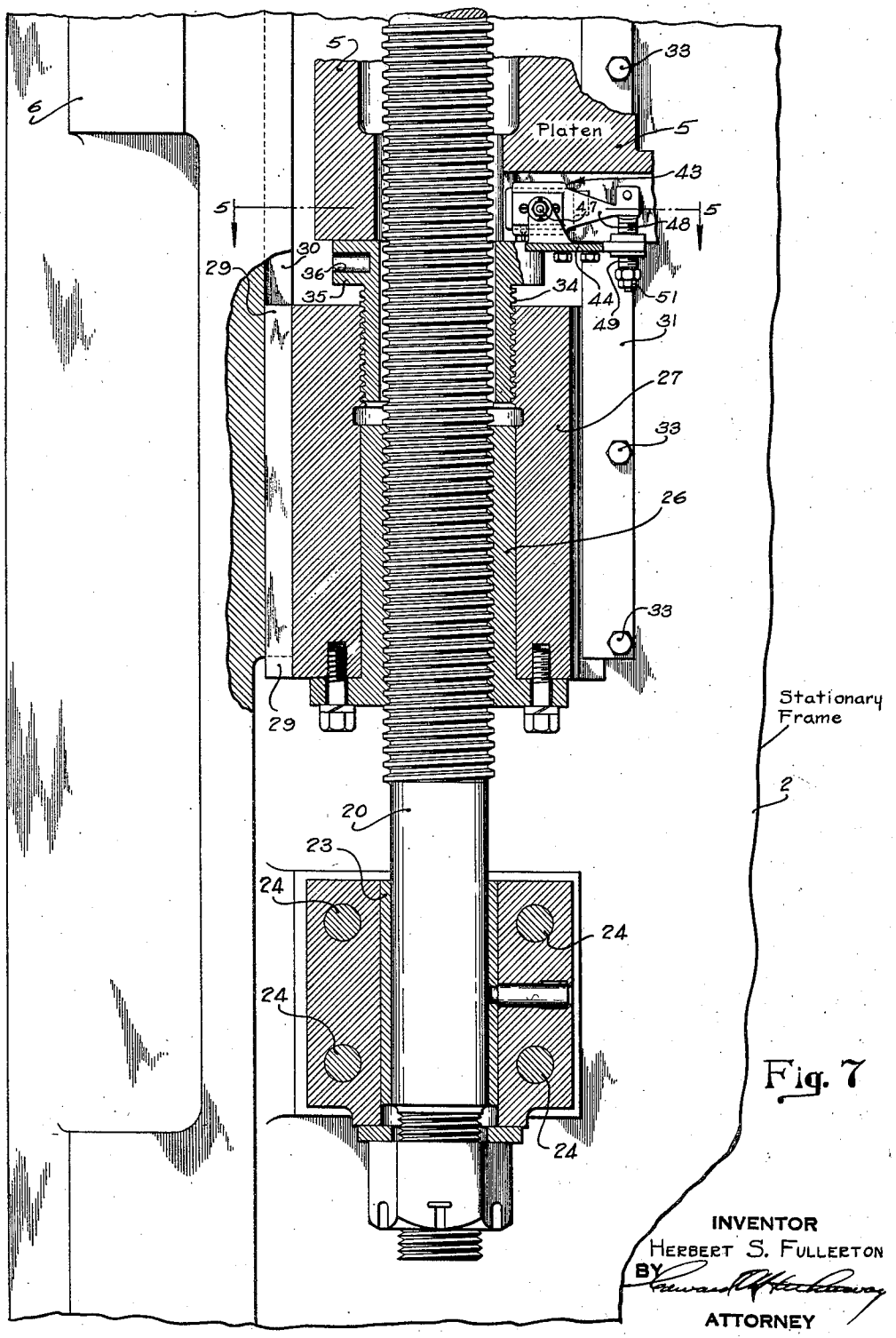


Fig. 7

INVENTOR
HERBERT S. FULLERTON
BY
ATTORNEY

April 27, 1943. H. S. FULLERTON 2,317,851

DIE SPOTTING PRESS

Filed July 27, 1940 7 Sheets-Sheet 5

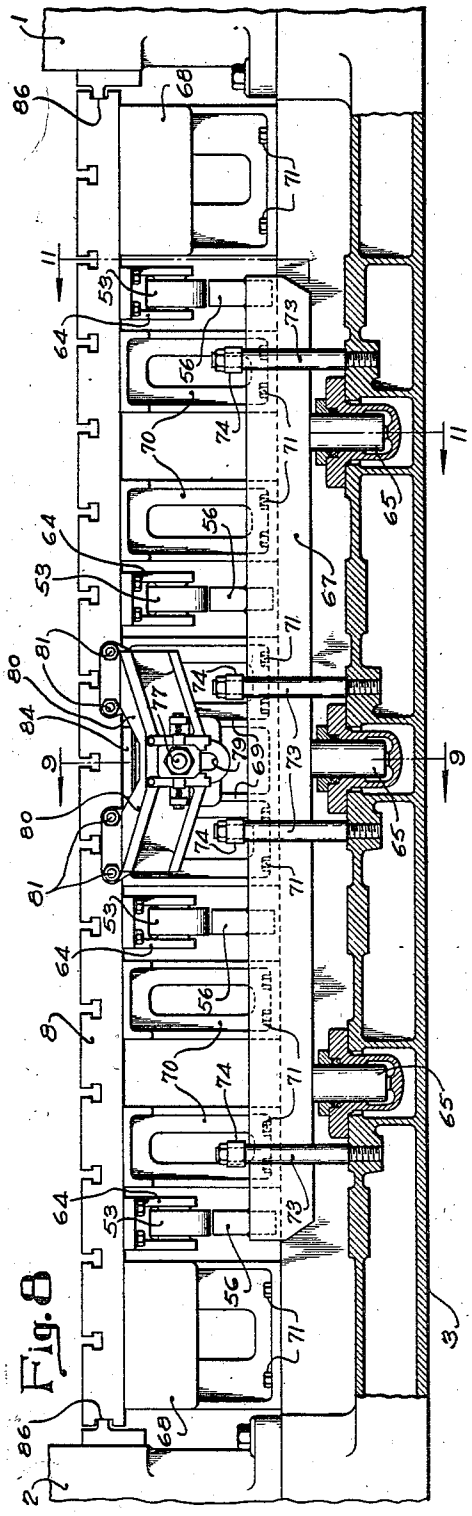


Fig. 8

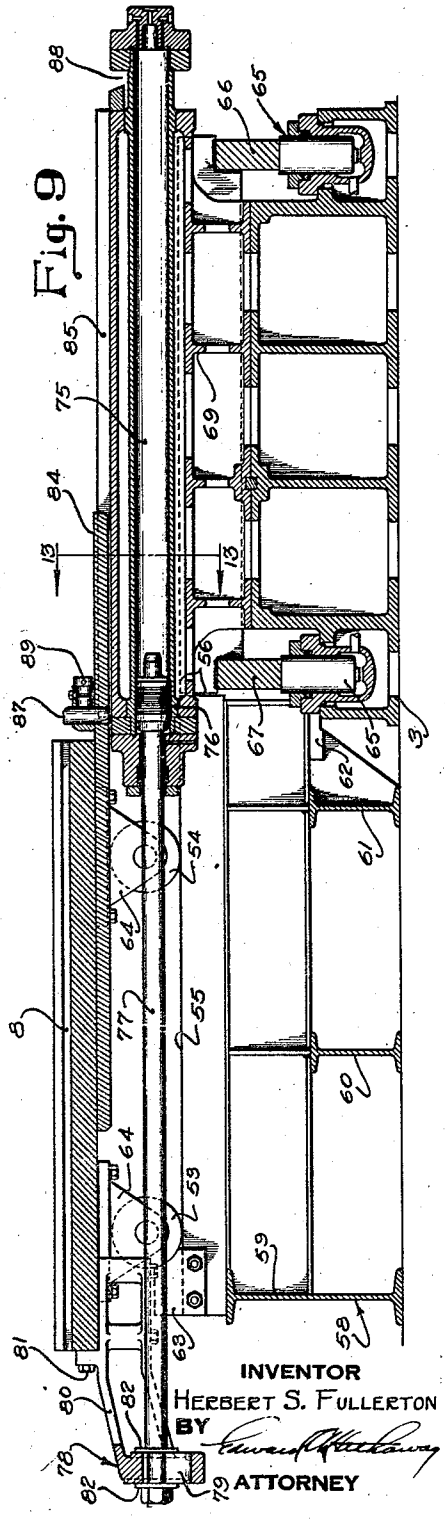


Fig. 9

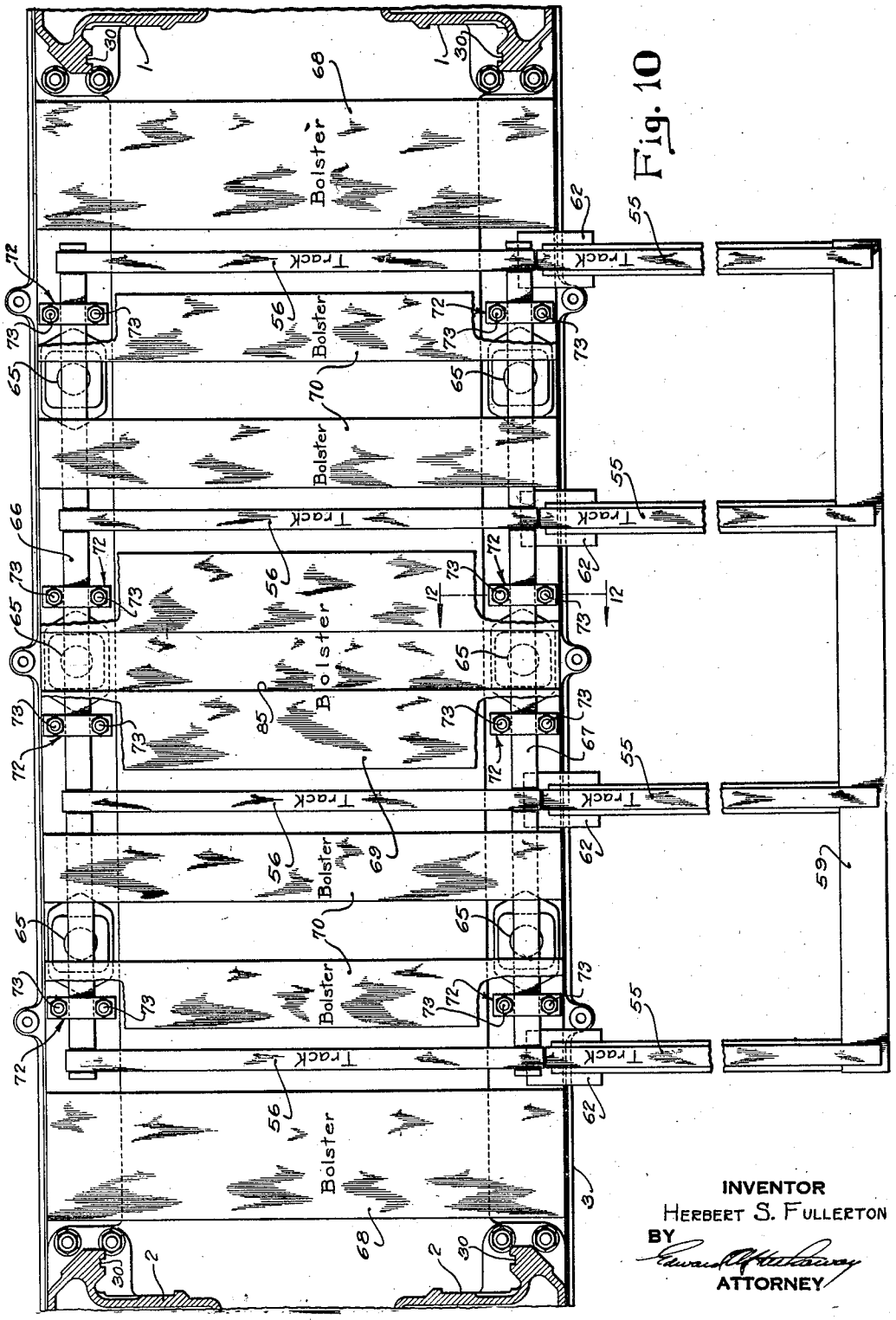
INVENTOR
HERBERT S. FULLERTON
BY
ATTORNEY

April 27, 1943. H. S. FULLERTON 2,317,851

DIE SPOTTING PRESS

Filed July 27, 1940 7 Sheets-Sheet 6

Fig. 10



INVENTOR
HERBERT S. FULLERTON
BY
ATTORNEY

April 27, 1943. H. S. FULLERTON 2,317,851

DIE SPOTTING PRESS

Filed July 27, 1940 7 Sheets-Sheet 7

Fig. 11

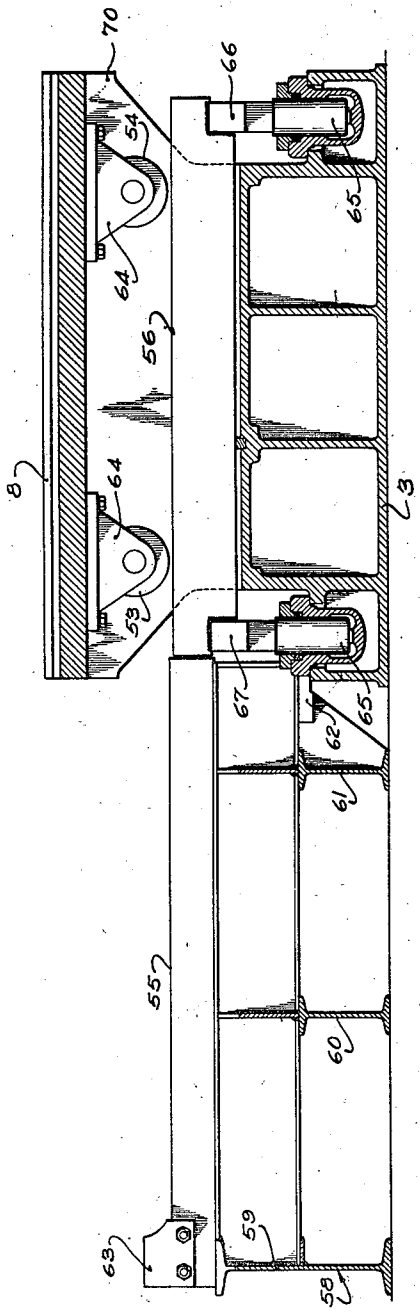


Fig. 13

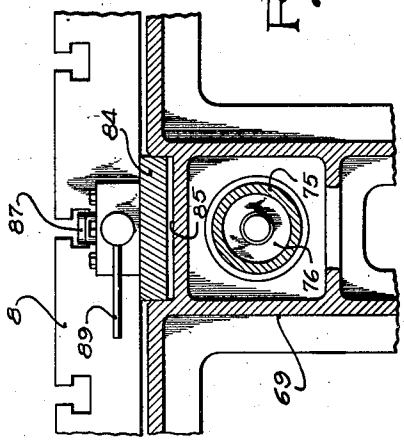
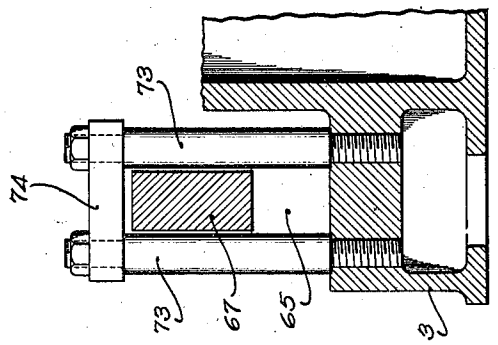


Fig. 12



INVENTOR
HERBERT S. FULLERTON
BY
ATTORNEY

Patented Apr. 27, 1943

2,317,851

UNITED STATES PATENT OFFICE

2,317,851

DIE SPOTTING PRESS

Herbert S. Fullerton, Philadelphia, Pa., assignor to The Baldwin Locomotive Works, a corporation of Pennsylvania

Application July 27, 1940, Serial No. 348,067

11 Claims. (Cl. 76—4)

This invention relates generally to press equipment and more particularly to die spotting presses.

Various types of die spotting equipment have been heretofore proposed and used for determining and indicating high spots on a die but the accuracy obtained with such prior art equipment was dependent upon the accuracy of the machine as initially built. Hence, any inaccuracies in the machine structure either as originally built or as entered the machine from wear through a period of use would simply have to be endured unless the machine was rebuilt.

It is an object of my invention to provide an improved die spotting apparatus in which the accuracy of the apparatus may be determined at any time by a mechanic and suitable compensation made to adjust or restore the accuracy. As a result of this improved mode of operation, the user of my improved die spotting press can always have as high a degree of accuracy as his mechanics are capable of accomplishing by their own personal ability. For instance, if it is desired to maintain the press platens in absolute parallelism while spotting the dies, then this can be accomplished in my improved arrangement if the mechanic has the skill to make certain simple micrometer measurements or if desired a predetermined non-parallel relation may be established between the complementary dies if such non-parallel relationship is required for best operation of a set of dies when used in a given production press.

Most often it is desirable to have the bases of the complementary dies maintained parallel to each other so that they will have proper cooperative guiding action when placed in a production press which, it may be assumed, has its upper and lower platens parallel to each other but it sometimes happens that because of certain inherent peculiarities of some particular production press, or possibly because of some peculiarities of the dies, the platens of this particular press operate in a non-parallel relation. Hence, if the dies are spotted or matched with the die bases in parallel relation it is readily seen that if these dies are placed on a production press having non-parallel platens, then improper die matching results during actual pressing operations with consequent inferior work. The peculiarities of the individual production presses become definitely known to the operators and in accordance with my invention I am able to spot dies so as to take into consideration such peculiarities and adjust for the degree of parallelism, thereby more perfectly adapting the dies to a given production press or job.

Another object is to provide an improved die spotting press in which all of the foregoing compensations may be made in a simple, effective and expeditious manner, while maintaining a high degree of accuracy, sensitivity and durability. A further object is to provide improved switch responsive means which responds when the dies contact each other at a high spot and particularly to have such means constructed and arranged in a simple, effective and rugged manner.

A further object is to provide an improved die spotting press adapted to allow one-half of a massive die to be quickly placed in a cooperative die spotting position and yet to be readily shifted to a position to permit a workman to have complete and easy access to the dies for removal of high spots.

Other objects and advantages will be more apparent to those skilled in the art from the following description of the accompanying drawings in which:

Fig. 1 is a front elevation of my improved die spotter with parts broken away to show details of construction;

Fig. 2 is a horizontal sectional view taken substantially on the line 2—2 of Fig. 1;

Fig. 3 is a diagrammatic outline of my improved die spotter, controls and operating mechanism therefor;

Fig. 4 is a side elevation of my press with the lower die supporting means moved out from the press;

Fig. 5 is an enlarged horizontal section taken substantially on the line 5—5 of Fig. 7;

Fig. 6 is an enlarged vertical section of the micro-switch taken substantially on the line 6—6 of Fig. 5;

Fig. 7 is an enlarged vertical section taken substantially on the line 7—7 of Figs. 2 and 5, parts being shown in elevation for clarity and the upper platen being shown in its down position to illustrate its operative relation to the micro-screws;

Fig. 8 is an enlarged elevation of the front end of the base and lower laterally movable platen with parts broken away to show certain of the operating plungers and cylinders, this view being similar to the bottom portion of Fig. 1;

Fig. 9 is a transverse section through the depth of the base and lower platen taken substantially on the line 9—9 of Fig. 8, but showing the lower platen laterally removed from the base;

Fig. 10 is a plan view of the base with the lower platen removed and portions of the platen supporting base girders broken away;

Fig. 11 is a section taken substantially on the line 11—11 of Fig. 8 with the lower platen in its normal die supporting position within the press but with certain elements omitted for sake of clarity;

Fig. 12 is a transverse section taken substantially on the line 12—12 of Fig. 10; and

Fig. 13 is a fragmentary section taken lengthwise of the lower base and platen taken substantially on the line 13—13 of Fig. 9.

As shown in the drawings, the press is of the type comprising generally a pair of side frames 1 and 2 mounted upon a base 3 and connected at their upper ends by a suitable crosshead structure generally indicated at 4. An upper vertically movable platen 5 is suitably guided on the side frames 1 and 2 through vertical guideways 6 located at each of the four corners of the side frames as shown in Fig. 2. The undersurface of the platen is provided with usual T-slots for supporting an upper die while a lower complementary die which is to be fitted or matched with the upper die is supported upon a lower table or platen 8, Fig. 1.

To move the upper platen 5 upwardly and downwardly a pair of hydraulic cylinders 9 and 10, Fig. 2, is supported on platen 5 at the ends thereof by bolted flanges 11, Fig. 1. A pair of stationary differential pressure operated rams 12 and 12', Figs. 2 and 3, one of which is shown at Fig. 1, is supported at its lower ends on base 3, while its upper ends extend through a suitable packing gland 13. Fluid pressure is supplied above and beneath said rams through passages such as 15 and 16. The ram and cylinder are only diagrammatically indicated on the left side of Fig. 1 for purposes of clarity and simplicity of understanding although both pairs of cylinders and rams are completely shown in Figs. 2 and 3.

For initial rough matching of dies the two halves thereof are secured to the upper and lower platens 5 and 8 whereupon fluid is exhausted from the upper ends of cylinders 9 and 10 to allow platen 5 to move down under gravity until the dies are in contact. The rate of movement is controlled by adjusting a valve for the fluid. The die surfaces will be covered with usual colored material so as to make an imprint at the high point of contact. Fluid pressure is then admitted to the hydraulic cylinders 9 and 10 to separate the dies whereupon a workman grinds or chips off the high spot. After the dies have been roughly spotted it is essential that the spotting be finished with a high degree of accuracy with the bases maintained in parallel relation or in some other predetermined non-parallel relation depending upon the peculiarities of the production press with which the dies are to be used.

To accomplish accurate spotting of the dies, I provide, Figs. 2 and 4, a pair of threaded rods 18 and 19 adjacent side frame 1 and another pair of threaded rods 20 and 21 adjacent side frame 2. Each of these rods and mechanism associated therewith is identical and hence the description of one, such as 20, will suffice for all. As shown in Fig. 7, the lower end of rod 20 is journalled in a bearing 23 which is secured to the inner side of frame 2 as by bolts 24. The upper end of rod 20 is journalled in a bearing such as 25, Fig. 1, formed in the upper stationary crosshead 4. A nut 26, Fig. 7, is formed in a crosshead 27 which is vertically guided at one side by a tongue 29 and groove 30 and is guided at the other side by a gib 31 removably secured to the frame side by bolts 33. A sleeve 34 has threaded engagement with the upper end of crosshead 27 and is provided with a bore through which the threaded portion of rod 20 freely extends, this sleeve having a supporting flange 35 provided with circumferentially spaced recesses 36 for receiving an adjusting wrench. The four screws 18—21, Fig. 2, are simultaneously rotatable through any suitable gear and shaft driving mechanism diagrammatically indicated in Fig. 3 as comprising a motor 37 driving a transverse shaft 38 which, in turn, drives a pair of bevel gears 39, a pair of longitudinal shafts 40 and bevel gearing 41 connected to the respective screws. Rotation of the screws will change the elevation of the four crossheads 27 so that when the crossheads are in their approximate position for effecting a final accurate spotting operation, the upper platen 5 is then lowered until it rests upon the tops of sleeve flanges 35. The operator now measures with a micrometer at each corner of the platens the vertical distance between the upper and lower platens. If the vertical distances between the platens at their four corners are not equal the operator then lifts platen 5 by hydraulic pressure and adjusts the sleeves 34 to make said vertical dimensions equal. The adjustment may be facilitated by suitable graduations on the periphery of flanges 35. A mark or other pointer arrangement may be placed on the upper end of crossheads 27 as an indication of the rotatable adjustment of the sleeves. After adjustment of the sleeves the operator can again lower the platen 5 by the hydraulic rams and cylinders to allow the platen to rest upon the sleeves whereupon further vertical micrometer measurements will be taken at the four corners of the platens and the sleeves again adjusted if necessary. By repeating this operation the operator can bring the upper and lower platens into that degree of parallelism which may be required, depending upon his personal ability to make the micrometer measurements between the platens and to make adjustments of the sleeves. It will be understood that the foregoing adjustments are made with the dies brought substantially together, although not in actual contact with each other. It will, of course, be understood that if a particular production press requires that the platens be out of parallelism then it is only necessary for the operator to adjust the sleeves 34 to give different vertical dimensions between the four corners of the platens. After the necessary adjustments are made the operator then lowers the upper platen 5 down on to the sleeves 34, this lowering being done by the hydraulic rams and cylinders. The platen is now lowered through the remaining distance by operation of motor 37 which causes the four screws 18—21 to be simultaneously rotated through the bevel gears 38—41, Fig. 3, thereby lowering the four crossheads 27 together with the platen. When the dies come in contact with each other at a high spot, one corner which is approximately in the neighborhood of the high spot will cease its downward movement and the remaining corners will minutely settle downwardly tending to follow the downward movement of the crosshead sleeves 34, the usual frame guideways for the movable platen having sufficient operating clearance to permit slight tilting of the platen. The sleeve 34 adjacent the corner of the platen which has ceased movement will of course move down away from the platen but when

this occurs an electrical contact is made through a micro switch generally indicated at **43**. These micro switches are carried one at each corner of the platen through suitable brackets **44** secured to the underside of the platen so that the switch button **45**, Fig. 6, is adapted to engage the flange **35** of the adjustable sleeve **34**. Hence, when the sleeve flange **35** separates from the platen the switch button **45** will drop to close the micro switch in a manner well-known in the switch art. These switches are sensitive to a few thousandths of an inch movement and hence it is seen that the switch operation would respond almost instantly to contact of the dies at a high spot. As shown in Dinzl Patent No. 2,177,821 these switches may be connected to an indicating board consisting of one lamp for each switch. Hence, when one lamp is unlighted it will be an indication that the dies have a high spot in the general locality of the corner corresponding to that unlighted lamp. However, when the dies are finally accurately matched, all portions will come into contact simultaneously and stop the entire movable platen with the result that all the sleeves **34** will simultaneously move downwardly away from the platen thus causing actuation of all micro switches. This will be indicated by the lamps. Hence, the dies will now be matched with their bases precisely in the desired predetermined relation.

To adjust the micro switches with ease and still provide a rugged structure, I mount the switch **43** upon a pivot **47** while an arm **48** has a spherical seat engaging a sleeve **49** which is threaded into the supporting plate **44**. A lock bolt **50**, pivotally supported on arm **48**, extends through the arm and the hollow sleeve **49** to be held by a nut **51**. When this nut is tightened it firmly holds the arm **48** into contact with screw sleeve **49** so as to prevent rotation of the latter, but upon loosening nut **51** the screw sleeve **49** may be rotated to vary the elevation of arm **48** and accordingly adjust the position of pin **45**.

From the foregoing it is seen that I have provided an extremely sensitive and effective means for matching dies with the die bases in parallel relation or in any predetermined non-parallel relation. Such operations are accomplished with dispatch by reason of using the hydraulic rams and cylinders to raise and lower the movable platen during the rough spotting while the screws are used to lower the movable platen during the last half inch or so of final accurate spotting. During this final accurate spotting the movable platen is preferably raised by the use of the hydraulic rams and cylinders.

Die table.—To render the dies highly accessible to permit removal of high spots by grinding or chipping while at the same time insuring accurate relative positioning between the upper and lower dies throughout a die matching operation, the lower table or platen is mounted upon four pairs of front and rear small wheels **53** and **54** which roll upon sectional trackways consisting of outer stationary tracks **55** and inner vertically movable track sections **56**. These two sets of trackways and associated mechanism to be described are so structurally and functionally related that the lower die may be moved forwardly out of the press as shown in Fig. 4, but when it is reinserted in the press it then has a normal accurate relation to the remaining mechanism especially the crossheads **27** with their micrometer adjusted sleeves **34**. Such repetitive accuracy during successive repositioning operation of the lower platen is most essential as otherwise the value of the mocrometer control would be rendered useless. In the operation of the micro control, when the vertical micrometer dimensions have been taken between the four corners of the platens and when the sleeves **34** have been adjusted accordingly, it is clear that this relationship must not be disturbed notwithstanding that the lower platen may be moved in and out several times during a spotting operation. To accomplish this permanency of relationship together with the flexible accessibility, I employ my following improved arrangement.

The outer stationary trackways **55**, Figs. 9 and 10, are specifically shown as four in number, although any suitable number thereof may be employed depending upon the size of the press or the weight of the dies to be spotted. Each of these trackways is mounted upon a suitable frame generally indicated at **58** and formed of a main longitudinal I-beam **59** and small beams **60** and **61**. The inner edge of the frame **58** is supported on the main press base **3** through suitable supporting plates **62**, Fig. 10. Suitable wheel stops **63**, Fig. 9, may be bolted to the outer ends of the stationary rails **55** to limit outward movement of the lower movable platen **8** which is provided with wheels **53** and **54** journalled in suitable brackets **64**.

The inner or movable sectional trackway structure comprises the main press base **3** having a plurality of lifting cylinders and rams generally indicated at **65**, specifically six in number, three of which are located on each longitudinal edge of the press base. The front and back longitudinal beams **66** and **67**, Fig. 9, are supported on top of the rams at each side while tracks **56**, specifically four in number, are supported transversely on said longitudinal beams in planes containing the stationary trackways **55**. These inner movable trackways **56** as shown in Figs. 9, 10 and 11 extend transversely of the press for substantially the full depth of the press base. To insure accurate vertical repositioning of the lower platen within the press after each lateral removal thereof, I have provided an improved arrangement whereby the platen is removably supported directly by the rigid base structure without having the same interfere with easy and quick removal or insertion of the platen. The press base element broadly includes two end bolsters **68**, Fig. 9, a relatively large central bolster **69** and small intermediate bolsters **70**, all of which are suitably secured as by bolts **71** to the lower portion of the press base. These bolsters extend for the full depth of the press base and are located preferably on each side of each movable trackway thereby holding the platen in spaced relation to the base to provide adequate room for the trackways and rollers. From the description so far it is seen that when operating fluid is admitted to the ram and cylinder **65** the longitudinal beams **66**, **67** together with the trackways **56** suspended thereon will all lift until the trackways engage rollers **53** and **54** whereupon the platen **8** is lifted from the bolsters **68—70**. This lifting action is relatively small and need be only sufficient to provide ample clearance between the bolsters and the movable platen during movement thereof. The movement, however, is continued until the trackways **56** are in alignment with the outer stationary trackways **55** whereupon the platen may be easily moved from the inner trackways **56** to the outer trackways **55**.

To insure that the upper edges of the inner and outer trackways are on the same level a series of limit stops generally indicated at 72 extend over the longitudinal beams 66, 67 at various points thereof. These limit stops, as shown in Fig. 12, specifically comprise a pair of stud bolts 73 threaded into suitable bosses of the press base and are connected by a flat bar 74.

To move the lower platen in and out of the press, the central bolster 69, Figs. 8 and 9, is provided with an operating cylinder 75 suitably rigidly secured to the bolster so as to constitute a stationary part of the press base. This cylinder lies substantially midway between the top of the longitudinal rails 66, 67 and the underside of the movable platen. A hydraulic ram 76 has its piston rod 77 connected to the movable platen through a suitable flexible connection generally indicated at 78, Fig. 9, comprising specifically, a vertical slot 79 formed in a forwardly projecting arm 80 which is secured by bolts 81 to the front end of the platen. The piston rod 77 is provided with suitable washers 82 on each side of the slot 79 thereby insuring proper shifting engagement with the rod. As a result of this slip joint, the hydraulic ram and cylinder 75, 76 may remain in a fixed position while still maintaining their operative connection to the movable platen during raising or lowering of the same by the lifting rams 65. Fluid pressure may be supplied to either side of the platen ram 76, Fig. 9, to move the platen in and out. After the platen has moved into the press fluid pressure from the lifting ram 65 is released whereupon the trackways 56 move downwardly to bring the platen to rest on the fixed bolster abutments 68, 69 and 70. The ram and trackway 56 continue to move down slightly to be clear of the rollers 53 and 54 as is clearly shown in Figs. 8 and 11. To insure adequate guidance of the platen during movement, a relatively long key 84 is formed on the underside of the movable platen and projects rearwardly as shown in Fig. 9 to slide within a suitable keyway 85 which is formed in the upper side of the central bolster 69 above the cylinder 75. As shown in Fig. 8, lateral guides and slots 86 are formed between the platen and the two frame sides 1 and 2.

To accurately laterally position the lower platen within the press and to lock the platen therein, a pin 87, Fig. 9, is vertically slidably supported on the key 84 so as to drop into a tapered lock bar opening 88 when the platen is in its rearmost position. Any suitable lever 89 may be employed to raise and lower the locking pin 87. It will be understood that operating fluid to the various operating cylinders may be supplied from any suitable source and that the supply or discharge of fluid to such cylinders may be controlled with any usual valve mechanism either to raise, lower or hold the upper platen or for suitably coordinating lateral and lifting movements of the lower platen. Inasmuch as such suitable valve mechanism for the foregoing operations may be of any usual form further description thereof is not deemed necessary.

From the foregoing disclosure it is seen that I have provided a die spotting press which is extremely effective in expeditiously spotting dies with a high degree of accuracy and ease of operation, these desirable characteristics being obtainable in my improved press for dies having either parallel or non-parallel bases.

It will of course be understood that various changes in construction and arrangement of parts may be made by those skilled in the art without departing from the spirit of the invention as set forth in the appended claims.

I claim:

1. The combination in a die spotting press having opposed relatively movable platens for supporting complementary dies and means for moving one of the platens and its die toward the other during a spotting operation comprising, means for effecting parallelism or a predetermined degree of non-parallelism between said platens but said platens being movable out of said parallelism or out of said predetermined non-parallelism when the dies engage each other at a high spot thereon whereby the movable platen adjacent the high spot continues its movement while the remainder of the platen continues to move slightly, and means responsive to said continued movement for indicating the occurrence thereof.

2. The combination in a die spotting press having opposed relatively movable platens for supporting complementary dies comprising, a plurality of independently adjustable supports for the movable platen adapted to effect a predetermined degree of parallelism of said movable platen relative to said opposed platen, and means for simultaneously uniformly moving said platen supports whereby the movable platen moves toward the opposed platen while maintaining its predetermined degree of parallelism during a die spotting operation.

3. The combination set forth in claim 2 further characterized in that said platen supports include vertically movable crossheads while the means for simultaneously moving said supports includes axially fixed rods having threaded engagement with said crossheads, and mechanism for rotating all of said rods simultaneously.

4. The combination set forth in claim 2 further characterized in that said platen supports include vertically movable crossheads and platen engaging members having threaded engagement with said crossheads so as to be vertically adjustable relative thereto whereby a predetermined degree of parallelism between said opposed platens may be effected, vertical screw rods having threaded engagement with said crossheads, means for simultaneously rotating said screws to effect uniform movement of said movable platen during a spotting operation, and means engageable with said platen engaging members so as to be responsive when said movable platen moves out of its predetermined degree of parallelism.

5. The combination set forth in claim 2 further characterized in that said platen supports includes vertically movable crossheads and platen engaging members having threaded engagement with said crossheads so as to be vertically adjustable relative thereto whereby a predetermined degree of parallelism between said opposed platens may be effected, and screw rods having threaded engagement with said crossheads, said platen engaging members being provided with openings coaxial with said screw rods which extend through said openings.

6. The combination in a die spotting press having side frames and opposed relatively movable platens disposed between said side frames comprising, crossheads vertically guided by each of said side frames, means whereby the movable platen rests on said crossheads and is adapted to separate therefrom so as to allow the crossheads to have continued movement when the movable platen ceases its movement upon contact of die

surfaces at a high spot thereon, and means for vertically moving said crossheads and the platen supported thereon during a spotting operation.

7. The combination in a die spotting press having side frames and opposed relatively movable platens disposed between said side frames comprising, crossheads vertically guided by each of said side frames for vertically supporting the movable platen, means for vertically moving said crossheads and the platen supported thereon during a spotting operation, and additional means for moving the movable platen away from said crossheads while the latter remain in position.

8. The combination in a die spotting press having side frames and opposed relatively movable platens disposed between said side frames comprising, crossheads vertically guided on each of said side frames, vertical screws axially fixed and having rotatable threaded connection with said crossheads for moving the same vertically upon rotation of said screws, one of said platens that is movable being adapted to be supported upon said crossheads, and hydraulic rams and cylinders for moving said movable platen away from said crossheads whereby said hydraulic rams and cylinders may effect movement of the movable platen during a rough die spotting operation while said screws and crossheads may effect platen movement during the final die spotting operation.

9. The combination set forth in claim 8 further characterized by the provision of sleeves having adjustable threaded connection with their respective crossheads and provided with openings through which the respective screws extend, said sleeves being interposed between the crossheads and movable platen so that the latter is supported by the crossheads through the sleeves, and said sleeves being adjustable so that said movable platen can be supported in a predetermined degree of parallelism with the opposed platen.

10. The combination in a die spotting press having opposed relatively movable platens and means for moving one of the same toward the other with a predetermined degree of parallelism between the same comprising, means responsive to movement of the movable platen out of said predetermined degree of parallelism when the dies contact each other at a high spot thereon, said responsive means including a member adapted to have an adjustable relation to one of said platens, an adjusting screw for shifting said member, and means for locking said member against said screw to prevent further adjustment thereof.

11. The combination in a die spotting press having opposed relatively movable platens for supporting complementary dies comprising, means for independently adjusting the elevation of certain portions of one of said platens to produce a predetermined relation between the same, means for relatively moving said platens toward each other while maintaining said predetermined relation but said platens being movable out of said predetermined relation when the dies engage each other at a high spot thereon whereby relative movement between the platens discontinues at a point adjacent the high spot while the remaining portions of the platens continue to have slight relative movement, and means responsive to said continued relative movement for indicating the presence of said high spot.

HERBERT S. FULLERTON.