

Nov. 10, 1925.

1,560,918

R. STÜBGEN

AUTOMATIC FEEDING OF METAL SHEETS AND THE LIKE

Filed Dec. 22, 1923

2 Sheets-Sheet 1

Fig. 1

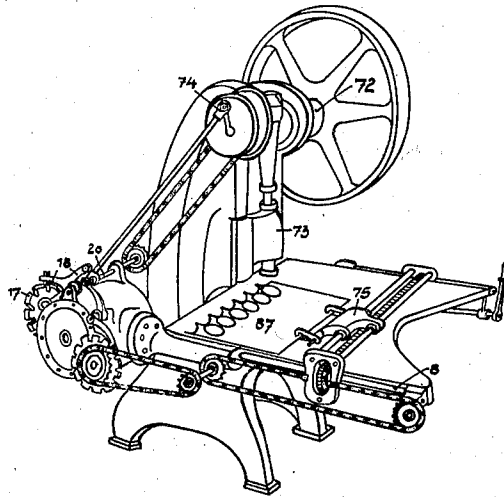
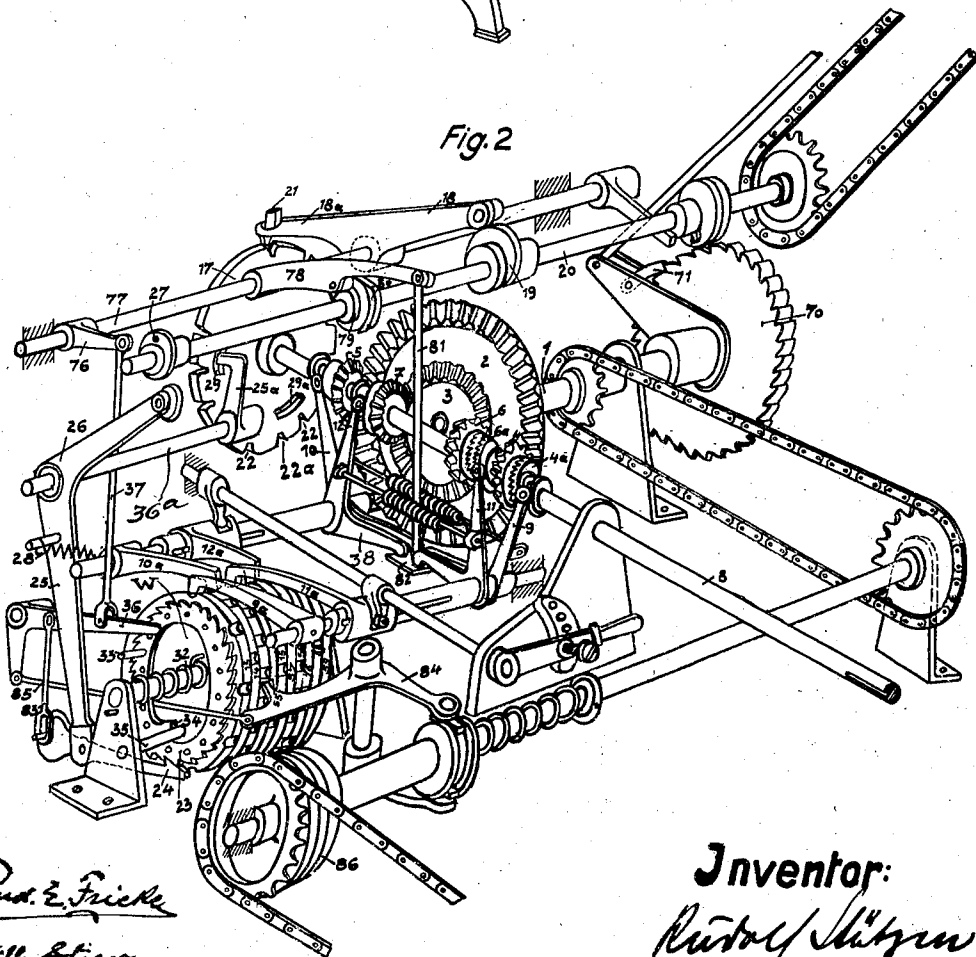


Fig. 2



Rud. E. Fricke
Willy Stier

Inventor:
Rudolf Stübgen

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R. STÜBGEN

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2 Sheets-Sheet 2

Fig. 3.

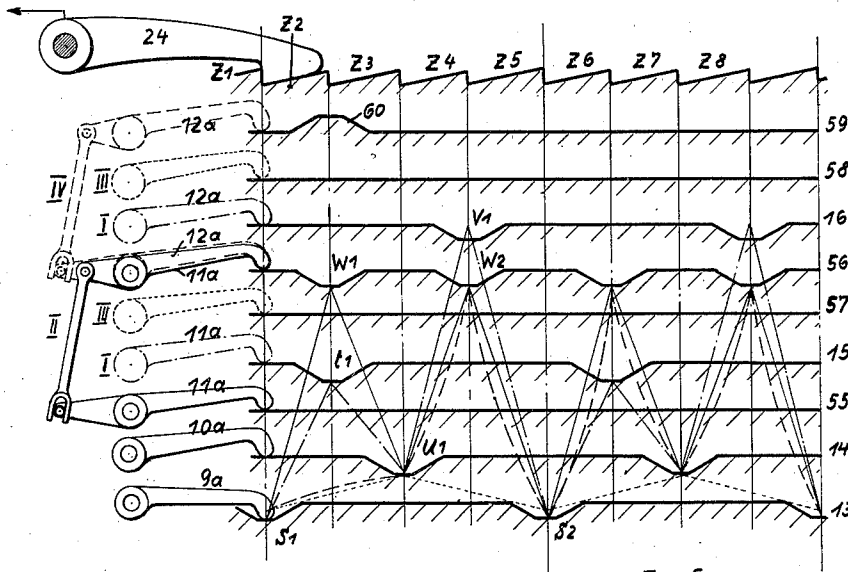


Fig. 4.

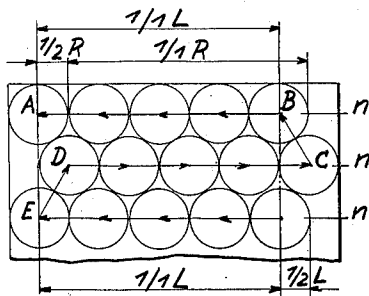


Fig. 6.

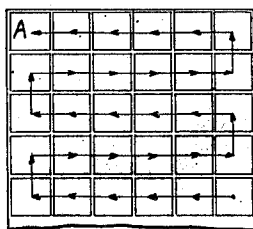


Fig. 5.

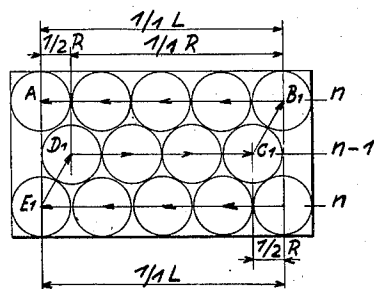
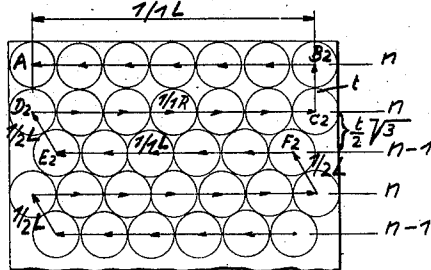


Fig. 7.



Paul E. Fricke

Willy Strier

Inventor:

Rudolf Stübben

UNITED STATES PATENT OFFICE.

RUDOLF STÜBGEN, OF ERFURT, GERMANY.

AUTOMATIC FEEDING OF METAL SHEETS AND THE LIKE.

Application filed December 22, 1923. Serial No. 682,295.

To all whom it may concern:

Be it known that I, RUDOLF STÜBGEN, a citizen of Germany, residing at Erfurt, Germany, have invented certain new and useful
5 Improvements in Automatic Feeding of Metal Sheets and the like, of which the following is a specification.

My invention refers to means for automatically feeding the material in stamps and presses of all kinds, and more particularly paper, card board or sheet metal, die or punch presses or printing presses in which the greatest number of stampings or impressions shall be obtained from a sheet of predetermined size. It is an important object of my invention to provide an improved feed mechanism of the zigzag type which is more effective and requires less handling than the feed mechanisms hitherto used.

10 In automatic mechanism of the type aforesaid means have been provided for feeding the material in such a way that without making any change in the parts constituting such mechanism consecutive or successive
25 rows of equal or of alternately differing numbers of cuts can be produced. In comparison with older types of feeding mechanisms this apparatus offered the advantage of enabling the machine to be adjusted in a
30 very short time for different modes of working, for instance changing over from rows having equal numbers of cuts to alternating rows of even and uneven numbers of cuts, impressions or the like. However this
35 mechanism merely allowed producing staggered rows of cuts or impressions, so that a die press or the like fitted with the mechanism was incapable of ensuring a complete utilization of the material.

40 This disadvantage is overcome by feeding mechanism according to the present invention, inasmuch as in addition to the two operations hereinbefore referred to it allows carrying out other operations such as for instance the production of non-staggered rows
45 containing equal numbers of cuts or combinations of staggered and non-staggered rows containing partly equal and partly different numbers of cuts or impressions.

50 Owing to the possibility afforded by the

novel mechanism of easily and automatically varying the sequence and character of the rows of cuts or impressions, paper or metal sheets of predetermined sizes can be fully utilized independently of such differences in size as are well known to occur frequently.

The essential feature of the present invention consists in placing the change gear, which causes the material to be fed by whole and half divisions and in two different directions, under the control of a number of controlling rings which, when changing over from one completed row to a fresh row of cuts or impressions, are simultaneously imparted a rotary step by step movement and in accordance with grooves, gaps or notched or recessed portions provided therein always allow only a single one of a number of levers to throw in the corresponding clutch or the like of the change gear. These rings are so designed as to automatically bring about the feed by half a longitudinal division in one or the other direction which is required at the end of each row, when producing staggered rows of cuts or when producing non-staggered rows, to prevent this half longitudinal feed motion from being carried out. The rings further cause the changes of direction and the transverse feed to be effected whenever required.

The controlling rings can preferably be combined into a cylinder which may be keyed fast once and for all on a suitable shaft. In this case dummy rings and special controlling rings may be provided and two of the levers which cooperate with the cylinder can be imparted a longitudinal movement, or the cylinder as a whole or parts thereof can be imparted such movement.

Provision is further made that directly after the last cut or impression in the last row of a sheet has been produced or while it is being produced, the gear controlling the feed of the sheet is automatically brought to a standstill, the entire mechanism controlling the zigzag motion of the sheet including ratchet pawls and the like being automatically removed out of contact with the ratchet wheels and the like and the whole

mechanism being automatically carried back into its initial position.

In the drawings affixed to this specification and forming part thereof the preferred form of a zigzag feed mechanism embodying my invention is illustrated by way of example.

In the drawings—

Figure 1 is a perspective view of a sheet metal stamping press having the new zigzag feed mechanism arranged thereon, while

Figure 2 is a similar view drawn to a larger scale of the feed mechanism itself.

Figure 3 is a diagrammatic development of the ring cylinder, while

Figures 4, 5, 6 and 7 are diagrams of metal sheets showing different arrangements of cuts or rows of cuts which can be produced automatically by means of the new device.

Referring to the drawings, 1 is a shaft being intermittently revolved by suitable means such as a ratchet disc 70 and pawl 71 driven by the die-shaft or an intermediate shaft revolving with the same number of revolutions, each partial revolution of shaft 1 taking place during the lifting of the die. The angle through which shaft 1 revolves during each partial revolution and which predetermines the feed corresponding to the division required in each individual case is adjusted by means of a crank 74 disposed on the die shaft.

On the shaft 1 there are keyed two cog wheels 2 and 3, the diameter of wheel 2 being the double of the diameter of wheel 3. Wheel 2 is in permanent gear with two smaller cog wheels 4 and 5 arranged diametrically opposite each other and wheel 3 meshes with two similarly opposite cog wheels 6 and 7. In the modification illustrated in the drawing, in which the diameter of wheel 3 is one half of the diameter of wheel 2, the four cog wheels 4, 5, 6 and 7 have an equal diameter. They are arranged for free rotation, but secured against lateral displacement on a feed shaft 8 extending at right angles to shaft 1 and serving for controlling the displacing of the sheet carrier 75. Each cog wheel carries one part of a clutch which, in the present case, is a toothed clutch, the other part of which is displaceably arranged and secured against rotation on the feed shaft 8. Of the clutches 4^a, 5^a for wheels 4 and 5 and 6^a, 7^a for wheels 6 and 7 only those marked 4^a and 6^a are visible in Fig. 2.

The clutches are thrown in an out by means of spring actuated operating levers 9, 10, 11 and 12 which in the modification illustrated in the drawing have the form of angle levers. One-armed controlling levers 9^a, 10^a, 11^a, 12^a operatively connected with the levers 9, 10, 11, 12, respectively, are acted upon by controlling rings 13, 14, 15, 16, respectively.

In operating the device that clutch is thrown in whose controlling lever can enter a notch in the controlling ring cooperating with it, the arrangement being such that only a single notched ring at a time is placed with its notch in face of the lever appertaining to it, while the other levers rest with their ends on circumferential parts of their rings, whereby the clutches cooperating with them are kept in thrown out position.

Obviously, by throwing in one of the clutches 4^a or 6^a, the intermittent revolution of shaft 1 will be transmitted onto the feed shaft 8 in one direction, while by throwing in one of the opposite clutches 5^a or 7^a, the transmission will take place in the opposite sense. On the other hand, if one of the clutches 6^a or 7^a is thrown in, the feeding distance will be only one half of the distance resulting from the throwing in of one of the clutches 4^a or 5^a. Consequently, the two couplings 4^a, 5^a correspond to a "full division", the clutches 6^a, 7^a to "one half division", when changing from one row to the subsequent one, provided the subsequent rows shall be staggered with regard to each other (Figs. 4 and 5 and the lower part of Fig. 7).

The feeding slide is fixed in the different working positions, that is on the die descending, by means of a dividing plate 17 arranged on the feed shaft 8 and a rock lever 18, 18^a acted upon by a cam disc 19 fixed onto a controlling shaft 20 revolving at the same speed as the die shaft of the press, this cam disc causing the pawl 21 to enter at each downward stroke of the die one of the notches 22 provided in the rim of the dividing disc, whereby this latter and the feed shaft 8 are arrested in the working position together with the feeding slide and sheet carrier.

Intermediate each pair of notches 22, these notches being distanced apart one full division, similar notches 20^a are provided, the distance between contiguous notches 22 and 22^a corresponding to one half division, while the distance between two notches 22^a corresponds to a full division. I wish it to be understood, however, that the feed distance depends exclusively on the position of crank 74 on the die shaft 72.

The advantage offered by the dividing disc 17 arranged on the feed shaft itself, as compared with the dividing rails employed in former devices of this kind, resides therein that the dividing disc need not be exchanged as frequently as these rails, an exchanging of these discs being, moreover, far simpler than the exchanging of dividing rails which must be fixed in position by means of at least two screws.

The means for varying the manner of feeding the sheet when changing over from

one row of cuts or prints to the next succeeding row, are the following:—

With the rings 13, 14, 15, 16, which are preferably combined to form a cylinder, a ratchet disc 23 is connected which is acted upon by a pawl 24 forming part of a pawl lever 25. The free arm 26 of this lever is in operative contact with a cam disc 27 keyed onto the control shaft. The lever 25 is further acted upon by a spring 28 which may as well be replaced by a counterweight or the like and tends to move the pawl 24 to the left (Figure 2). The pawl 24 and lever 25 are, however, prevented from moving to the left by an arm 25^a connected with lever 25 which rests against the dividing disc 17, until this disc has turned so far that one of the grooves 29 or 29^a has arrived in face of the lever 25^a. This will take place after the last cut or print of a row of cuts or prints has been effected, or rather after the sheet has reached the position in which the last cut or print is made.

When this is the case, lever 25 is free to move to the left as soon as the cam 27 releases arm 26 of the lever. This will happen as the die descends and pawl 24 will now move the ratchet wheel 23 and along with it the rings 13, 14, 15, 16 the distance of a tooth in the direction of the clock, whereby the lever 9^a or 10^a, which up till now rested in a circumferential notch or cavity of the respective ring 13 or 14, is lifted, the corresponding coupling 4^a or 5^a being thereby thrown out. At the same time, provided that staggered rows of cuts or impressions are produced, a cavity in one of the two rings 15 and 16 designed for one half division is carried below the corresponding lever 11^a or 12, thus causing the lever in question to enter the cavity under the action of its own weight or of a spring or a counterweight, not shown, and to throw in the respective coupling 6^a or 7^a.

However, inasmuch as immediately after the first cut or print of a new row has been produced, the sheet must again be fed a full division, the grooves 29 and 29^a in disc 17 have such a length that the arm 25^a, after having been withdrawn by cam disc 27 from the groove 29 before the first cut or print of the new row had been produced, will, on cam 27 continuing its revolution and the die descending in order to produce the first cut or print, enter once more into the groove 29, whereby the ratchet wheel 23 can be fed the distance of a second tooth. This causes the lever 11 or 12 which had previously entered a cavity of the appertaining ring 15 or 16 to be lifted from this cavity and the respective clutch 6^a or 7^a to be opened, while one of the levers 9^a or 10^a is caused to enter a cavity in the ring appertaining to it, whereby one of the clutches 4^a or 5^a for a full division will be thrown in.

In order to avoid the necessity of turning the main controlling mechanism back into its initial position by hand before starting work on a fresh sheet, means are provided for automatically stopping the machine directly after the last cut or print in the last row of a sheet has been produced, all feeding means being automatically moved out of contact with their cooperating parts or rendered inoperative in some other manner, while the feed mechanism moves back automatically into its initial or zero position.

The means for effecting all this consists in a pin adapted to be adjusted on the feed cylinder, in a throwing out lever for the gear, one or a plurality of means for lifting the feed levers and pawls, an abutment or stop for the zero position and means such as a spring counterweight or a mechanically or electromagnetically operated winch for automatically rotating back the feed cylinder. In the modification disclosed in the drawing, an ordinary coil spring 32 is employed, one end of the spring being fixed in the hub of the feed cylinder, while the other end is fixed at a stationary part 31 of the machine, this coil spring having the tendency of turning the feed cylinder W in an anti-clockwise direction.

In one end face of the feed cylinder W several holes or notches are arranged, these holes or notches being disposed equidistantly and their number corresponding to one half of the number of the teeth of the ratchet disc 23. Inasmuch as with every change of rows the disc 23 is fed the distance of two teeth, each of the holes or notches 41—54 corresponds to one row of cuts or prints. A pin 33 is inserted in one of the holes or notches in accordance with the number of cuts or prints to be produced in the individual sheet. Assuming the first hole to correspond to the initial or zero position which is predetermined by the projection 34 of the feed cylinder W abutting against the stationary stop 35 and eight rows of cuts or prints to be produced in the sheet, the pin 33 must be introduced into the eighth hole in order that, as the last cut or print of the eighth row is produced, as soon as spring 28 and pawl 24 have caused the feed cylinder to be fed forward, which will take place automatically as soon as cam disc 27 and slot 29 have assumed the predetermined position, the pin can displace lever 36 and throw out the control shaft 20 and the whole mechanism by aid of connecting rod 37.

In order to obtain a sufficiently large movement of the pawl 24, its movement is transmitted by the pin 33 abutting against lever 36 and by rod 37 and lever 76 upon shaft 77 and a lever 78 keyed thereon, the free end of this lever extending into a cam nut 79 provided with a switch tongue 80.

Normally the lever will remain in the slot 79; however, as the rods are lifted, the lever will be caught by the tongue 80, and, as shaft 20 continues its rotation, the tongue 80 will cause the lever to be lifted as far as is required in order to throw all parts out.

Lever 78 has an extension from which is suspended a rod 81 carrying at its lower end a plate 82 which extends underneath the arms 38 of the feed levers 9, 10, 11, 12 and by lifting these arms causes the clutches 4-7 to be thrown out.

The pawl 24 is thrown out by being connected through a rod 83 with the lever 36. In order to also throw out the transverse catch, the lever 83 is connected by a rod 85 with the lever 36.

At the same time, however, also all the levers 9, 10, 11, 12 cooperating with the clutches 4^a, 5^a, 6^a, 7^a are lifted free of their respective rings or are held in inoperative position, and the pawls 24 are retracted out of contact with wheel 23, this being effected by any suitable means, for instance in the case of the levers by means of extensions 38 and a corresponding number of arms arranged on shaft 36^a of the throwing out lever 26.

After the feed cylinder W has been thus released, the spring 32 will turn it until the projection 24 abuts against stop 35, whereby the cylinder again assumes its zero position. This offers the advantage that, on a new sheet being placed into the machine, normal conditions of working are given at once and the feed mechanism will under all circumstances act without any loss of time, as required in each individual case.

It should further be noted that the transverse feed at the end of a row can be effected by means of a clutch 86, preferably of the friction type, which will then be thrown in automatically, this being effected by suitable means, for instance by means of the lever 84.

In order to explain more fully the working of this machine under different conditions, reference shall now be had to Figs. 3-7. In the following explanation the terms "1/1 left" and "1/1 right" mean feeding the sheet a full division, while "1/2 left" and "1/2 right" mean feeding the sheet one half division, "left" and "right" being used with reference to the movement of the sheet 87 and the sheet carrier 75, respectively.

It should further be noted that of the different possibilities mentioned above, Fig. 3 illustrates the one in which there are arranged between the normal rings 13, 14, 15, 16 special feed rings and also some plain rings having indentures or cavities. In the instance illustrated in the drawings, the two levers 11, 11^a and 12, 12^a for "one half feed" are arranged to be displaced so as to be enabled to cooperate either with their

normal rings 15 and 16 or with the special and plain rings.

The starting point of the first cut or print in each sheet is marked A in Figures 4-7.

The mode of working illustrated in Fig. 4 is characterized by rows staggered one half division with regard to each other, each row containing an equal number of cuts or prints. In this case the sheet must be fed in such manner that at the end of the first row fed with 1/1 left the sheet is not only shifted transversely with regard to the direction of feed, but also one half division to the left. Therefore, the feed mechanism must be set for 1/2 left in order that the first cut or print C of the second row can be produced. The sheet is thereafter fed full divisions, but in a direction opposite to the former direction of feeding, that is to the right, until the last cut or print D of the second row has been produced, whereupon the sheet must be fed another half division to the right in order that, after it has been displaced transversely, the first cut or print E of the third row can be produced.

In order that this mode of working can be carried through, the levers 11 and 12 cooperating with the clutches 6^a and 7^a for one half division are adjusted for cooperation of their arms 11^a and 12^a with the normal rings 15 and 16 (Fig. 3). The levers serving for feeding a full division (1/1 left and 1/1 right) are always disposed above their rings 13 and 14.

In starting work, that is to say with the mechanism being placed in zero position where projection 34 of cylinder W abuts against the stationary stop 35, the nose provided on lever 9^a projects into the cavity s¹ of ring 13, whereby the clutch 4^a appertaining to lever 9 and which causes the sheet carrier to be fed a full division to the left is thrown in. This position is maintained until the sheet assumes the position serving for producing the cut or print B.

During this time, the dividing disc 17 is turned at each feeding movement of the sheet the distance 22-22 until the sheet has reached the position in which the last cut or print B shall be produced, when the disc places its slot 29 in face of the lever 25^a. On the die descending onto the sheet, the arm 26 appertaining to lever 25 is then displaced by cam 27 so that now lever 25 pulls pawl 24 to the left and thereby causes cylinder W to turn the distance of a tooth of the ratchet wheel 23. As cam 27 continues its rotation, pawl 24, which before acted upon tooth s¹ of the ratchet wheel, now places itself in front of tooth s². At the same time, arm 9^a of lever 9 for 1/1 left places itself on the circumference of the ring 13, whereby clutch 4^a is thrown out, while arm 11^a of lever 11 has entered the cavity t¹ of its ring

15, whereby clutch 6^a is thrown in, which causes the sheet to be fed one half division to the left.

As the die, after having produced the cut of print B, rises, the sheet is now fed $\frac{1}{2}$ left from B to C.

As the cut or print C is being produced, lever 25 is released by cam 27 to execute a movement to the left (in the drawing) and, inasmuch as slot 29 of dividing disc 17 is long enough to be still positioned in face of arm 25^a, lever 25 and pawl 24 are once more moved to the left, thereby causing the feed cylinder to be turned once more the distance of a tooth (from z^2 to z^3). Lever arm 11^a is thereby lifted free of the cavity w^2 , clutch 6^a thrown out, but, at the same time, the cavity w^1 of ring 14 is placed below arm 10^a of lever 10, whereby this latter is caused to throw in clutch 5^a for $\frac{1}{2}$ right.

Since the sheet has arrived in the position serving for producing the cut or print C, the pawl 21 cooperates with the notches 22^a of dividing disc 17 which are distanced apart one half division from notches 22.

The sheet is now fed $\frac{1}{2}$ right, until dividing disc 17, which now rotates in the opposite direction, presents either slot 29 or (according to the number of cuts or prints to be produced in each row) slot 29^a to the arm 25^a, this being the case as soon as the sheet reaches the position for producing the cut or print D.

In the manner above described, as the die now effects its descent, the feed cylinder W is turned the distance of a tooth from z^3 to z^4 , whereby arm 10^a is lifted free of cavity w^1 , clutch 5^a is thrown out, lever arm 12^a (for $\frac{1}{2}$ right) is caused to enter cavity w^1 of its ring 16 and consequently clutch 7^a serving for lifting the sheet one half division to the right is thrown in.

The sheet being simultaneously displaced in transverse direction, now reaches the position required for producing the cut or print E and the pawl 21 now cooperates with the adjoining notch 22 of dividing disc 17.

During the lowering of the die the feed cylinder W is again rotated the distance of a tooth of the ratchet disc, from z^4 to z^5 , whereby arm 12^a is withdrawn from cavity w^1 , clutch 7^a is thrown out, lever arm 9^a is caused to enter cavity s^2 of ring 13 and clutch 4^a serving for feeding the sheet $\frac{1}{2}$ left is thrown in again. After the sheet has been fed to the left until it has reached the position in which the last cut or print H in the last row shall be produced, the pin 33 inserted in the cylinder W abuts against the lever 36, whereby the feed cylinder is caused to automatically return into its zero position in which projection 34 abuts against stop 35.

Before explaining the working of the

device in producing rows of cuts or prints, as illustrated in Fig. 5, where alternating rows of n and n^1 cuts or prints shall be produced which are staggered with respect to each other, it should be noted that the sheet is fed to the right the distance of one half division. The clutch for $\frac{1}{2}$ left must therefore be kept thrown out by any suitable means, for instance by fixing lever 11, 11^a in inoperative position by electromagnetic means or by preventing clutch 6^a from being thrown in or, as shown in Fig. 3, by providing a plain ring 55 and arranging lever 11, 11^a to be displaced, if desired. In Fig. 3, the two levers 11, 11^a and 12, 12^a serving for feed $\frac{1}{2}$ left and $\frac{1}{2}$ right are arranged for simultaneous displacement and for being fixed in a plurality of different positions. This is effected by means of a hand lever 88 (Fig. 2). If, as required in order to produce cuts or prints as shown in Fig. 5, lever arm 11^a rests on plain ring 55, lever arm 12^a for $\frac{1}{2}$ right feed cooperates with a special ring 56 provided on cylinder W (position II in Fig. 3).

The mechanism now operates as follows:—

The first row from A—B¹ is produced as described with reference to Fig. 4, arm 9^a for the $\frac{1}{2}$ left coupling 4^a projecting into cavity s^1 of ring 13, while arms 10, 11^a, 12^a cooperating with clutches 5^a, 6^a, 7^a rest on circumferential parts of their rings and keep these clutches in thrown out position. If the sheet then reaches the position serving for producing the cut or print B¹, the slot 29 in dividing disc 17 faces arm 25^a and as the die now descends the feed cylinder is turned, as described above, the distance of a tooth from z^1 to z^2 , thereby causing arm 9^a to be lifted free of cavity s^1 , clutch 4^a to be thrown out, arm 12^a to enter cavity w^1 of special ring 56 and clutch 7^a for $\frac{1}{2}$ right feed to be thrown in, whereby the sheet is fed from B¹ to C¹.

As the die descends on the sheet held in position C¹, owing to the position and width of slot 29 provided in dividing disc 17 whose notches 20^a have become operative, the feed cylinder is turned the distance of a further tooth from z^2 to z^3 whereby arm 12^a is lifted free of cavity w^1 , clutch 7^a is thrown out, arm 10^a is caused to enter the cavity w^1 of ring 14 and clutch 5^a for $\frac{1}{2}$ right feed is thrown in. In this position of the parts the second row from C¹ to D¹ is produced.

With the sheet reaching the position in which cut or print D¹ is produced, the second slot 29^a of dividing disc 17 has arrived in face of arm 25^a and, as the die descends onto the sheet in position D¹, feed cylinder W is once more turned the distance of a tooth from z^3 to z^4 , whereby arm 10^a is lifted free

of cavity w^1 , clutch 5^a is thrown out, arm 12^a is caused to enter again a cavity, this time the cavity w^2 of special ring 56 and clutch 7^a for $1/2$ right feed is thrown in, the sheet being thereby fed from D^1 to E^1 .

In the position E^1 , the feed cylinder is turned the distance of a further tooth from z^4 to z^5 whereby arm 12^a is lifted free of cavity w^2 , while arm 9^a is caused to enter the next following cavity s^2 in its ring, thereby throwing in clutch 4^a for $1/1$ left feed.

As appears from the above, arm 11^a does not become operative at all, but at all those points where, in the arrangement according to Fig. 4, the clutch for $1/2$ left feed was thrown in, now the clutch for $1/2$ right feed is rendered operative.

Fig. 6 illustrates a sheet with rows of equal numbers of cuts or prints which are not staggered with regard to each other. In this case, the sheet is always fed the distance of a full division and therefore the two clutches 6^a and 7^a must be kept in thrown out position.

To this end, as shown in Fig. 3, in view of the fact that levers 11, 11^a and 12, 12^a are coupled with each other, two special plain rings 57 and 58 are provided on which the arms 11^a and 12^a will rest when the levers 11 and 12 have been shifted into the position III. One might of course arrange the levers 11 and 12 to be displaceable singly, and in that case plain ring 57 might be dispensed with and arm 11^a might be allowed to rest on the plain ring 56 as in working according to Fig. 5. However, the connection shown between the levers 11 and 12 is preferable in order to spare the attendant the necessity of reflecting when setting the mechanism and to provide for the requirements of working, such as for instance shown in Fig. 7, as will be explained later.

After what has been said above, it does not appear necessary to further explain the mode of working in the case shown in Fig. 6.

The arrangement of rows illustrated in Fig. 7 is chosen in cases where either a better utilization of the sheet is desired or special patterns shall be produced. In this case, a number of superposed rows having an equal number of cuts or prints must be followed by a plurality of rows staggered with regard to each other and alternately comprising n and n^1 cuts or prints. In this case, the two clutches for $1/2$ feed must not be thrown in.

To this end, a further special ring (plain ring) 59 with one or a plurality of preferably removable cams 60 is provided and the levers 11 and 12 are coupled with each other, as shown in Fig. 3 in such manner that each of the two arms 11^a and 12^a can

enter a cavity of the ring appertaining to it, as long as the other arm rests on a circumferential portion of its normal ring or on an ordinary plain ring, the arm (for instance 11^a) being, however, prevented from entering the cavity placed below it, whenever the other arm (for instance 12^a) reaches one of the cams 60.

If, as shown in Fig. 7, only two rows shall be produced which are not staggered with regard to each other, the clutches for one half division must be rendered inoperative only once when changing the rows and, consequently, only a single cam 60 for arm 12^a is required. It may be mentioned by the way that the larger transverse feed corresponding to a full division (t) required in the case of two non-staggered rows, as compared with the smaller transverse feed

$$\left(\frac{t}{2} \cdot \sqrt{3}\right)$$

required in the case of staggered rows, is simply provided for by a corresponding form of the dividing disc (not shown) for the transverse feed and by causing the transverse feed to be effected with the aid of a friction clutch allowing a sliding cooperation of its parts.

In order to produce cuts as shown in Fig. 7, the levers 11, 11^a and 12, 12^a are shifted into the position IV in which arm 11^a rests on the special ring 56 which, in the operation illustrated in Fig. 5, cooperates with arm 12^a , while arm 12^a now rests on the special ring 59.

The first row of cuts or prints from A— B^2 is produced in the ordinary way. When the sheet has reached the position B^2 , slot 29 of dividing disc 17 faces arm 25^a and the feed cylinder W is now turned the distance of a tooth from z^1 to z^2 , whereby arm 9^a is lifted free of s^1 , clutch 4^a is thrown out, arm 12^a rises on cam 60 and prevents arm 11^a from entering cavity w^1 of ring 56. As the die now rises after having produced the cut or print B^2 , only an ordinary transverse feed motion is produced, the sheet being thus carried into the position C^2 . On the die descending again, the feed cylinder W is turned the distance of a tooth from z^2 to z^3 whereby arm 10^a is caused to enter the cavity of w^1 of ring 14, thereby causing clutch 5^a for $1/1$ right feed to be thrown in. In this position of the parts, the second row of cuts or prints is produced, until in the position D^2 , the cylinder W is fed the distance from z^3 to z^4 , whereby 10^a is lifted free of w^1 , clutch 5^a is thrown out and arm 11^a is caused to enter the cavity w^2 of ring 56, arm 12^a now resting against the plain circumferential portion of ring 59 and thus being unable to prevent arm 11^a from being lowered. Clutch 6^a for $1/2$ left feed is now thrown in and with the normal transverse

feed the sheet is now fed in such manner that the portion designed for the cut or print E^2 is placed below the die. As the die is lowered onto the sheet, feed cylinder W is turned from s^4 to s^5 whereby clutch 6^a is thrown out and, on arm 9^a entering the cavity s^2 of ring 13, clutch 4^a is thrown in.

The operation now proceeds as indicated by the dash line in Fig. 4.

It should be noted that instead of displacing the levers 11, 11^a and 12, 12^a one might also displace the feed cylinder W or parts thereof and make the slots 29, 29^a in the dividing disc 17 adjustable in width, or the dividing disc 17 might be arranged on its hub for rotation, a resilient clutch or the like being provided for fixing the disc in different positions, whereby a great number of different operations could be carried out with one and the same dividing disc.

Obviously, the dividing disc 17 need not be arranged on the feed shaft 8 itself, but might as well be located on another shaft, working in synchronism with the feed shaft.

In order to keep the masses to be moved at each feeding operation as small as possible, the dividing disc may further be stationary and the pawl 28 may be fixed to an intermittently rotating arm which must then be keyed onto the feed shaft 8 or a shaft moved by it, the dividing disc and pawl 21 thus merely changing places. Moreover, the pawl may be subjected to the influence of the feed shaft by suitable means.

Instead of the slots 29, 28^a in the dividing disc, cam faces, wedges or the like can be arranged on that side of the dividing disc 17 which faces lever 25. In that case the disc would then act on the lever either directly or indirectly, and in this case the spring 28 might be dispensed with.

I wish it to be understood that I do not desire to be limited to the exact details of construction shown and described, for obvious modifications will occur to a person skilled in the art.

I claim:—

1. Feeding mechanism for stamping and printing presses and the like comprising a main shaft, means for imparting to this shaft a step by step motion, a feed shaft, means associated with said two shafts for varying the angle of rotation of said feed shaft at each step motion of said main shaft and means for automatically controlling said varying means.

2. Feeding mechanism for stamping and printing presses and the like comprising a main shaft, means for imparting to this shaft a step by step motion, a feed shaft, two large cog wheels of different diameters fixed on said main shaft, two pairs of smaller cog wheels mounted on said feed shaft for free rotation and permanently gearing with said large cog wheels, means for tempo-

rarily fixing one of said smaller cog wheels on said feed shaft and means for automatically controlling said fixing means.

3. Feeding mechanism for stamping and printing presses and the like comprising a main shaft, means for imparting to this shaft a step by step motion, a feed shaft, two large cog wheels of different diameters fixed on said main shaft, two pairs of smaller cog wheels mounted on said feed shaft for free rotation and permanently gearing with said large cog wheels, clutches for permanently securing one of said smaller cog wheels against rotation on said feed shaft and means for automatically controlling said clutches.

4. Feeding mechanism for stamping and printing presses and the like comprising a main shaft, means for imparting to this shaft a step by step motion, a feed shaft, two large cog wheels of different diameters fixed on said main shaft, two pairs of smaller cog wheels mounted on said feed shaft for free rotation and permanently gearing with said large cog wheels, clutches for permanently securing one of said smaller cog wheels against rotation on said feed shaft and a system of controlling levers and operating means adapted for actuating such levers so as to vary the operative position of said fixing means.

5. Feeding mechanism for stamping and printing presses and the like comprising a main shaft, means for imparting to this shaft a step by step motion, a feed shaft, two large cog wheels of different diameters fixed on said main shaft, two pairs of smaller cog wheels mounted on said feed shaft for free rotation and permanently gearing with said large cog wheels, clutches for permanently securing one of said smaller cog wheels against rotation on said feed shaft and a system of controlling levers and notched rings adapted for actuating such levers so as to control said clutches.

6. Feeding mechanism for stamping and printing presses and the like comprising a main shaft, means for imparting to this shaft a step by step motion, a feed shaft, two large cog wheels of different diameters fixed on said main shaft, two pairs of smaller cog wheels mounted on said feed shaft for free rotation and permanently gearing with said large cog wheels, means for temporarily fixing one of said smaller cog wheels on said feed shaft, means for automatically controlling said fixing means and means for automatically throwing out said fixing means after a predetermined number of operations.

7. Feeding mechanism for stamping and printing presses and the like comprising a main shaft, means for imparting to this shaft a step by step motion, a feed shaft, two large cog wheels of different diameters fixed on said main shaft, two pairs of smaller cog

wheels mounted on said feed shaft for free rotation and permanently gearing with said large cog wheels, means for temporarily fixing one of said smaller cog wheels on said feed shaft, means for automatically controlling said fixing means and means for imparting a step by step motion to said controlling means.

8. Feeding mechanism for stamping and printing presses and the like comprising a main shaft, means for imparting to this shaft a step by step motion, a feed shaft, two large cog wheels of different diameters fixed on said main shaft, two pairs of smaller cog wheels mounted on said feed shaft for free rotation and permanently gearing with said large cog wheels, clutches for permanently securing one of said smaller cog wheels against rotation on said feed shaft, a system of controlling levers and notched rings adapted for actuating such levers so as to control said clutches and means for turning said rings step by step.

9. Feeding mechanism for stamping and printing presses and the like comprising a main shaft, means for imparting to this shaft a step by step motion, a feed shaft, two large cog wheels of different diameters fixed on said main shaft, two pairs of smaller cog wheels mounted on said feed shaft for free rotation and permanently gearing with said large cog wheels, clutches for permanently securing one of said smaller cog wheels against rotation on said feed shaft, a system of controlling levers and notched rings adapted for actuating such levers so as to control said clutches, means for turning said rings step by step, means for automatically throwing out said turning means and means for automatically returning said rings to their normal position.

10. Feeding mechanism for stamping and printing presses and the like comprising a main shaft, means for imparting to this shaft a step by step motion, a feed shaft, two large cog wheels of different diameters fixed on said main shaft, two pairs of smaller cog wheels mounted on said feed shaft for free rotation and permanently gearing with said large cog wheels, clutches for permanently securing one of said smaller cog wheels against rotation on said feed shaft, a system of controlling levers and notched rings adapted for actuating such levers so as to control said clutches, means for turning said rings step by step, means for automatically throwing out said turning means, means for automatically holding said feed shaft against rotation, means for automatically returning said rings to their normal position and means associated with said holding means for rendering said throwing out means operative.

11. Feeding mechanism for stamping and

printing presses and the like comprising a main shaft, means for imparting to this shaft a step by step motion, a feed shaft, two large cog wheels of different diameters fixed on said main shaft, two pairs of smaller cog wheels mounted on said feed shaft for free rotation and permanently gearing with said large cog wheels, clutches for permanently securing one of said smaller cog wheels against rotation on said feed shaft, a system of controlling levers and notched rings adapted for actuating such levers so as to control said clutches, means for turning said rings step by step, means for automatically throwing out said turning means, a dividing disc on said feed shaft having circumferential notches and a groove, means for holding said disc against rotation, means for automatically returning said rings to their normal position and means adapted to cooperate with said groove for rendering operative said throwing-out means for the turning means.

12. Feeding mechanism for stamping and printing presses and the like comprising a main shaft, means for imparting to this shaft a step by step motion, a feed shaft, two large cog wheels of different diameters fixed on said main shaft, two pairs of smaller cog wheels mounted on said feed shaft for free rotation and permanently gearing with said large cog wheels, clutches for permanently securing one of said smaller cog wheels against rotation on said feed shaft, a system of controlling levers and notched rings adapted for actuating such levers so as to control said clutches, means for turning said rings step by step, means for automatically throwing out said clutches and means associated with said rings for actuating said throwing-out means for said clutches.

13. Feeding mechanism for stamping and printing presses and the like comprising a main shaft, means for imparting to this shaft a step by step motion, a feed shaft, two large cog wheels of different diameters fixed on said main shaft, two pairs of smaller cog wheels mounted on said feed shaft for free rotation and permanently gearing with said large cog wheels, clutches for permanently securing one of said smaller cog wheels against rotation on said feed shaft, a system of controlling levers and notched rings adapted for actuating such levers so as to control said clutches, means for turning said rings step by step, means for automatically throwing out said turning means, a dividing disc on said feed shaft having circumferential notches and a groove, means for holding said disc against rotation, means for automatically returning said rings to their normal position, means adapted to cooperate

with said groove for rendering operative said throwing-out means for the turning means, means for automatically throwing out said fixing means for the dividing disc and adjustable means associated with said rings for actuating said throwing-out means for said clutches.

14. Feeding mechanism for stamping or printing presses and the like comprising means for feeding a sheet step by step, alternately full divisions and one half division, means for automatically reversing the direction of feed after a predetermined number of steps so as to allow several rows of cuts or impressions to be produced, and means for automatically stopping and throwing out and for automatically returning

said feeding means to their initial positions, after the last cut or impression of a predetermined row has been produced.

15. Feeding mechanism for stamping or printing presses and the like comprising means for feeding a sheet step by step alternately several full divisions and one half division, a plurality of notched controlling rings coaxially mounted, means for rotating said rings simultaneously the same distance, a plurality of levers in operative relation to said rings so as to be acted upon by them and means adapted to be acted upon by said levers for governing the length of step of said feeding means.

In testimony whereof I affix my signature.

RUDOLF STÜBGEN.