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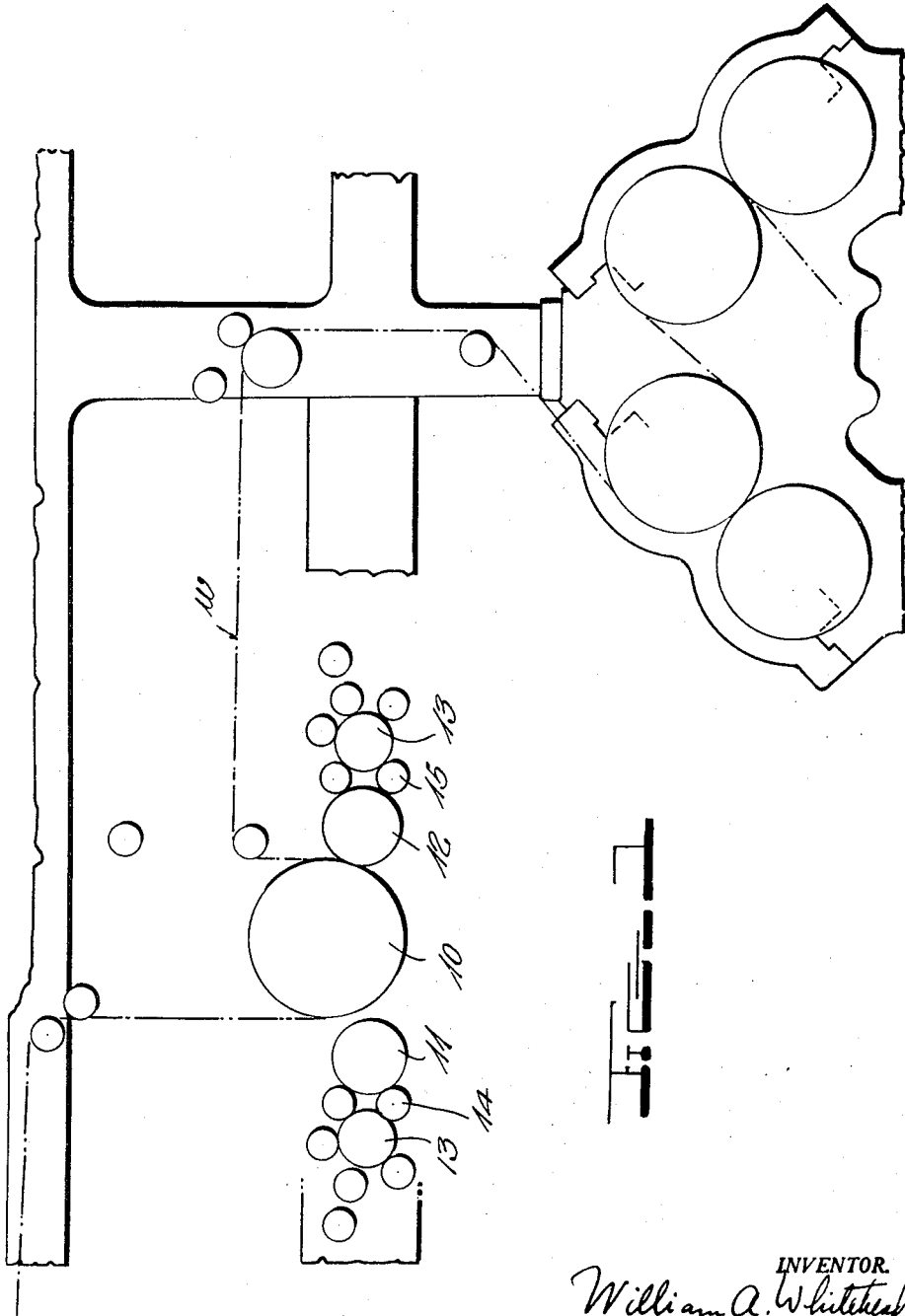
W. A. WHITEHEAD

2,425,167

PRINTING PRESS

Filed June 11, 1943

14 Sheets-Sheet 1



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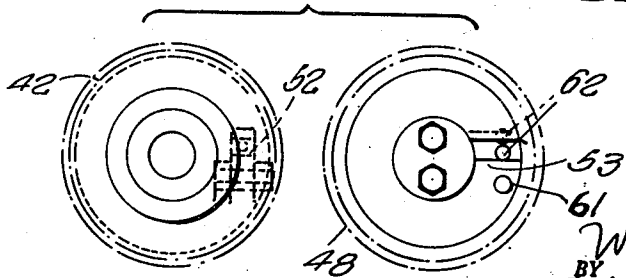
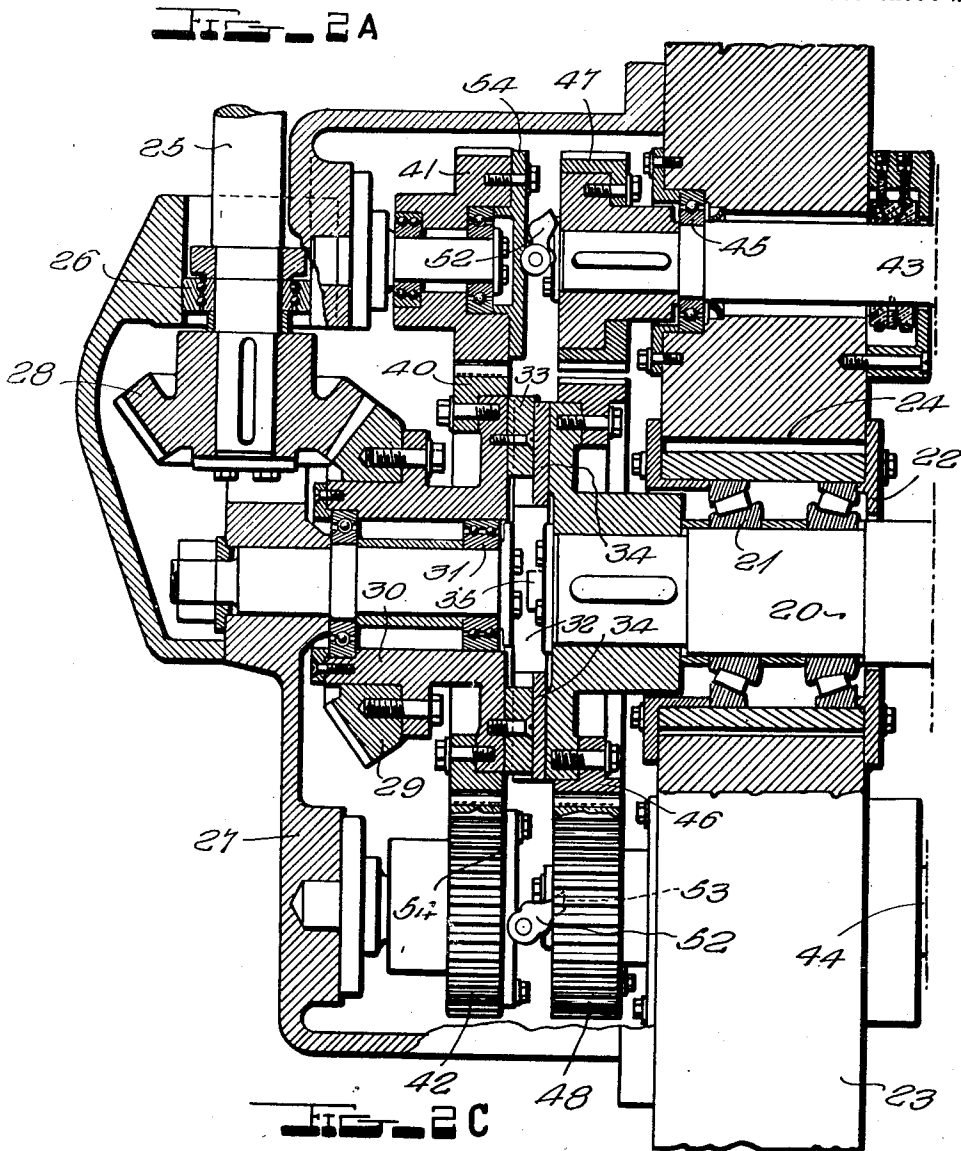
W. A. WHITEHEAD

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14 Sheets-Sheet 2



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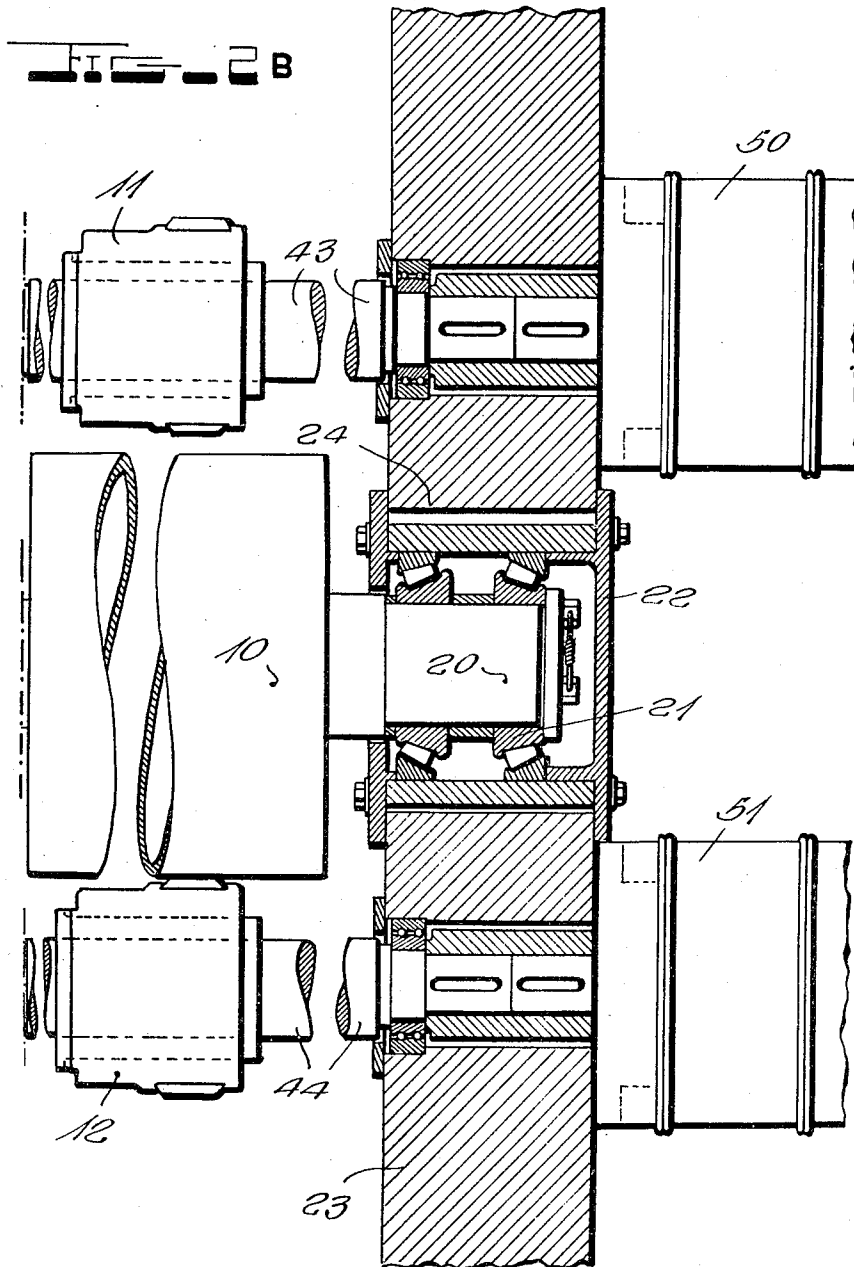
W. A. WHITEHEAD

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14 Sheets-Sheet 3



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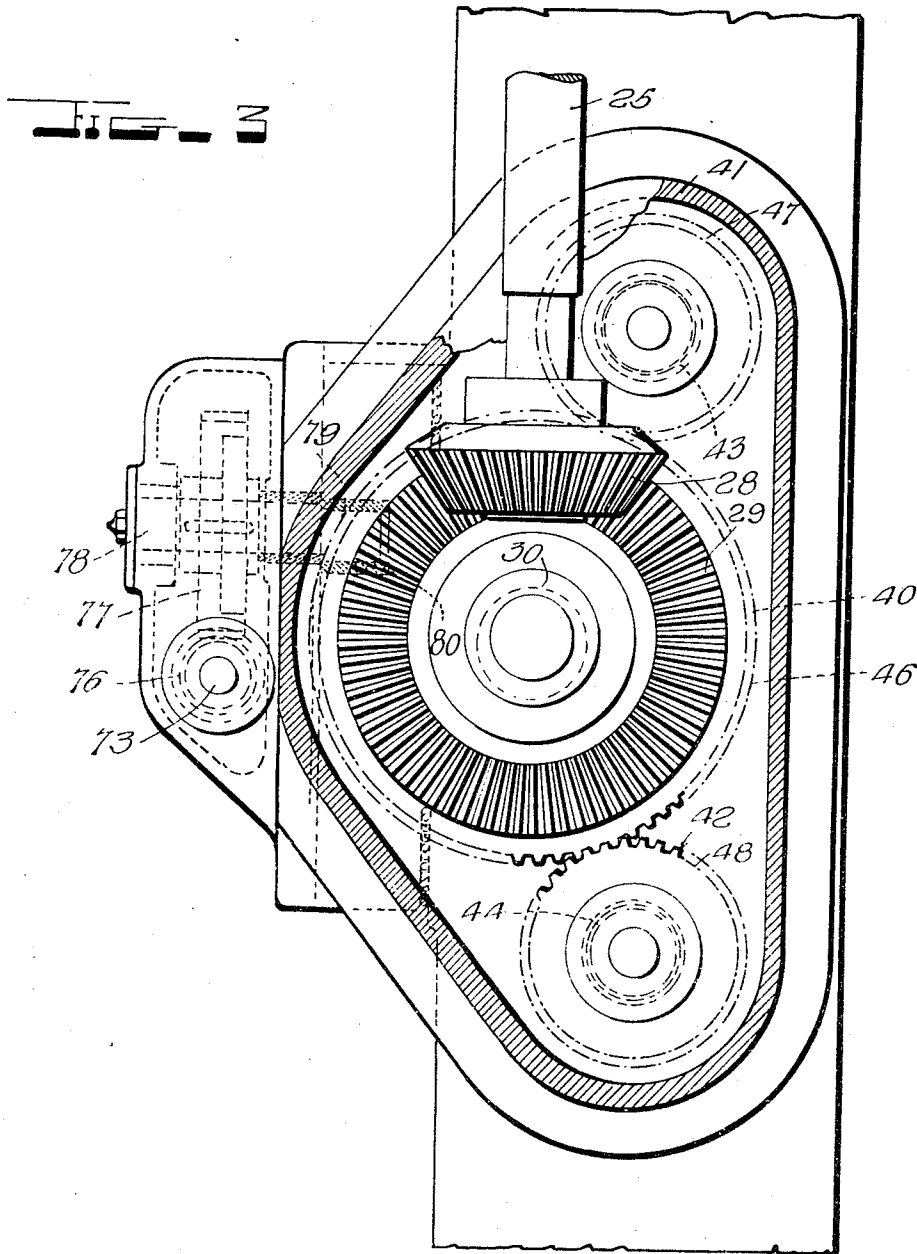
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14 Sheets-Sheet 4



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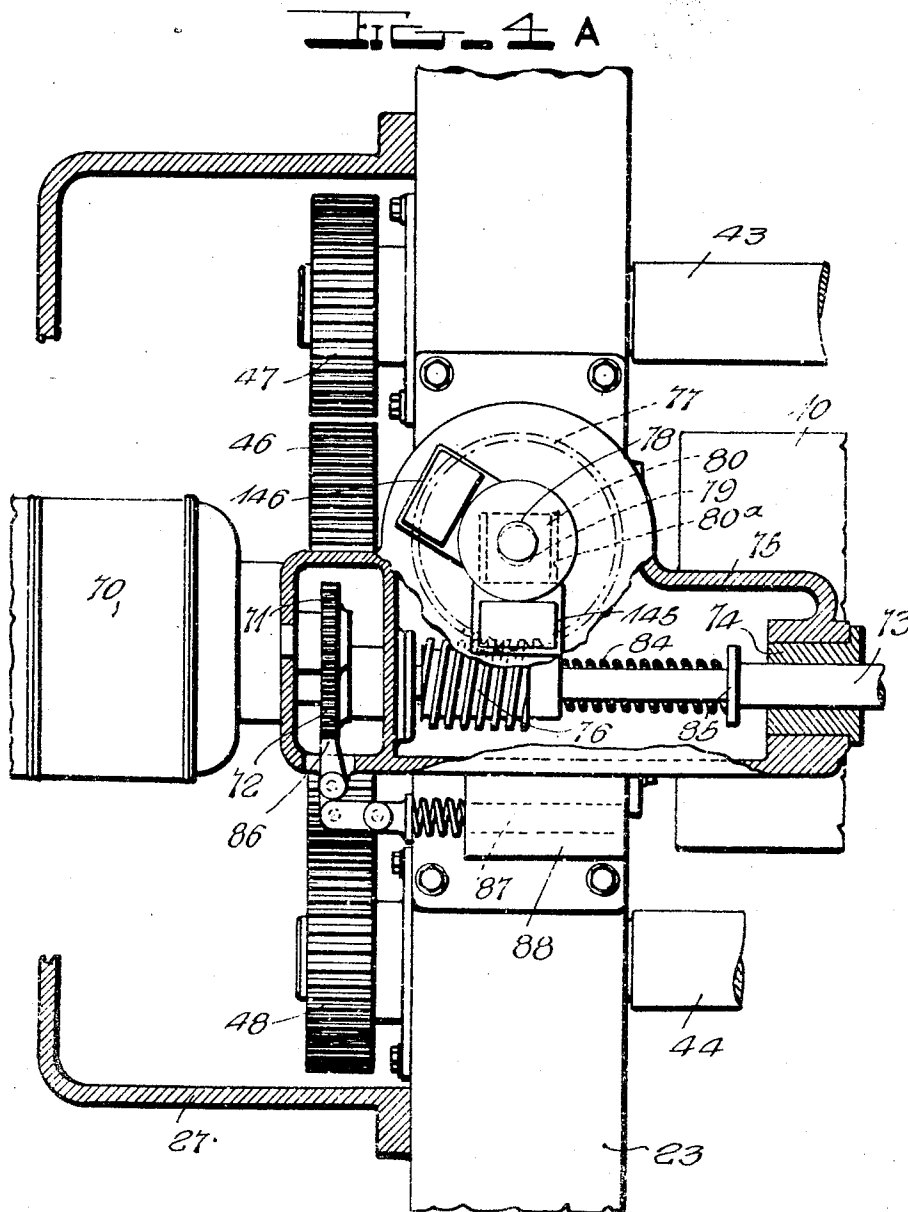
W. A. WHITEHEAD

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14 Sheets-Sheet 5



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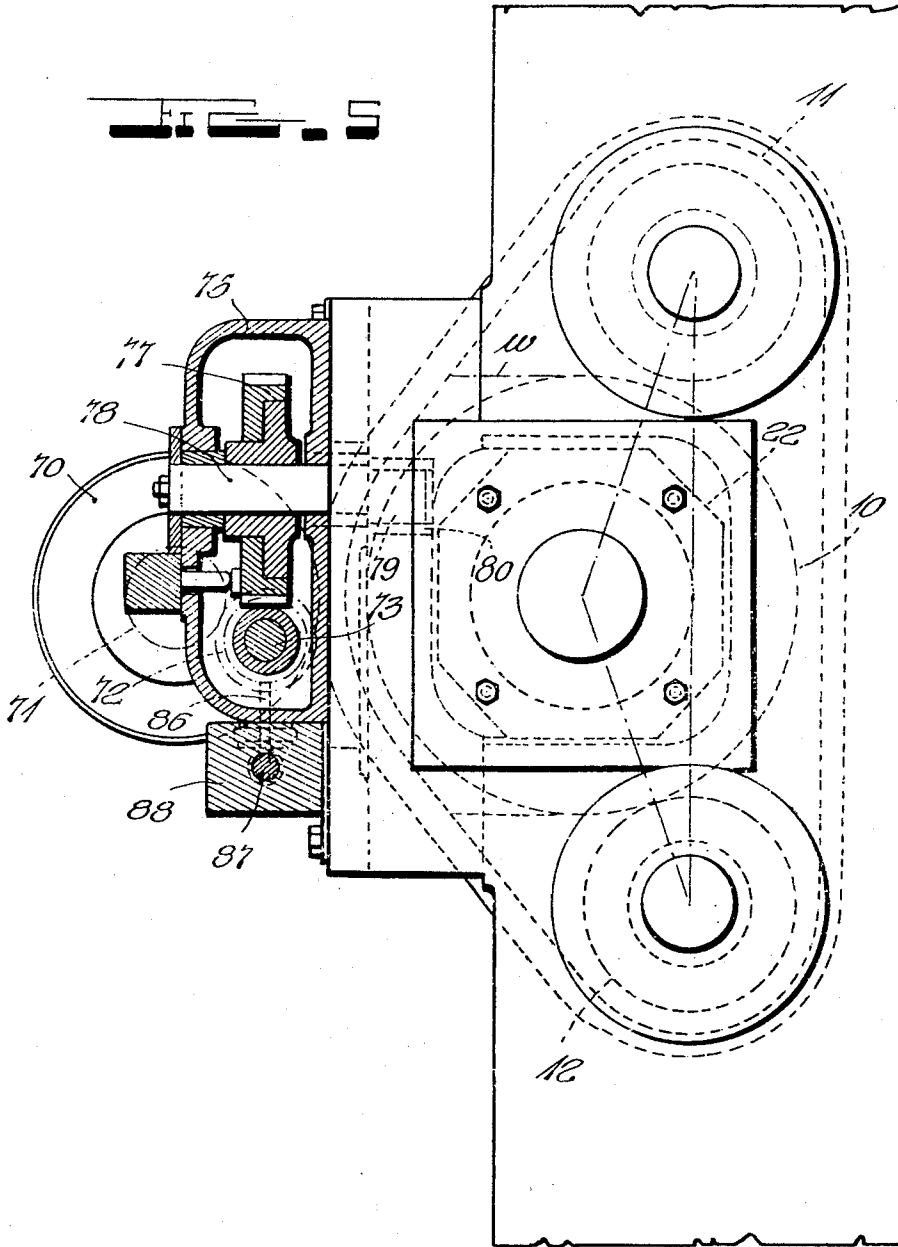
W. A. WHITEHEAD

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14 Sheets—Sheet 7



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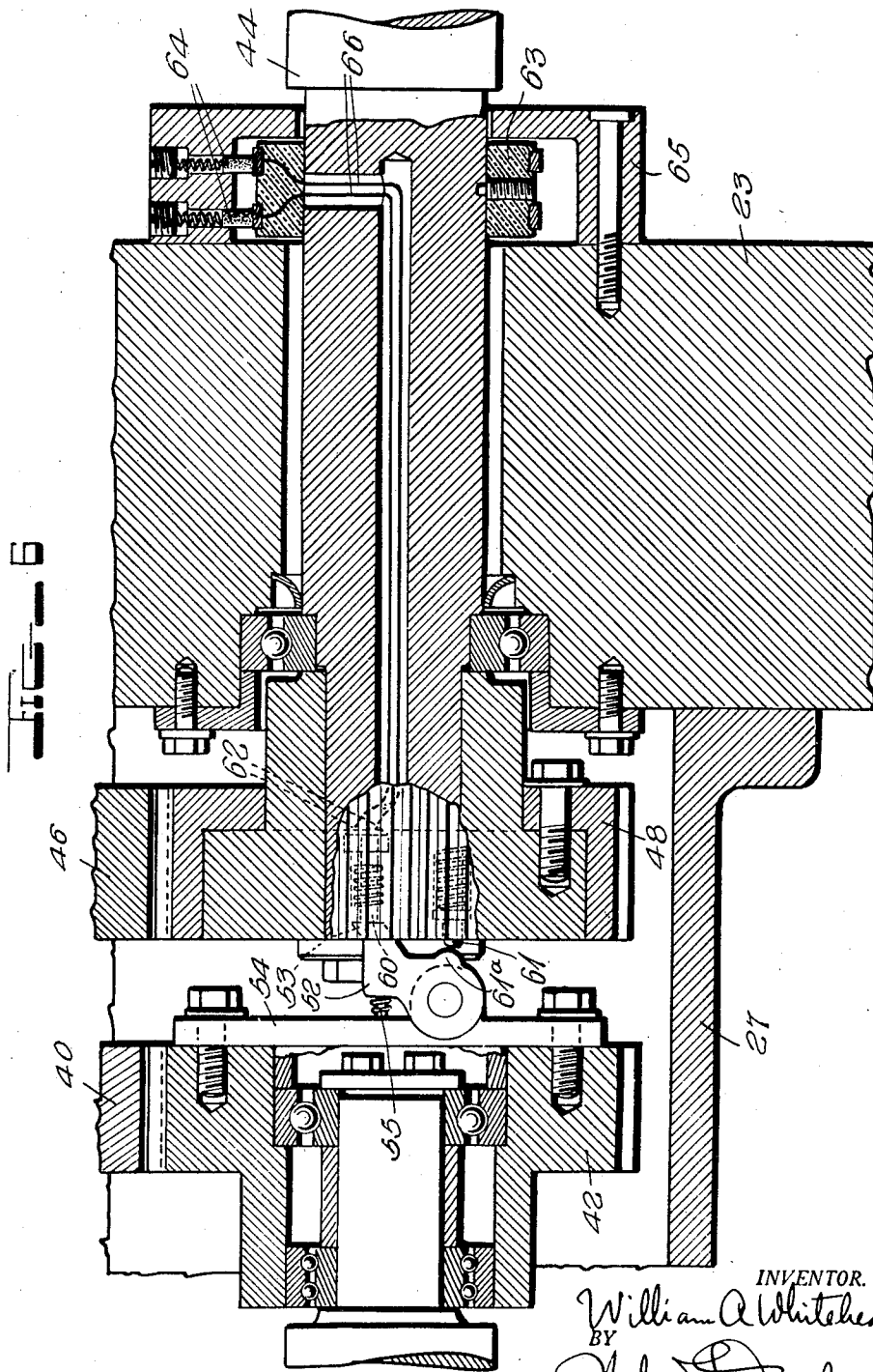
W. A. WHITEHEAD

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14 Sheets-Sheet 8



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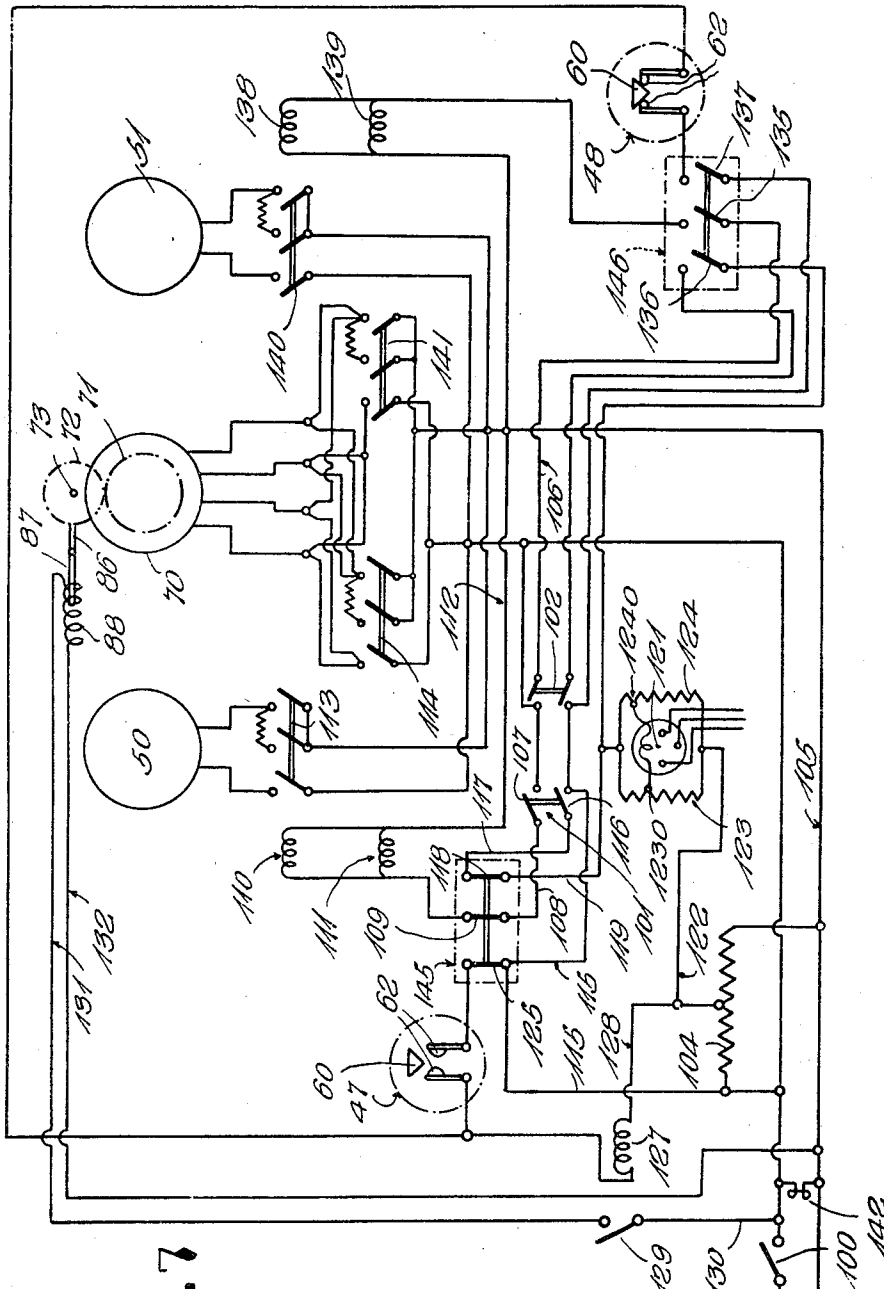
W. A. WHITEHEAD

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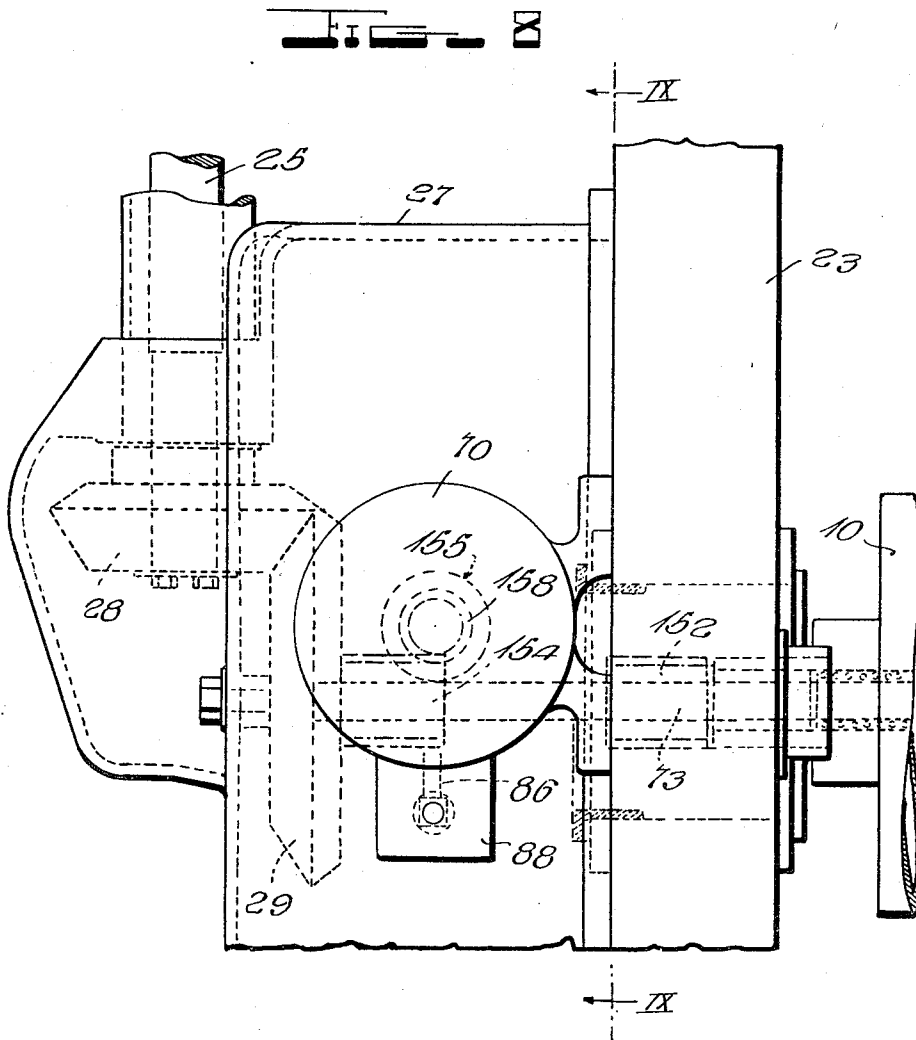
W. A. WHITEHEAD

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14 Sheets-Sheet 10



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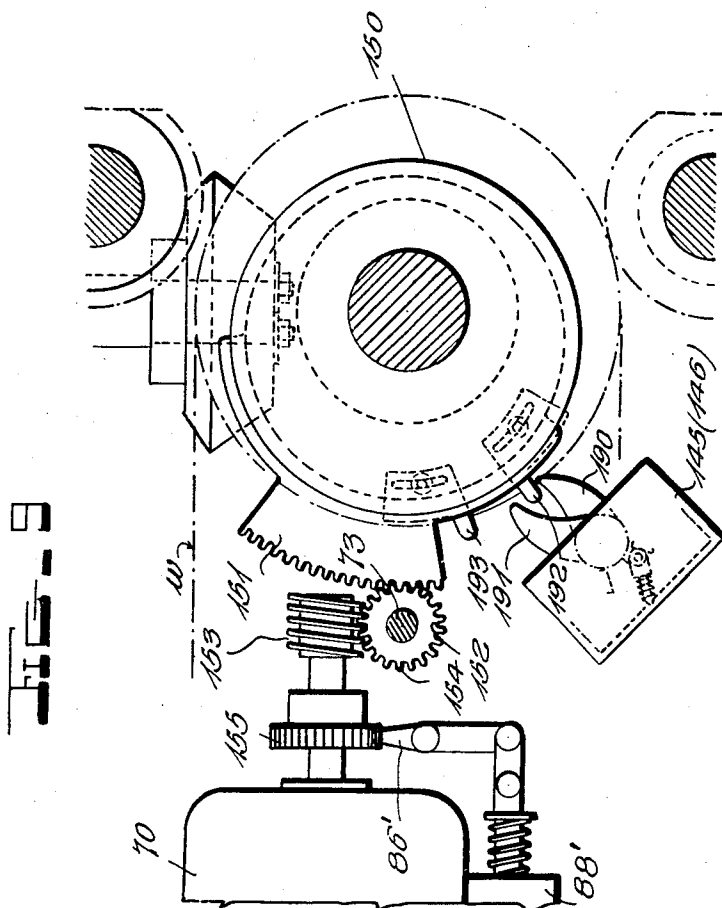
W. A. WHITEHEAD

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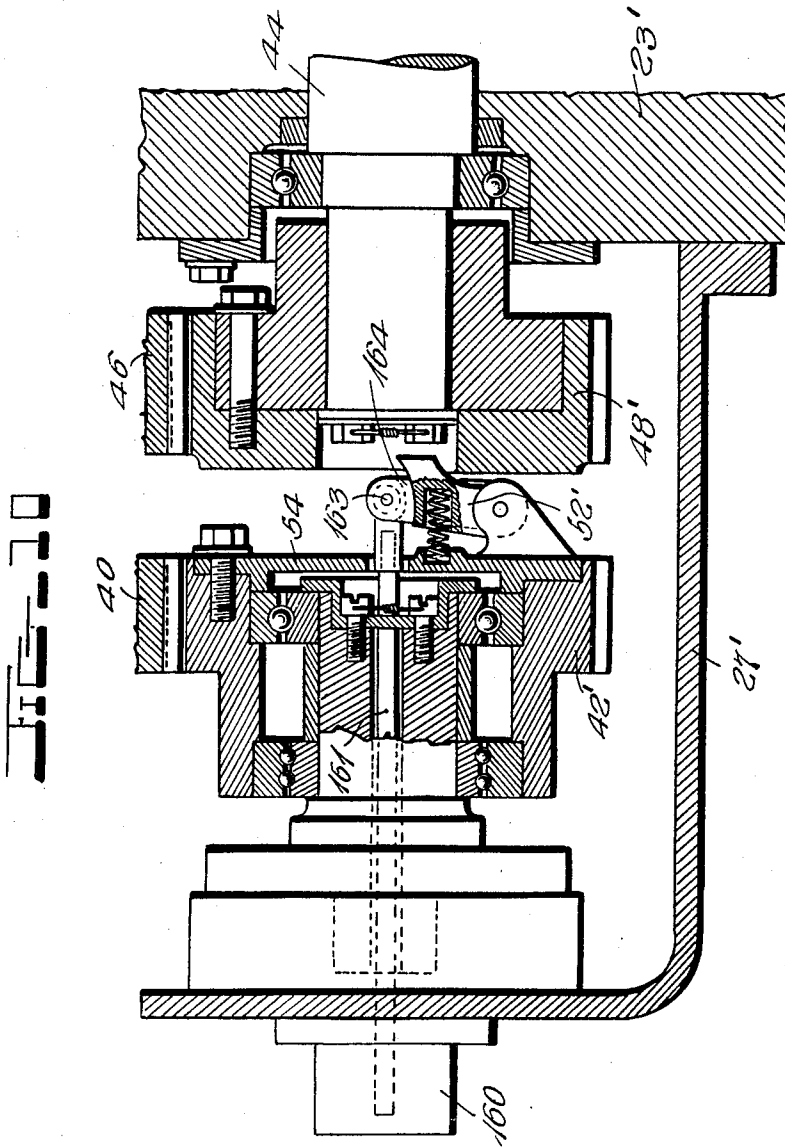
W. A. WHITEHEAD

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14 Sheets-Sheet 12



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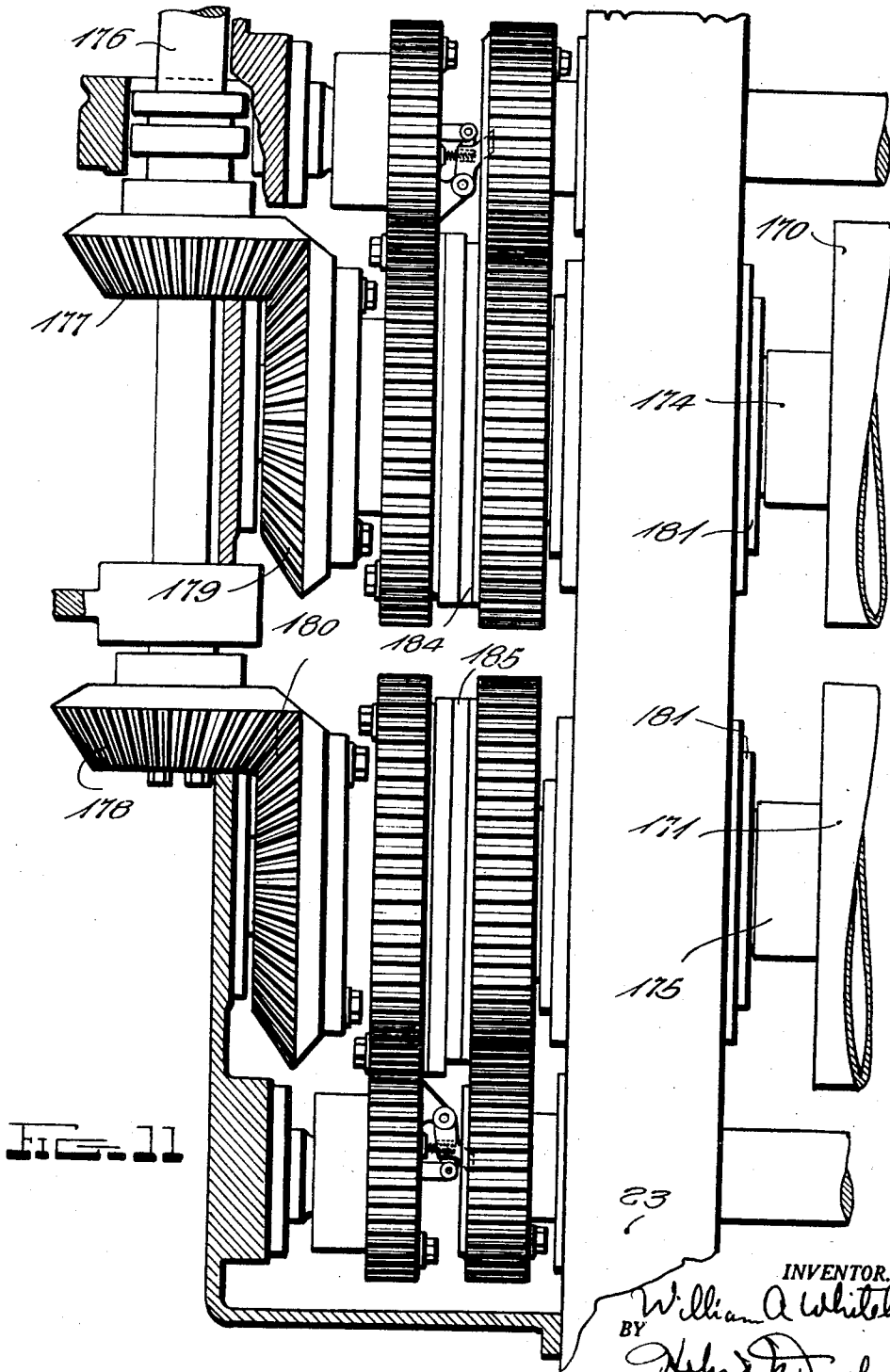
W. A. WHITEHEAD

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14 Sheets-Sheet 13



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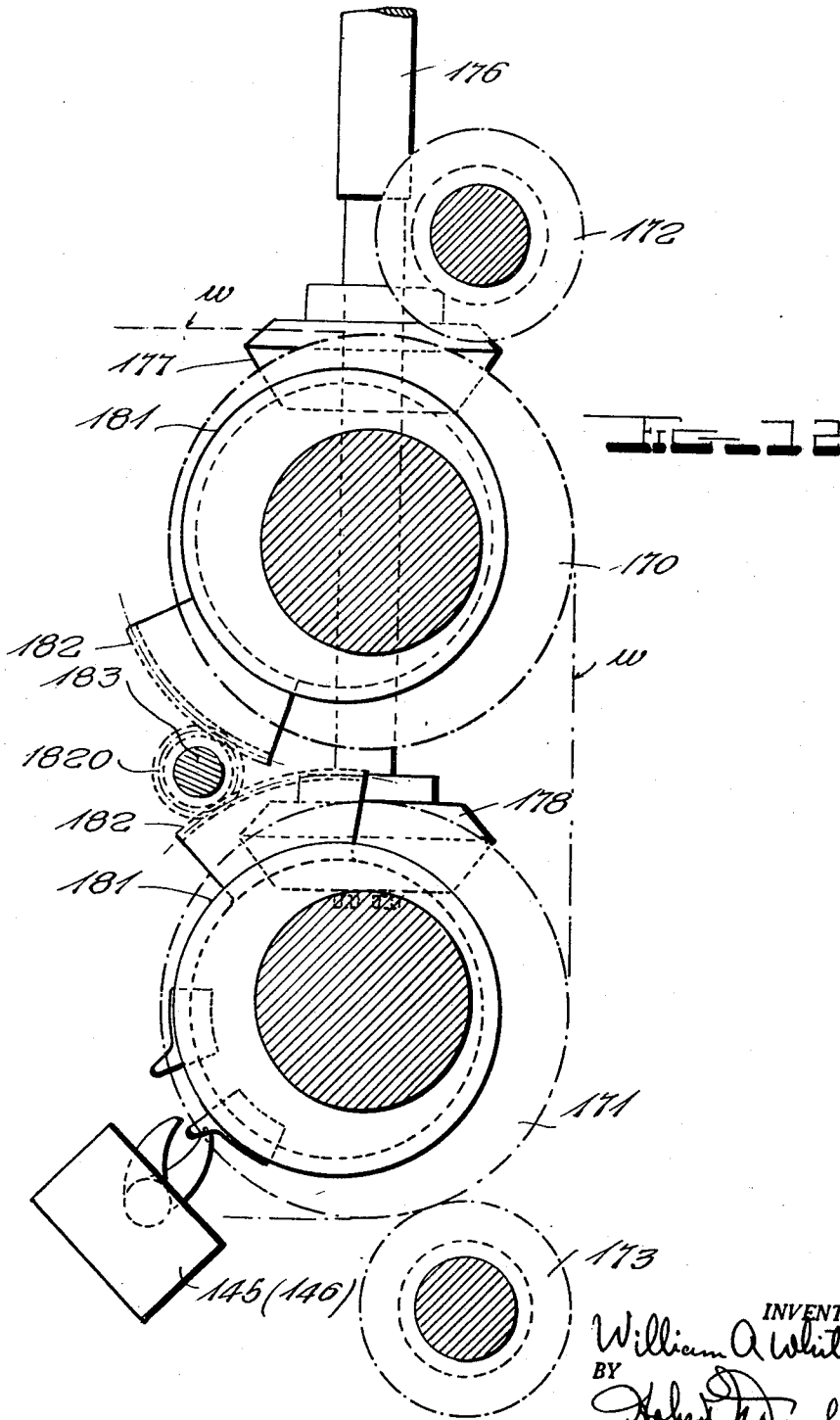
W. A. WHITEHEAD

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14 Sheets-Sheet 14



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UNITED STATES PATENT OFFICE

2,425,167

PRINTING PRESS

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Application June 11, 1943, Serial No. 490,459
In Great Britain July 2, 1942

11 Claims. (Cl. 101—221)

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This invention relates to improvements in printing presses and refers more particularly to "non-stop" printing mechanism such as is commonly employed for printing late news or like matter.

It is an object of this invention to provide a "non-stop" printing mechanism which is entirely automatic in operation and which is independent of the skill of the operator.

Another object of the invention resides in the provision of a mechanism of the class referred to in which the type matter will be properly inked before impression.

It is a further object of the invention to reduce to a minimum the number of copies spoiled by a change in the matter printed by the "non-stop" mechanism.

A still further object of the invention resides in the provision of a "non-stop" printing mechanism in which the minimum of operating gear is required.

Still another object of the invention is to enable type plates of full or partial circumferential length to be employed.

Other objects of the invention and advantages thereof will be clear from the following description of a preferred embodiment thereof, reference being made therein to the annexed drawings.

In said drawings:

Figure 1 is a diagrammatic end elevation of a perfecting rotary printing press embodying a "non-stop" printing unit fitted with a single impression cylinder assembly;

Figures 2a and 2b jointly show partly in section and partly in plan a "non-stop" printing unit having a single impression cylinder, and the mechanism for driving said cylinder and the type cylinder;

Figure 2c shows views of two of the gears of the speed synchronizing gearing;

Figure 3 is a rear end elevation of Figure 2a;

Figures 4a and 4b jointly show in side elevation the mechanism for moving the impression cylinder laterally into engagement with the respective type cylinders;

Figure 5 is a rear end elevation of Figure 4a;

Figure 6 is a detail section showing a part of the timing gearing and the associated synchronizing pawl and ratchet mechanism;

Figure 7 is a diagram of the electrical equipment and connections for the "non-stop" printing unit shown in Figures 2 to 5;

Figure 8 is a detail plan view showing a modification of the mechanism for supporting and laterally moving the impression cylinder;

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Figure 9 is a sectional view on line IX—IX of Fig. 8;

Figure 10 is a detail section showing a modified arrangement of switch gear for controlling lateral movement of the impression cylinder assembly;

Figure 11 is a plan view of a portion of a "non-stop" printing unit having an impression cylinder assembly comprising two cylinders; and

Figure 12 is an end partly in section elevation of Figure 11.

To provide for changes being made in the matter printed on the paper web, it has hitherto been customary to employ a "non-stop" printing mechanism comprising an impression cylinder and two sets of type cylinders, one of said sets running in contact with the impression cylinder and the other being stationary and out of contact with said cylinder. To change the printed matter, the required printing plates are inserted by the operator on the stationary set of type cylinders, which are then set in rotation and are brought up to nearly the surface speed of the web. When the type matter is registered in the correct circumferential position in relation to the paper web, this set of type cylinders is moved into direct drive connection with the impression cylinder to print the new or added matter on the web, the other or superseded set of type cylinders being disengaged from the impression cylinder drive so that they come to rest in readiness to receive other printing plates having further changed or added matter thereon.

There are in general use two classes of "non-stop" printing mechanism, one in which the two sets of type cylinders are mounted on a common shaft and are suitable only for late news or edition headings, since with this arrangement it is possible only to employ printing plates which do not exceed one quarter of the circumference of the type cylinder, and the other, with which it is possible to employ printing plates which may extend over the full circumference of the type cylinders, having one set of said cylinders mounted on one shaft and the other set on another shaft. Both classes of mechanism are open to certain disadvantages. Firstly, the mechanism embodies manually operated register clutches and changing from one set of type cylinders to the other is therefore dependent on the skill of the operator. Further, it is impossible properly to ink the surface of a set of type cylinders until after they have been laterally moved into contact with the impression cylinder, and a considerable number of copies is therefore wasted upon each

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change being made. Another disadvantage common to existing types of non-stop printing mechanism is that both sets of printing cylinders are moved for each change, one set into the operative position and the other into the inoperative position, two sets of operating gear being required to effect these changes.

In accordance with the invention a late news or like printing mechanism comprises an impression cylinder assembly and a pair of type cylinders arranged at opposite sides thereof, said impression cylinder assembly being movable into impression contact with either one or other of said type cylinders. The impression cylinder assembly may consist of a single impression cylinder movable laterally into engagement with either type cylinder, or a pair of impression cylinders which are movable together so that when one is in engagement with one of the type cylinders, the other is out of contact with the other type cylinder.

The shaft carrying the or each impression cylinder may for this purpose be mounted in the front and rear press frame members in bearings which are movable through either a straight or arcuate path as by means, for example, of eccentrics, in a plane generally parallel to, but for convenience and design offset from, a plane through the axes of the type cylinders. Preferably the type cylinders are independently rotatable by means of gearing from the impression cylinder shaft and means are provided for synchronizing the surface speed of the inoperative type cylinder with that of the impression cylinder assembly before the latter is moved into contact with said type cylinder.

Referring now to the drawings, and more especially to Figure 1, the impression cylinder assembly of a "non-stop" late news or like printing mechanism includes an impression cylinder 10, with which are associated a pair of type cylinders designated 11 and 12 respectively. The type cylinders are laterally arranged at opposite sides of the impression cylinder so that either may be placed in operative driving engagement with the impression cylinder while the other is in the inoperative position out of contact with the impression cylinder.

The type cylinder 12 is shown in the operative position and the cylinder 11 in the inoperative position, so that the paper web *w*, which passes around substantially 180° of the impression cylinder to contact either type cylinder, receives the impression from the inked type matter on the type cylinder 12. As will be seen more clearly in Figure 1, the impression cylinder is offset in relation to a plane through the axes of the type cylinders. Figure 1 also illustrates the two sets of ink-distributing drums 13 and form-inking rollers 14, 15 by which ink is delivered to the type cylinders, as well as a portion of a perfecting rotary press from which the newsprint is fed to the "non-stop" unit. The type cylinder 11, being out of driving engagement with the impression cylinder, is stationary and thus in readiness to receive any new type matter, such as a further late news item, which it may be desired to print.

Referring now to Figures 2 to 6 inclusive, the impression cylinder 10 is carried by a shaft 20 journalled in bearings 21 and in order to enable the cylinder to be moved transversely from a position where, as shown in Figures 2a and 2b, it is in printing engagement with one of the type cylinders, to a position where it is in printing

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contact with the other type cylinder, the bearings 21 are mounted in housings 22 which externally are of generally square contour and are carried by the front and rear press frame members 23 within parallel elongated slots 24 therein. The shaft 20 is continuously driven from, for example, the main drive through a shaft 25 rotatable in a bearing 26 within a housing 27 secured to the rear press frame member 23. A bevel gear 28 keyed on the shaft 25 meshes with a bevel gear 29 secured to a tubular stub shaft 30 journalled on a bearing 31 within the housing 27 and substantially coaxial with the shaft 20 when the impression cylinder is out of engagement with both of the type cylinders. The drive is transmitted from the stub shaft 30 to the shaft 20 through an "Oldham" or other equivalent coupling 32 allowing relative displacement of the driving and driven axes, one of the outer members 33 of said coupling being secured to the stub shaft 30 and the other outer member 34 to the adjacent end of the impression cylinder shaft 20. The intermediate coupling member is designated by the numeral 35.

Secured to the stub shaft 30 for rotation therewith is a gear wheel 40 which is constantly in mesh with a pair of gear wheels 41, 42, each of which is coaxial with one of a pair of shafts 43, 44 journalled in bearings 45 in the front and rear press frame members 23 and having keyed thereon the type cylinders 11, 12. The gearing 40, 41, 42 constitutes a timing gear train of which the gears 41 and 42 rotate at the same angular speed as the type cylinders. The type cylinder shafts 43, 44 are each adapted to be driven, in the extreme transverse positions of the impression cylinder, by means of a gear wheel 46 which is of slightly lesser pitch diameter than gear wheel 40, and is secured to the coupling member 34, said gear 46 in one position of the shaft 20 meshing with a gear wheel 47 secured to the shaft 43 and, in the other position of said shaft, with a gear wheel 48 secured to the shaft 44. The gear wheels 47, 48 are also of slightly lesser pitch diameter than the gear wheels 41, 42, to provide the same gear ratio in relation to the gear 46 as that between the gear wheel 40 and the gears 41, 42. Thus, when the impression cylinder is in engagement with the type cylinder 12, the latter is driven through the shaft 44 and the gear wheels 48, 46, the gear 46 being then out of engagement with the gear 47, while when the impression cylinder is in its other transverse position in engagement with the type cylinder 11, the latter is driven through the shaft 43 and gear 47 from the gear 46, said gear 46 being then disengaged from the gear 48. Accordingly while one of the type cylinders is in impression contact with the cylinder 10, the other is out of contact with said cylinder and, being stationary, is ready to receive any new type matter, such as late news, which it may be desired to print.

In addition to the gearing described above for driving the impression and type cylinders, each type cylinder shaft is coupled to one of a pair of electric motors 50, 51 mounted on the front press frame member 23. The purpose of each of these motors is to bring the respective type cylinder from stationary to printing speed before the impression cylinder is moved into engagement therewith. When a change is to be made in the matter being printed by one of the type cylinders, the motor associated with the then inoperative type cylinder, on which latter a plate containing the new matter has been inserted, is set in oper-

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ation and, when this cylinder reaches a speed approximately equal to that of the corresponding timing gear wheel 41 or 42, a pawl or dog 52 on said timing gear wheel engages a ratchet groove or recess 53 in the adjacent face of the corresponding drive gear 47 or 48 and thus brings the speed of the type cylinder into registry with that of the timing gear wheel. The pawls 52 and grooves 53 also ensure that the type cylinders are in proper angular relationship to the impression cylinder before printing is commenced. As illustrated, each of the pawls 52 is pivotally mounted eccentrically of the axis of the corresponding timing gear wheel on a plate 54 secured to said gear wheel and is urged towards the ratchet groove in the corresponding driving gear wheel 47 or 48 by means of a spring 55. The arrangement is preferably such that the pawl will lock within the ratchet groove immediately the driving gear wheel 47 or 48 commences to overrun the timing gear wheel 41 or 42 and will remain engaged in said groove until the driving gear wheel disengages from the gear wheel 46 and its speed thus drops.

A spring-loaded plunger 61 engages an enlarged portion 61a of the pawl to hold the latter against chattering until it engages within the groove 53.

In addition to synchronizing the speed of the inoperative type cylinder with that of the impression cylinder before these cylinders are brought into impression contact, engagement of the pawl or dog 52 as above described, within the recess in the corresponding driving gear wheel 47 or 48 may serve to control the movement of the impression cylinder and move it into engagement with the inoperative type cylinder to disengage it from the operative type cylinder, which by that time has been brought up to impression cylinder speed. For this purpose each of the driving gear wheels 47, 48 carries an electrical contact in the form of a spring-loaded push-button 60 (Figure 6) which is adapted to be engaged by the nose 61 of the pawl 52 when the latter enters and locks within the recess 53 in the corresponding driving gear wheel. This causes the push-button to be depressed to close an electrical circuit through a pair of contacts 62 on the driving gear wheel 47 or 48, a slip ring 63 and brushes 64 carried in a housing 65 secured on the rear press frame members around each type cylinder shaft 43, 44, and conductors 66 leading from the contacts 62 to brush contacts on the slip rings. Each set of brushes 64 is connected in a control circuit of a reversible electric motor 70 which, through gear wheels 71 and 72, is coupled to a shaft 73 mounted for rotational and axial movement in bearing bushes 74 in housings 75 secured to the sides of the main press frame members 23, the shaft 73 being arranged parallel to the axis of the impression cylinder 10. Keyed on the shaft 73 at either end thereof is a worm 76, each of these worms being in driving engagement with a worm wheel 77 secured to a shaft 78 rotatably mounted in bushes in the corresponding housing 75. Also secured to each of the shafts 78 is an eccentric 79 which runs within a bore in a rectangular block 80 which, as shown in Figures 4A and 4B, slides within an elongated recess 80a in the associated bearing housing 22 within which the impression cylinder shaft 20 is mounted. Thus upon energization of the motor 70, the eccentrics cause the bearing housings 22 to move within their slots 24 in the press frame members 23 and thereby move the impression cylinder laterally into surface contact with one or other of the type cylin-

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ders 11, 12. A concentric curved block 81 secured on one of the worm wheels 77 is adapted to engage with one or other of a pair of adjustable stops 82, 83, shown as comprising screws threaded in bosses in the corresponding housing 75, to limit the angular movement of the worm wheels 77 and therefore of the eccentrics 79 and, as will later be described, this cessation of rotation of the worm wheels is synchronized with the actuation of limit switches associated with and controlled by one of the worm wheels to de-energize the motor 70 and also the motor 50 or 51 by which the type cylinder now in impression contact with the cylinder 10 has been brought to printing speed.

Although the motor 70 is de-energized when the impression cylinder engages the previously inoperative type cylinder, its rotor continues to revolve due to its inertia. As, however, rotational movement of the worm wheel 77 carrying the block 81 has been arrested by engagement of said block with one or other of the stops 82, 83, this continued rotation of the rotor of motor 70 will be translated into axial movement of the shaft 73. The shaft 73 continues to rotate, which at the same time ensures that rotation of the other worm wheel 77 ceases. This axial movement of the shaft 73 serves to compress one or other of a pair of springs 84 coiled about the shaft and each arranged between one of the worms 76 and a collar 85 loose on the shaft and engageable with a part of the housing 75 by which its axial movement on the shaft is limited. In each extreme axial position of the shaft 73 (in Figures 4A and 4B it is shown in the extreme left-hand position), this compression of one of the springs 84 maintains the lug 81 in engagement with the stop 82 or 83 by which rotation of the worm wheel 77 carrying said lug was arrested, while the other spring is relaxed. A pawl 86 pivotally carried on one of the housings 75 and movable into and out of engagement with the teeth of gear wheel 72 is provided to hold the impression cylinder in the required printing position. The pawl 86, as illustrated, is coupled to the armature 87 of a solenoid 88 which, as will hereinafter be described, is operable to hold the motor 70 stationary, thereby preventing displacement of the impression cylinder, until the then inoperative type cylinder reaches printing speed.

When a change is to be made in the printed matter and the motor 70 has been energized to rotate the shaft 73 in the reverse direction, the energy stored in the right-hand compressed spring 84 causes said shaft to move toward the right to a midway position where the two springs are balanced. Since during this axial movement of the shaft 73 the gears remain stationary, the motor is not under load and quickly reaches maximum speed so that, in the midway position of the shaft, the motor has developed sufficient power to turn the gears 77 and thus cause the impression cylinder to move into engagement with the other type cylinder. Thus the shaft 73, which is alternately spring-loaded in opposite directions, assists in quickly developing maximum power in the motor 70 to move the impression cylinder.

Figure 7 shows schematically the electrical equipment and connections by which the operation of the printing unit described above is controlled. This equipment includes a manually operable main switch 100 and manually operable two-pole switches 101 and 102 for connecting the motors 50 and 51 respectively into circuit to bring the corresponding type cylinders, as previously described, to approximately the surface speed of

the impression cylinder, said switches 101 and 102 thereafter also controlling, in conjunction with the aforesaid contacts 62 and the pawl 86, the operation of the motor 70 to change the position of the impression cylinder.

Assuming the press to be running and the impression cylinder of the non-stop printing unit to be in the position shown in Figures 1 to 5 of the drawings, i. e. in printing engagement with the type cylinder 12, the circuit connections are as shown in Figure 7, the switch 100 being open and the motors 50, 51 and 70 de-energized. When it is desired to make a change in the matter printed on the paper web by the non-stop unit, a printing plate containing new or revised type matter is secured on the cylinder 11 and the switch 100 is closed. This completes a circuit from one side 103 of a direct current supply source, through a resistance 104 and back to the other side 105 of said current source. The switch 101 is then actuated to complete a circuit from the line 103, through line 106, one contact 107 of the switch 101, line 108, closed contact 109, contactor coils 110 and 111, and line 112, back to the other line 105 of the current source. Energization of the coils 110 and 111 closes a pair of triple-pole switches 113, 114, the former constituting an automatic contactor starter for the motor 50, and the switch 114 constituting an automatic contactor starter for the motor 70. The motor 50 is thus connected in the mains circuit 103, 105 to rotate the shaft 43 carrying the inoperative type cylinder 11, while the motor 70 is held stationary by engagement of the pawl 86 with the gear 72, thereby preventing displacement of the impression cylinder until the type cylinder 11 reaches printing speed. A circuit is also established from the line 103, through line 115, contact 116 of switch 101, line 117, closed contact 118, lines 119 and 120 and thence by way of a moving coil, centre zero voltmeter 121 and line 122 to the other side of the mains 105. The voltmeter, which includes two resistances 123 and 124, records the potential difference between a fixed tapping 1230 of the resistance 123 which governs the speed at which the change is to be made, and a variable tapping 1240 of the resistance 124 the position of which varies in accordance with the speed of the press, being connected to a relay associated with the press-operating motor so that when the motor is energized the press is brought to the desired speed.

When the speeds of the type cylinder 11 and impression cylinder 10 have been brought into register and the pawl or dog 52 on the timing gear wheel 41 has engaged within the recess in the corresponding driving gear 47 to close the contacts 62 through the push button 60, a circuit is completed from the line 103, through line 115, closed contact 125, contacts 62, line 126, coil 127 and line 128 to the resistance 104 and thence to the other line 105 of the supply mains. A single pole contactor gravity switch 129 is thus actuated to close a circuit from the line 103, through line 130, switch 129, line 131, solenoid 86, and line 132 to the line 105. Energization of the solenoid 86 causes the pawl 86 to disengage from the gear 72 thereby to permit rotation of the motor 70 in a direction to move the impression cylinder laterally out of engagement with the type cylinder 12 and into engagement with the type cylinder 11.

During the preceding operation of the press i. e. with the impression cylinder in printing engagement with the type cylinder 12, the contacts

62 associated with the driving gear 46 remained closed under the action of the corresponding pawl 52. However, immediately upon disconnection of the drive from the gear 46 to the gear 48 by movement of the impression cylinder to engage the type cylinder 11, the speed of the shaft 44 drops and this pawl disengages from the co-operating ratchet groove 53 in the driving gear 46, with the result that the push button 60 of said driving gear is released and opens the corresponding contacts 62. Similarly the contacts 62 of the driving gear 47 will remain closed as long as the impression cylinder remains in printing engagement with the type cylinder 11.

When the impression cylinder reaches a position where it is in printing engagement with the type cylinder 11, at which time the driving gear 46 is in mesh with the gear 47, the contacts 109, 118 and 129 are opened, in a manner to be described, the contact 109 releasing the switches 113 and 114 to de-energize the motors 50 and 70. Opening of the contact 118 disconnects the speed control voltmeter 121 and this permits variation of the speed of the press at the discretion of the operator. Finally, opening of the contact 125 enables the pawl 86 to reengage with the gear 72 to lock the motor 70 against rotation. The switch 100 is then actuated to break the supply circuit and the switch 101, which is mechanically interlocked with the switch 100, is opened, this interlocking preventing subsequent operation of switch 101 until the switch 100 is again closed.

Simultaneously with the opening of the contacts 109, 118 and 129, three similar contacts 135, 136 and 137 associated with the motor 51 are closed. The contacts 135 and 136 are in circuit with the switch 102 which is also mechanically interlocked with the mains switch 100 and is therefore inoperative until said mains switch has been closed. The other switch 137 is in circuit with the contacts 62 of the gear 48, which contacts have been opened following disengagement of the driving gear 46 with said gear 48 and the consequent stopping of said latter gear. These contacts 135, 136 and 137 are therefore in the same positions as were the corresponding contacts 109, 118 and 125 during the preceding printing operation, i. e. with the impression cylinder in printing contact with the type cylinder 12.

The contact 135 is also in circuit with a pair of coils 138, 139 the former of which controls the operation of a triple-pole switch 140 in the circuit of the motor 51 and the latter controlling the operation of a triple-pole switch 141 in the circuit of the motor 70 and through which said motor is energized to rotate in the reverse direction and thereby return the impression cylinder to the position shown in Figures 1 to 5. An electrical signalling or warning device such as a lamp, horn or bell, may be provided as shown at 142.

The two sets of switches 109, 118, 125 and 135, 136, 137 are each housed in a box 145, 146 respectively said boxes being fixed on the housing 75 associated with the rear press frame member 23. These switches are arranged to be opened and closed mechanically and at the proper times as by means of trip dogs (not shown) adjustably secured for rotation with the shafts 78. The setting of the abutment screws 82, 83 is synchronized with the angular positions of the dogs in relation to the respective sets of switches so that rotation of the worm wheels 77 and the shaft 73 is stopped immediately either switch has been actuated.

Despite the provision of means for synchronizing the speed of each type cylinder with that of the impression cylinder before moving the latter out of impression engagement with one type cylinder and into impression engagement with the other, it is necessary that the driving gear wheel 46 shall engage the gears 47 and 48 without jamming. With this in mind the teeth of these gears are cut on the addendum to a point and each of the isosceles angles formed by the intersection of planes through the axes of the type and impression cylinders—the axis of the impression cylinder being offset from a plane through the axes of the type cylinders—is less than the pressure angle of the wheel teeth.

Figures 8 and 9 illustrate a modified arrangement in which, instead of the parallel sliding bearing housings 22 for the impression cylinder shaft as shown in Figures 1 to 5, annular eccentric bearing housings 150 are provided, there being on such housing at each end of said shaft arranged within circular openings in the corresponding end press frame members 23'. Each bearing housing 150 has attached thereto a quadrant gear 151 meshing with one of a pair of helical gears 152 at opposite ends of the shaft 73'. The shaft 73' is driven from the motor 70', which in this embodiment has its axis normal to that of the shaft 73', through a worm 153 on the motor spindle and a worm wheel 154 on said shaft. The motor shaft also has secured thereto a ratchet gear 155 with which the locking pawl 86' is adapted to engage under control of the solenoid 88'.

With this modified form of bearing housing for the impression cylinder shaft, the trip dogs for actuating the two sets of limit switches 109, 118, 125 and 135, 136, 137 of the electrical equipment are secured to one of the bearing housings 150 for rotation therewith. Figure 9 shows one of the switch boxes 145, 146, the switches being of the toggle kind having a pair of coaxially arranged pivoted arms 190, 191 respectively engageable with trip dogs 192, 193 mounted on one of the rotatable bearing housings. The trip dogs are angularly adjustable on the bearing housing as by means of a slot and bolt connection so that their positions may be varied in accordance with the setting of the abutment stop screw 82, 83.

This modified arrangement, due to the bearings being supported around their entire peripheries by solid metal of the end press frame members, enables the impression cylinder to withstand heavier loads, such as when printing from pages of text or half tones, without variation in the quality of the printed matter. Although the path of movement of the impression cylinder while it is being changed from one printing position to the other will be arcuate instead of straight, as in the embodiment of Figures 2 to 5, thereby resulting in stretching of the paper web, the increase in tension may have no serious effect on the printing, being limited to a few ounces per inch of web.

Figure 10 shows an alternative arrangement of the mechanism and electrical equipment for controlling the operation of the solenoid 88. The contacts 62 and push button 60 are here replaced by a switch 160 secured on the gear housing 27' of the rear press frame member 23', each switch having a pair of contacts (not shown) corresponding to the pair of contacts 62 carried by the driving gears 47' or 48'. Each pair of contacts is adapted to be actuated to open and close the solenoid control circuit through the coil 127

by a rod 161 which is arranged for axial movement within the stud of the corresponding timing wheel 41' or 42'. The inner end of the rod 161 is pivotally connected at 163 to an arm 164 which is secured to the pawl 52' for rocking movement about the pivotal axis thereof. This arrangement has the advantage that the electrical equipment is entirely separate from the mechanical so that when dismantling or adjusting any of the mechanical components there will be no danger from live connections.

In Figures 11 and 12, the impression cylinder assembly of a late news or like printing mechanism comprises a pair of impression cylinders 170, 171 each of which is movable into and out of printing engagement with one of a pair of type cylinders 172, 173. The type cylinders are mounted and driven in the same manner as the cylinders 11, 12 of Figures 2 to 5. Each of the impression cylinder shafts 174, 175 is driven from a main drive shaft 176 to which are secured two bevel gears 177, 178 meshing with a pair of bevel gears 179, 180 on the respective impression cylinder shafts. The latter are shown as being carried at each end in eccentric bearings 181 in the same manner as in the arrangement of Figures 8 and 9, and each bearing has secured thereto a toothed quadrant 182 which is in mesh with one of a pair of helical gears 1820 secured at opposite ends of a shaft 183, similar to the shaft 73 and driven from the motor 70 in the same manner as in Figures 8 and 9. Each cylinder shaft, furthermore, is driven through a coupling 184 or 185 similar to that shown in the first embodiment.

It will be clear from Figures 11 and 12 that as the eccentric bearings supporting the respective impression cylinder shafts are arranged so that while one of said cylinders is in impression engagement with the corresponding type cylinder, the other impression cylinder is out of engagement with the other type cylinder, the latter therefore being stationary, rotation of the shaft 183 will cause simultaneous angular movement of the quadrants to move the impression cylinder assembly to its other operative position. Both impression cylinders are continuously driven and the paper web *w* passes about both cylinders in turn, in this arrangement, however, engaging only about 90° of each cylinder surface.

Self-synchronous motors may be employed in place of the motors 50 and 51 to bring the respective type cylinders to printing speed. Where motors of this kind are employed, the timing gear train 40, 41, 42, the pawls 52 and the contacts 62 or switch 160 are unnecessary.

The mechanism described in each of the aforesaid embodiments will be seen to be entirely automatic in operation and, being independent of register clutches, is also independent of the skill of the operator. Since only one cylinder assembly is required to move in order to make a change in the matter printed on the web, only one operating mechanism is required. Further the invention enables printing plates of full or partial circumferential length to be used. Finally, as the type cylinders remain stationary, the invention avoids any difficulties in supplying ink thereto, with the result that the inoperative type cylinder may be effectively inked before it is placed in impression contact with the paper web.

What I claim and desire to secure by Letters Patent in the United States is:

1. A late news or like printing machine comprising an impression cylinder, a pair of laterally spaced type cylinders, means for driving the im-

pression cylinder, means for rotating the type cylinders independently of the impression cylinder and for synchronizing the surface speeds of the impression and type cylinders, means for automatically moving said impression cylinder laterally into impression engagement with one or other of said type cylinders and control means actuated when the surface speed of the latter is synchronized with that of the impression cylinder for initiating movement of said automatically moving means, and means thereafter for driving the operative type cylinder from the impression cylinder.

2. A late news or like printing mechanism comprising an impression cylinder, a pair of laterally spaced type cylinders, a hollow drive shaft, a coupling for driving the impression cylinder from said drive shaft, means for driving either of the type cylinders independently of the impression cylinder, a driving gear rotatable with the impression cylinder and engageable with one or other of a pair of driven gears for driving each type cylinder from said impression cylinder, a timing gear train including a driving gear on said hollow drive shaft and a pair of driven gears coaxial with the type cylinders, a dog on each of said driven timing gears engageable within a recess in the corresponding driven type cylinder gear when the surface speed of each type cylinder reaches that of the impression cylinder, means controlled by each of said dogs for disconnecting the independent type cylinder driving means, and means for simultaneously moving the impression cylinder laterally out of engagement with one of said type cylinders and into engagement with the other of said cylinders.

3. A late news or like printing mechanism comprising an impression cylinder, a pair of laterally spaced type cylinders, a hollow drive shaft, a coupling, for driving the impression cylinder from said drive shaft, an electric motor for driving each type cylinder independently of the impression cylinder, a driving gear rotatable with the impression cylinder and engageable with one or other of a pair of driven gears for driving each type cylinder from said impression cylinder, a timing gear train including a driving gear on said hollow drive shaft and a pair of driven gears coaxial with the type cylinders, a dog on each of said driven timing gears engageable within a recess in the corresponding driven type cylinder gear when the surface speed of each type cylinder reaches that of the impression cylinder, electrical connections in each motor circuit actuable on engagement of the corresponding dog within the recess in the associated type cylinder driving gear to stop said motor, and a reversible electric motor for moving the impression cylinder laterally out of engagement with one of said type cylinders and into engagement with the other of said cylinders.

4. A late news or like printing mechanism comprising an impression cylinder, a type cylinder at one side of said impression cylinder, means for driving the type cylinder independently of the impression cylinder and for synchronizing the surface speeds of said impression and type cylinders, a frame, bearings in said frame supporting the impression cylinder, an eccentric connected to each of said bearings, and a reversible electric motor for actuating said eccentrics to move said bearings laterally of the frame thereby to place said impression cylinder in impression engagement with said type cylinder and means for energizing said motor when the surface speed of the

latter is synchronized with that of the impression cylinder.

5. A late news or like printing machine comprising an impression cylinder, a pair of type cylinders at opposite sides of said impression cylinder, means for driving each type cylinder independently of the impression cylinder and for synchronizing the surface speeds of said impression and type cylinders, a frame, eccentric bearings in said frame supporting the impression cylinder, a reversible electric motor for rotating said bearings thereby to move said impression cylinder laterally into impression engagement with one or other of said type cylinders when the surface speed of the latter is synchronized with that of the impression cylinder, a detent operating on said rotating motor to prevent rotation of said bearings and means actuated by rotation of said bearings for actuating said detent to prevent further rotation of said bearings.

6. A late news or like printing machine comprising an impression cylinder, a pair of laterally spaced type cylinders, means for driving the impression cylinder, means for rotating the type cylinders independently of the impression cylinder and for synchronizing the surface speeds of the impression and type cylinders, motor means for moving the impression cylinder laterally out of printing engagement with one and into printing engagement with the other of said type cylinders, control means for said motor actuated when the speed of said latter type cylinder is synchronized with that of said impression cylinder, and means for then driving said type cylinder from the impression cylinder.

7. A late news or like printing mechanism comprising an impression cylinder, a pair of laterally spaced type cylinders, means for rotating the impression cylinder, an electric motor for bringing each of said type cylinders to the surface speed of the impression cylinder, a reversible electric motor for moving the impression cylinder laterally out of engagement with one type cylinder and into engagement with the other, pawl and ratchet mechanism for locking said impression cylinder against such lateral movement until the surface speed of the inoperative type cylinder is synchronized with that of the impression cylinder, and a solenoid energizable upon synchronization of said speeds to release said locking mechanism.

8. A late news or like printing mechanism comprising an impression cylinder, a pair of laterally spaced type cylinders, means for rotating the impression cylinder, electric motors for rotating the type cylinders independently of the impression cylinder, means for synchronizing the surface speeds of the impression and type cylinders, a reversible electric motor operable upon synchronization of said surface speeds for moving the impression cylinder laterally out of engagement with one type cylinder and into engagement with the other, mechanical means driven by said reversible motor for automatically stopping said motor and the type cylinder driving motor upon completion of the lateral movement of the impression cylinder, and means operable in such position of the impression cylinder for driving the operative type cylinder from said impression cylinder.

9. A late news or like printing mechanism comprising an impression cylinder, a pair of type cylinders at opposite sides of the impression cylinder, means for rotating the impression cylinder, electric motors for rotating the type cylinders independently of the impression cylinder, means for synchronizing the surface speeds of the impres-

sion and type cylinders, a reversible electric motor for moving the impression cylinder laterally out of engagement with one type cylinder and into engagement with the other, locking means for the impression cylinder releasable to permit such lateral movement upon synchronization of the surface speeds of the type and impression cylinders, mechanical means driven by said reversible motor for automatically stopping said motor and the type cylinder driving motor upon completion of the lateral movement of the impression cylinder, means for actuating the locking means to hold the impression cylinder in laterally adjusted position, and means for driving the operative type cylinder from the impression cylinder.

10. A late news or like printing machine comprising an impression cylinder, a pair of laterally spaced type cylinders, a reversible electric motor, an axially movable shaft driven by said motor, gearing driven from said shaft for moving the impression cylinder laterally into impression engagement with one or other of said type cylinders, a pair of springs for loading said shaft in either axial position thereof, stop means for said gearing to limit lateral movement of the impression cylinder, and means for simultaneously de-energizing said motor, said stop means producing axial movement of the shaft to compress one or other of said springs due to the momentum of the motor.

11. A late news or like printing mechanism

comprising rotary impression means, a pair of laterally spaced type cylinders, means for driving the rotary impression means, means for rotating the type cylinders independently of the impression means and for synchronizing the surface speeds of the impression means and type cylinders, means for automatically moving said impression means laterally into impression engagement with one or other of said type cylinders and control means actuated when the surface speed of the latter is synchronized with that of the impression means for initiating movement of said automatically moving means.

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