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MAY 25, 1943

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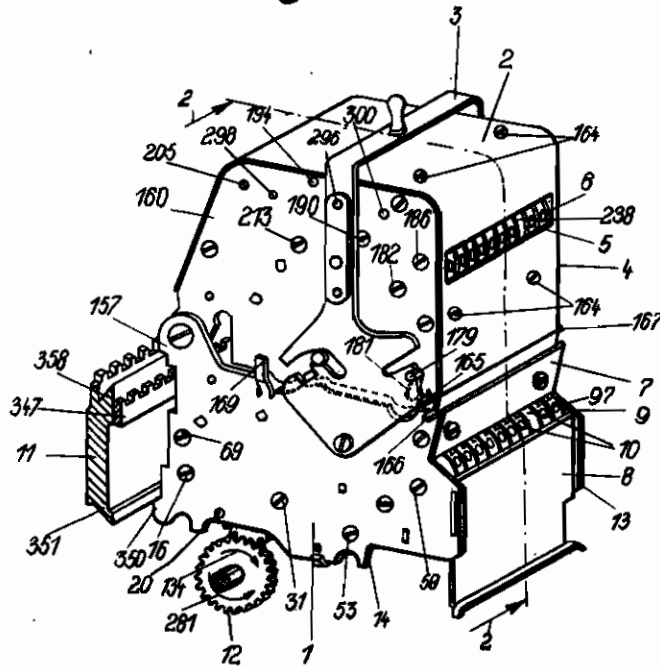
R. ANSCHÜTZ ET AL  
TYPEWRITING-CALCULATING MACHINES WITH TOTAL  
TAKING MECHANISM, AND TO SIMILAR MACHINES  
Filed Jan. 18, 1939

Serial No.

251,634

10 Sheets-Sheet 1

Fig. 1



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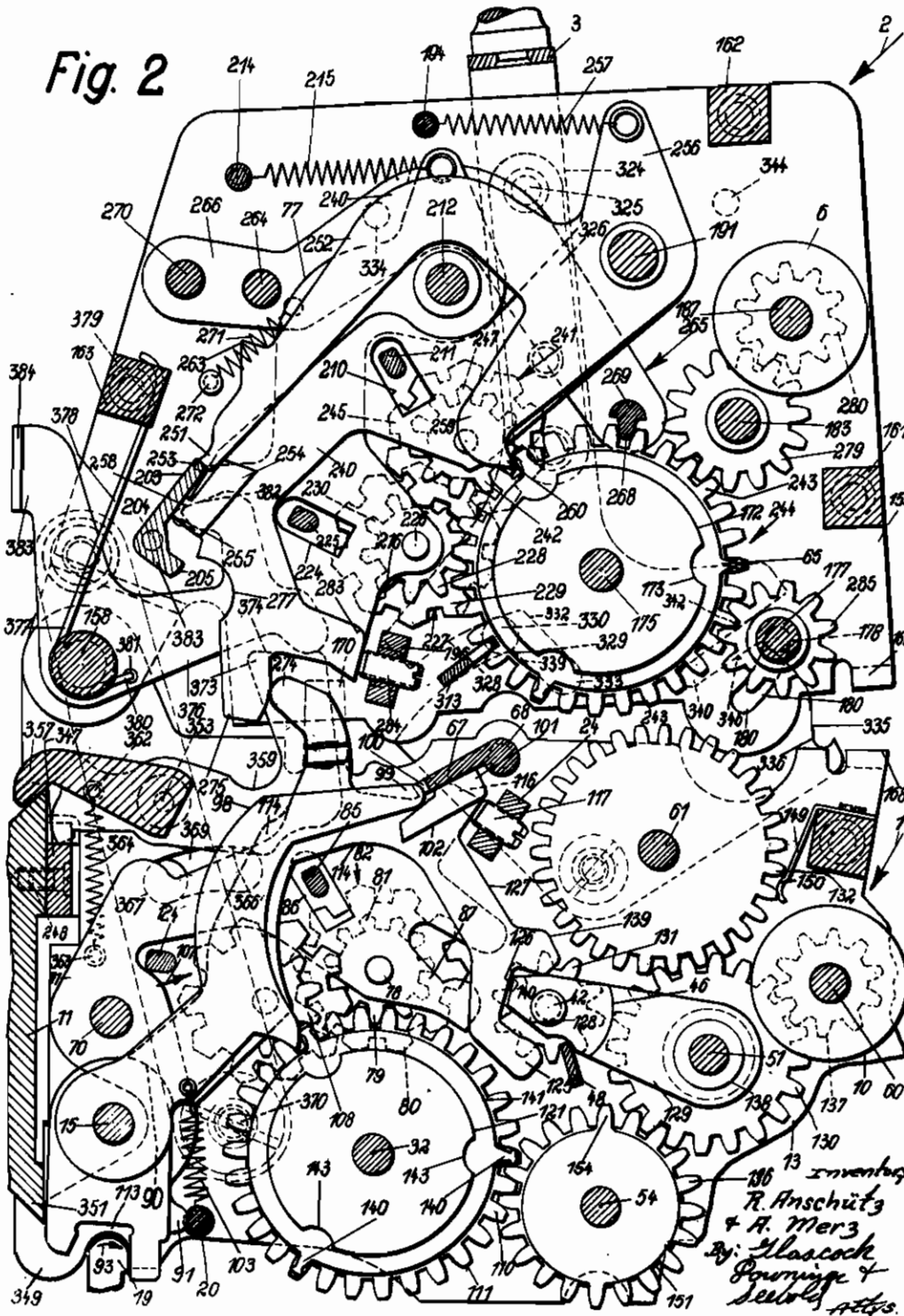
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Fig. 2



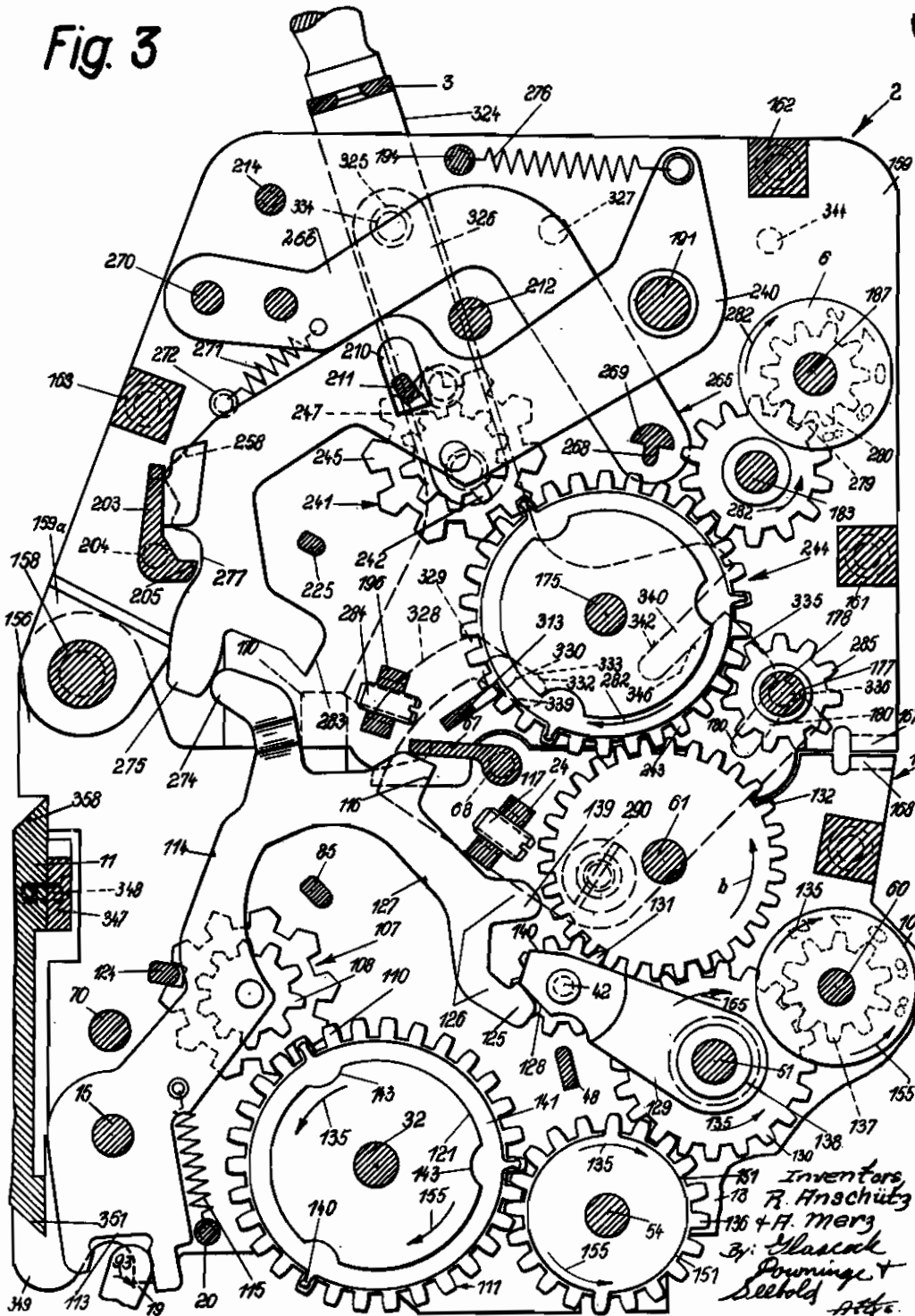
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Fig. 3



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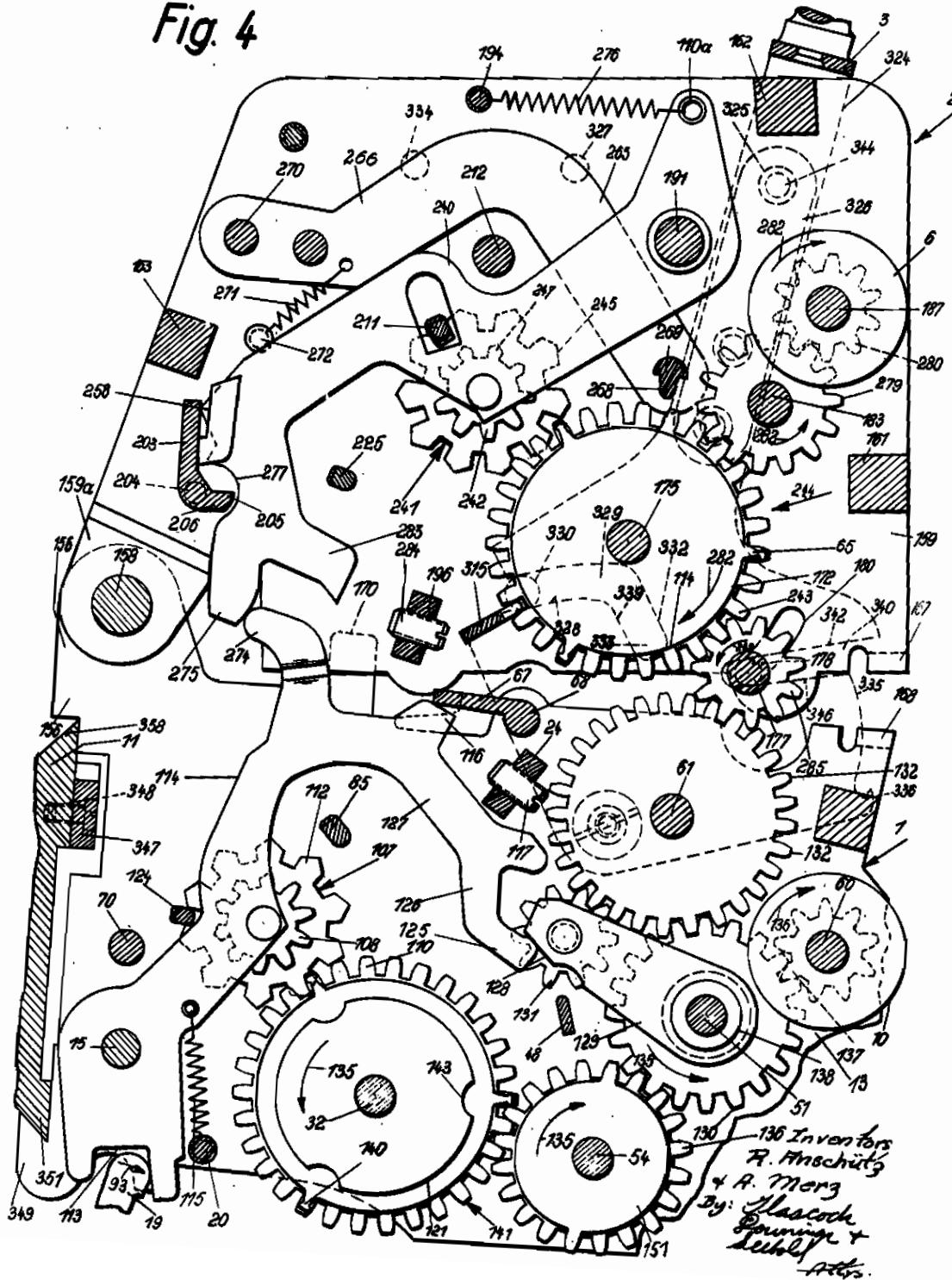
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Fig. 4



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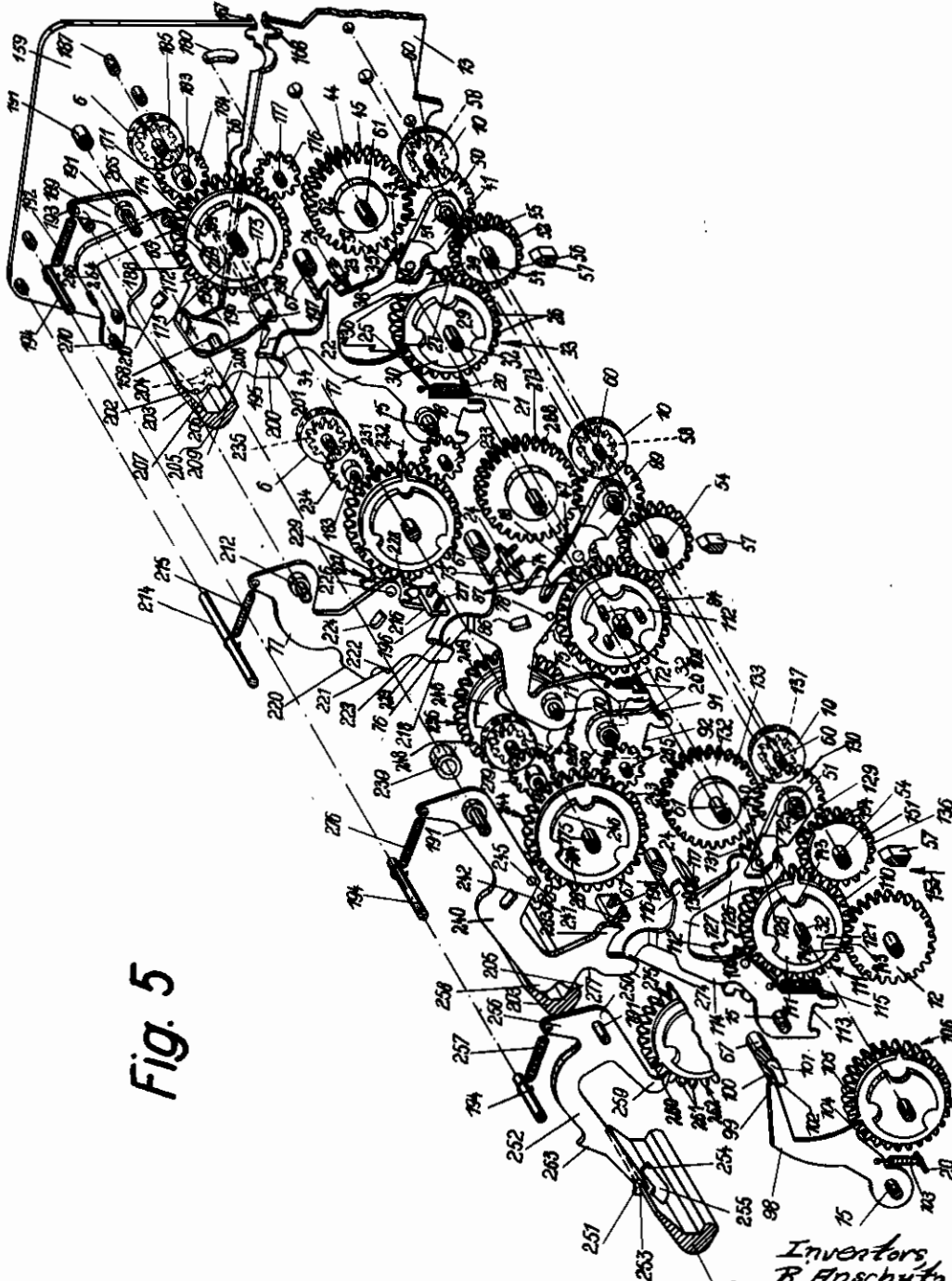


Fig. 5

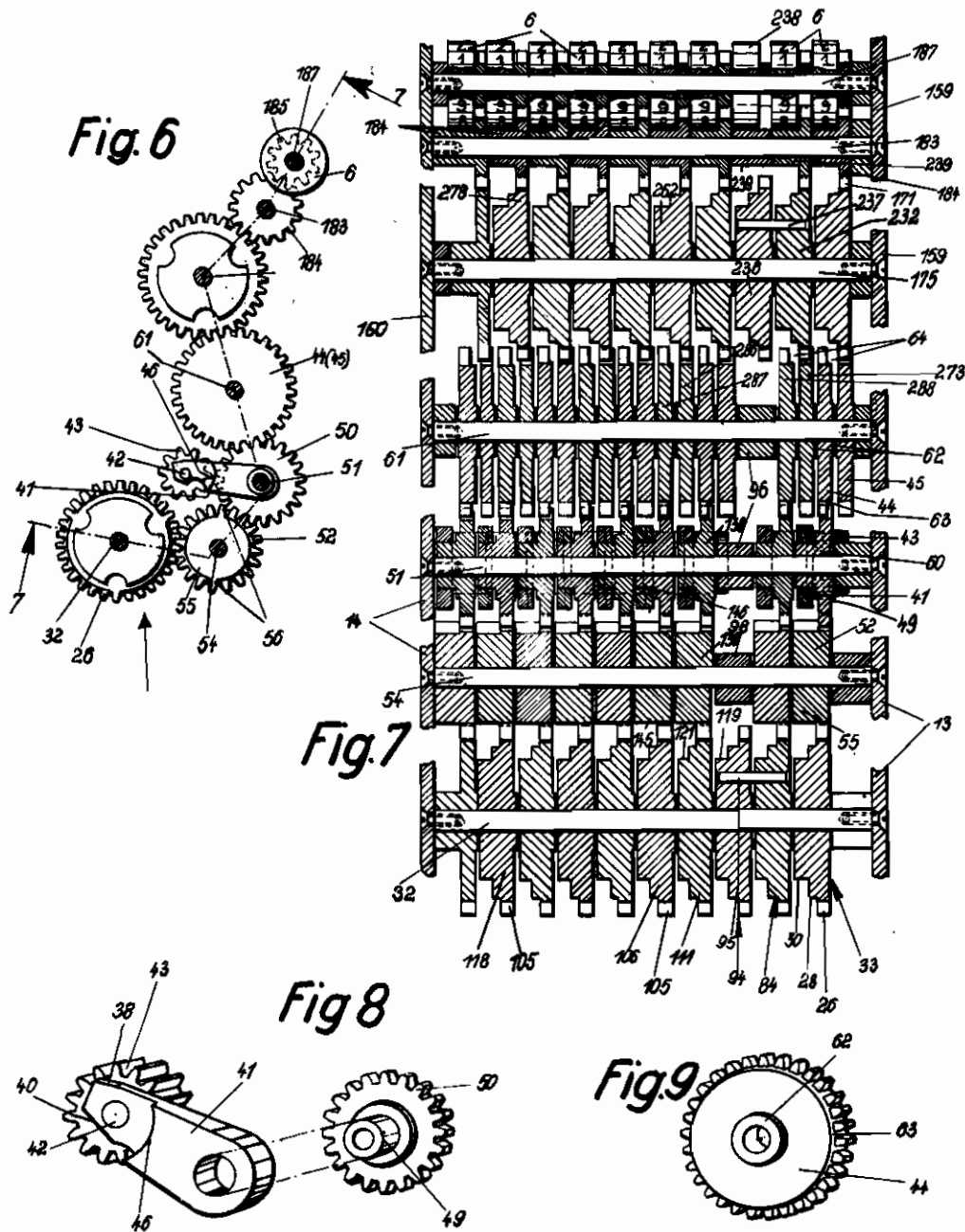
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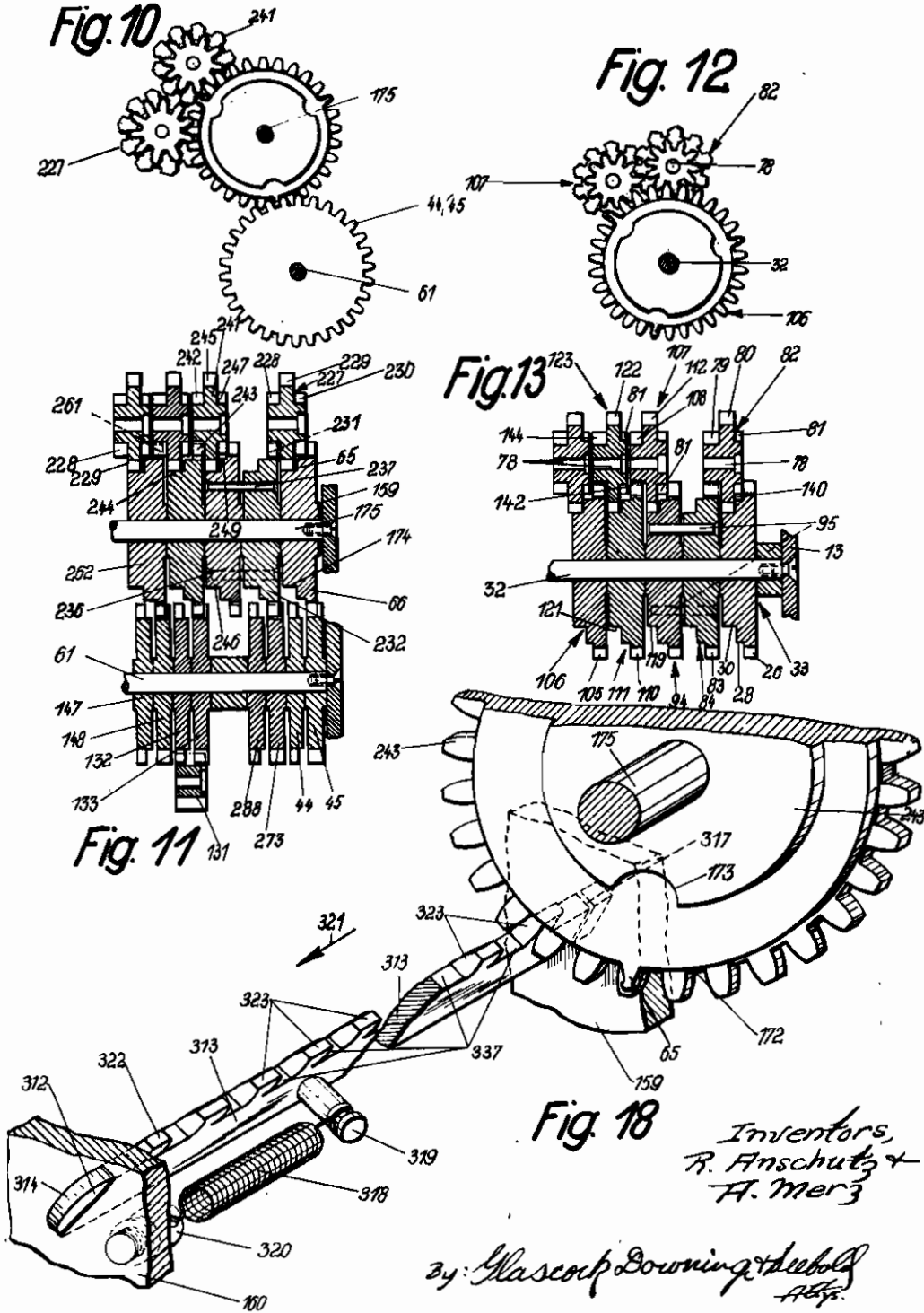
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Fig. 14

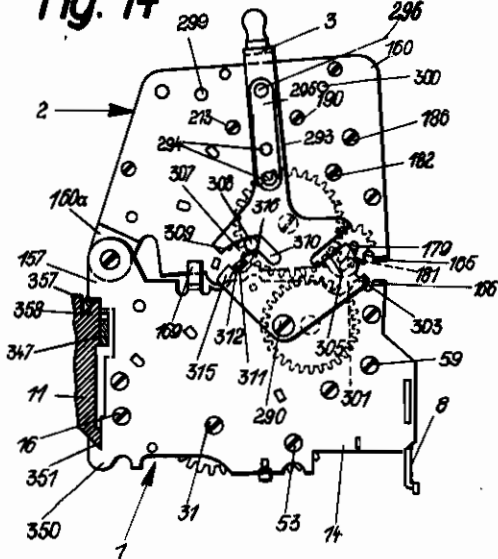


Fig. 15

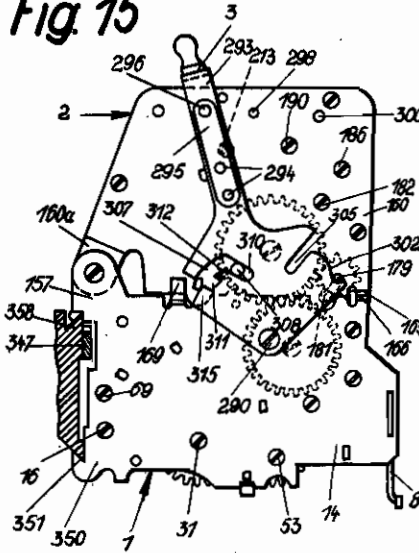


Fig. 16

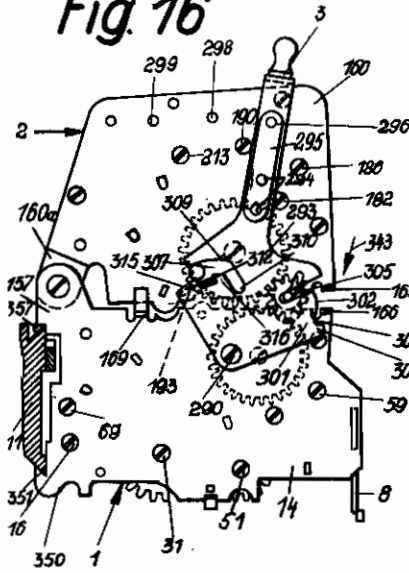
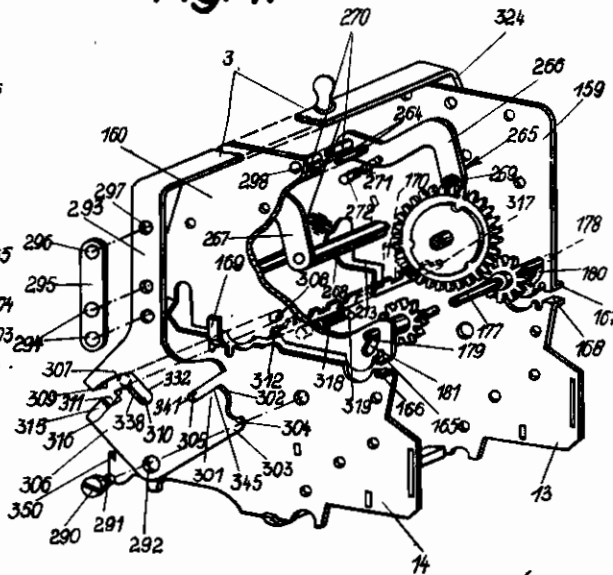


Fig. 17



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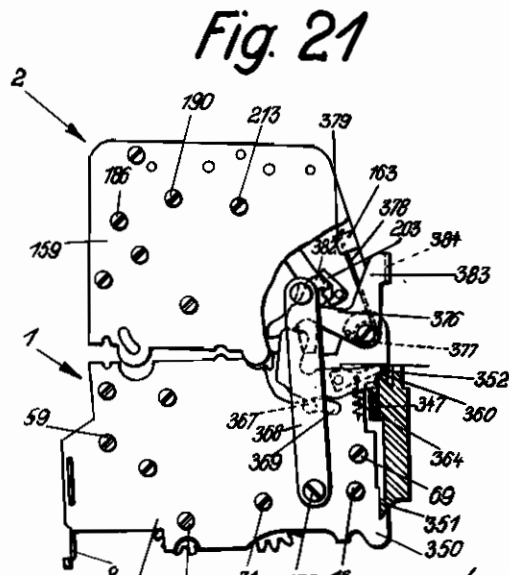
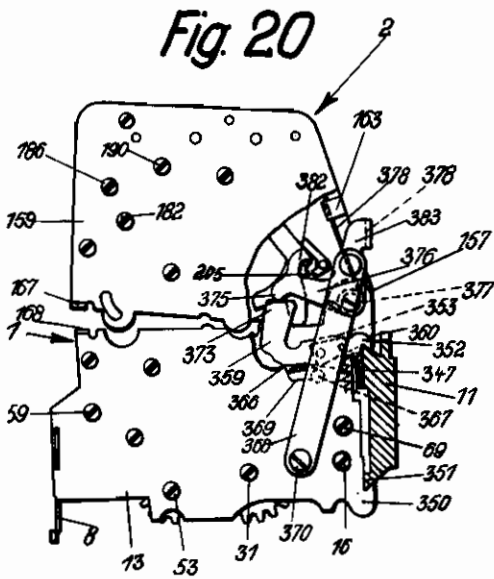
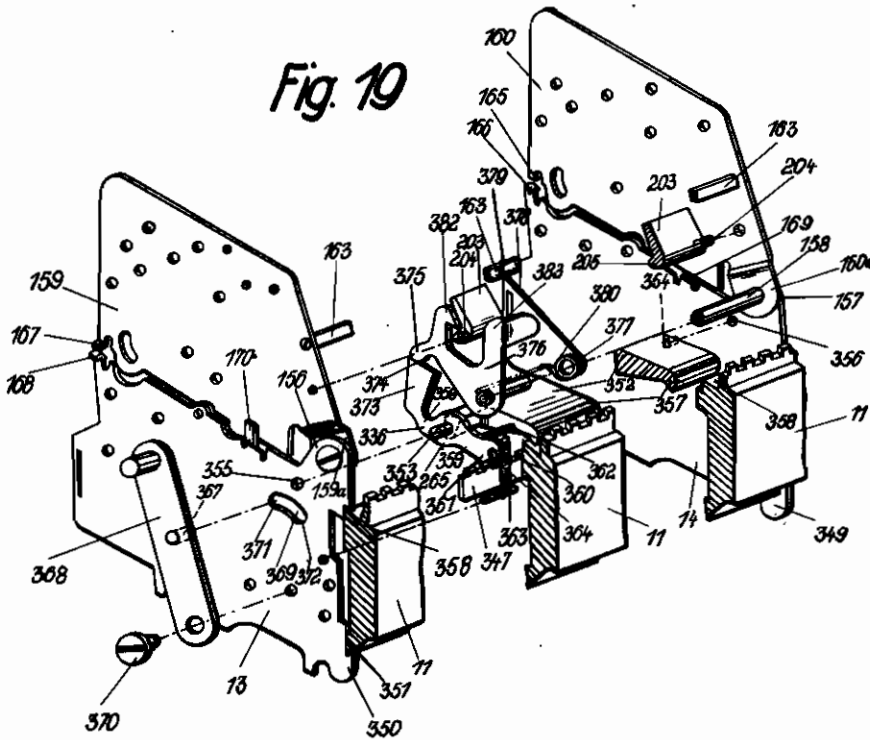


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10 Sheets-Sheet 9



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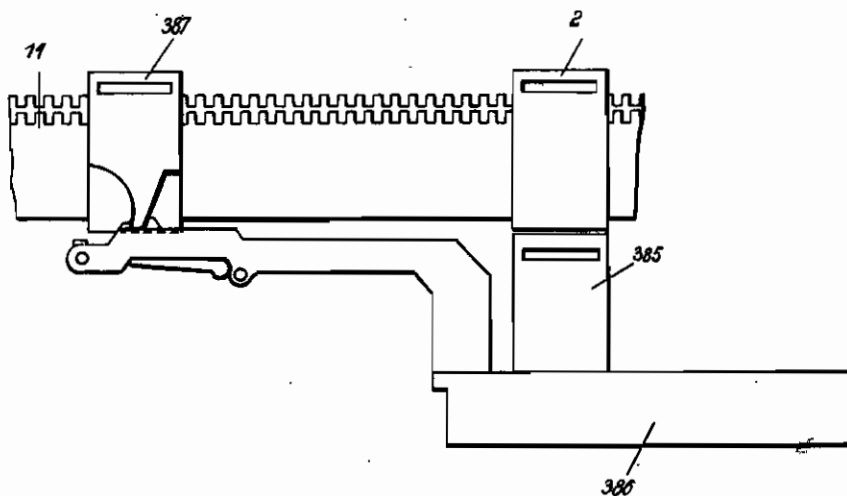
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Fig. 22



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# ALIEN PROPERTY CUSTODIAN

## TYPEWRITING-CALCULATING MACHINES WITH TOTAL TAKING MECHANISM, AND TO SIMILAR MACHINES

Robert Anschütz and August Merz, Zella-Mehlis,  
Germany; vested in the Alien Property Custodian

Application filed January 18, 1939

This invention relates to typewriting-calculating machines with total taking mechanism, and to similar machines.

According to the invention, any or all of the totalizers in a machine of the class specified are combined with accumulators or summing-up devices, and each accumulator is arranged to be selectively coupled with the corresponding totalizer. The units comprising a totalizer and its accumulator, will be referred to as "double totalizers."

By these means, values which have been introduced into the totalizers, are accumulated for later use, so that calculations involving accumulation of values, are easy and simple.

In the accompanying drawings, an accounting machine to which the invention has been adapted, is illustrated partly by way of example.

In the drawings

Fig. 1 is a perspective illustration, viewed from the front and the left, of a double totalizer comprising a column totalizer mounted on the totalizer suspension rail of the paper carriage, and the accumulator allotted to the column totalizer.

Figs. 2, 3 and 4 are sectional elevations taken on the line 2—2 in Fig. 1 and drawn to a larger scale.

Fig. 2 shows the accumulator uncoupled from the totalizer.

Fig. 3 shows the two parts coupled in such manner that the accumulator is operated subtractively upon additive operation of the totalizer.

Fig. 4 shows the parts coupled in such manner that the accumulator is operated additively upon additive operation of the totalizer.

Fig. 5 is a perspective illustration of the mechanisms at the three lowermost places, including the comma place, viewed from the front and the left, parts being shown at a distance from each other for the sake of clearness.

Fig. 6 shows part of a train of gears in the hundredths place connecting the totalizer and the accumulator.

Fig. 7 is a section through all calculating places of the double totalizer on the line 7—7 in Fig. 6, viewed in the direction of the arrows, the axes of all gears being shown in a vertical plane.

Figs. 8 and 9 are perspective details relating to Fig. 7.

Figs. 10 and 12 show details of the train of gears illustrated in Fig. 7.

Figs. 11 and 13 are, respectively, sections

through the axes to the gears in Figs. 10 and 12, the axes being again shown in a vertical plane.

Figs. 14, 15 and 16 are elevations of the double totalizer, viewed from the left in Fig. 1 and showing its manipulating handle in three distinct positions.

Fig. 17 is a perspective illustration of the accumulator, with its casing partly broken open.

Fig. 18 is a detail relating to Fig. 17, shown in perspective and drawn to a larger scale.

Fig. 19 is a perspective illustration showing the side walls of the double totalizer, and part of its mechanism viewed from the left and the rear.

Figs. 20 and 21 are elevations of the double totalizer, viewed from the right in Fig. 1 and showing two distinct positions of the means for securing the double totalizer to the totalizer suspension rail of the paper carriage.

Fig. 22 is a diagram of a modified arrangement.

### (1) General description

The column totalizer 1 and the accumulator 2 make up together a double totalizer.

In the example illustrated, the accumulator 2 is mounted to swing at the top of the column totalizer 1, and can be selectively coupled with the column totalizer 1. By a U-shaped manipulating lever 3 the accumulator 2 can be coupled with the column totalizer 1, and the species of the accumulator 2 can be set preliminarily.

The cover 4 of the accumulator 2 is slotted at 5 to display number rollers 6 forming part of the accumulator 2. The numbers "0" to "9" are placed on the rollers in anti-clockwise sequence. The cover 7 and a controlling plate 8 of the column totalizer 1 define a slot 9 displaying number rollers 10 forming part of the column totalizer 1 on which are also placed the numbers "0" to "9" in anti-clockwise sequence.

The means for securing the column totalizer 1 to the totalizer suspension rail 11 of the paper carriage, not shown, of the accounting machine on which it is suspended will be fully described in section 15 "The suspension and securing means for the column totalizer and the accumulator" with reference to Figs. 19, 20 and 21.

### (2) The arrangement of the mechanism in the column totalizer

Referring now to Figs. 1 and 2, a bar 15 extends through the frame of the column totalizer 1 and is held against its side plates 13 and 14 by screws 16. A locking lever 17 (Fig. 5) is mounted to

swing on the bar 15 for the hundredths place of the column totalizer 1.

At its rear end, this locking lever 17 has a fork 18 and when the locking lever of the hundredths place of the column totalizer 1 moves into active position, a releasing finger 19 whose upper end is shown in Fig. 2, engages in the fork for preparing the corresponding place for a calculating operation. A spring 21 whose upper end is attached to the locking lever 17 and whose lower end is anchored to a rod 20 secured in the side plates 13 and 14 of the column totalizer 1, tends to turn the locking lever 17 clockwise about the bar 15. The normal position of the locking lever 17 is defined by an abutment 22 on the locking lever 17 bearing against an adjustable screw 23 in a transverse bar 24 which is secured between the two side plates 13 and 14 of the vertical totalizer 1.

In this normal position, a tooth 25 on the locking lever 17 engages in a gap between the teeth of a spur gear 26. The spur gear 26 is mounted to rotate on a shaft 32 which is secured to the side plates 13 and 14 by screws 31. It is equipped with three tens-transfer teeth 27 and a flange 30 which has a semi-cylindrical recess 28 opposite each tens transfer tooth 27. The arrangement of the spur gear on the shaft 32 is best seen in Fig. 7. The spur gear will be referred to as the "main driving wheels 33."

The locking lever 17 is equipped with a tooth 34 positioned between the bar 15 and the abutment 22 for cooperation with a locking lever in the accumulator 2, as will be described in section 6, "The arrangement of the mechanism in the totalizer." In the present instance, this is the locking lever of the hundredths place in the accumulator 2.

An extension 35 of the locking lever 17 beyond the abutment 22 is forked at 36 and has prongs 37 and 39 cooperating, respectively, with inclines 38 and 40, Fig. 8.

Mounted to rotate on a rivet 42 in the free end of the coupling arm 41 is a coupling spur gear 43. A shaft 51 is secured in the end plates 13 and 14 of the column totalizer 1, and on it pairs of transmission spur gears 44, 45, (Fig. 7), are mounted for free rotation. The width of each coupling gear 43 is equal to the overall width of a pair of gears 44 and 45, so that the coupling gear engages at the same the two otherwise freely rotatable transmission gears 44, 45.

The left-hand side of the coupling arm 41 is recessed at 46 for the reception of another coupling gear which is similar to the gear 43, but is allotted to the next higher place of the column totalizer 1. In the normal position of the coupling arm 41, the coupling gear 43 rests on a locking bar 46, Fig. 2 which is secured in the side plates 13 and 14 of the column totalizer 1 and, by engaging in a gap of the gear 43, holds the coupling arm 41 against swinging anti-clockwise about the shaft 51, preventing unintentional rotation of the coupling gear 43 in its inactive position.

The coupling arm 41 is not mounted directly on the shaft 51 but is seated on the boss 49 of a spur gear 50, Fig. 8, which in turn is mounted to rotate on the shaft 51. The boss or distance sleeve 49 bridges the distance to the next higher place, as shown in Fig. 7. It will be understood that in this manner the coupling arm 41 and the sleeve 49 can turn independently of each other.

The spur gear 50 meshes with a spur gear 52 which is mounted for free rotation on a shaft 54, secured to the side plates 13 and 14 by screws 53.

The spur gear 52 is made integral with zero setting disc 55 which has two zero setting teeth 56, for cooperation with the usual zero stop 57 in Fig. 5. The spur gear 52 also meshes with the teeth 26 of the main driving wheel 33.

The number roller 10 of the hundredths place is provided with a spur gear 56, Fig. 5, meshing with the spur gear 52. The number roller 10, with its spur gear 56, is mounted to rotate freely on a shaft 60 which is secured in the side plates 13 and 14 of the column totalizer 1 by screws 59.

The spur gear 50, meshes with the transmission gear 44 on the shaft 61. The corresponding transmission gear 45 is mounted at the right of the gear 44. If the gears 44 and 45 are not in active position, the same are free to rotate quite independently of each other, so that any tens transfer in the column totalizer 1 is performed independently of the accumulator 2, and vice versa. Transfer of value is only possible from the column totalizer 1 to the accumulator 2 in active position, in which the transmission gears 44, 45 are connected by the wide coupling spur gear 43 on the arm 41 and now rotate as a unit.

The transmission gears 44 and 45 are spaced apart by their bosses 62 extending beyond the body of the gear, as shown for a gear 44 in Fig. 9, and their teeth are so short that a free space 63 is formed at one side. The clearance made up by the bosses 62 and the set-back of the teeth at 63 is indicated by 64 in Fig. 7 and can be entered by tens transfer cams 65, Fig. 5, on driving wheels 66 in the accumulator 2 on a shaft as will be fully described in section (6).

A flap 67 extends all over the ten calculating places in the column totalizers 1 and is mounted in the side plates 13 and 14 by trunnions 66 for cooperation with the back of the abutment 22.

A shaft 70 is secured in the side plates 13 and 14 of the column totalizer 1 by screws 69. On this shaft 70, a locking-wheel lever 71, Fig. 5, is arranged at that decimal place of the column totalizer 1 which is the next higher from the hundredths place, to swing about the shaft. A spring 72 which is attached to the locking-wheel lever 71 at one end, and anchored to the rod 20 at the other, tends to turn the lever 71 clockwise about the shaft 70, and its normal position is defined by an abutment 73 on the lever engaging an adjustable screw 74 in the transverse bar 24. The back of the abutment cooperates with the flap 67.

A fork 75 at the rear end of the locking-wheel lever 71 is arranged to cooperate with the releasing finger 19, Fig. 2, when the decimal place of the column totalizer 1 moves into active position. The finger 19 prepares the corresponding calculating place for a calculating operation.

A tooth 76 on the locking-wheel lever 71 which corresponds to the tooth 34 of the locking lever 17 at the hundredths place, is bent to the right for one calculating place for cooperation with a locking lever 77 in the accumulator 2, as will be described in section (6).

Arranged on the locking-wheel lever 71 are mounted to turn about a rivet 79, a spur gear 79, Figs. 2 and 13, a Maltese gear 80 and a spur gear 81. The parts 79, 80 and 81 make up together the usual locking and tens transfer wheel and the individual wheels will be referred to as the locking wheel 82. The spur gear portion 79 of the locking wheel 82 of the tenths decimal calculating place meshes with the teeth 83 of the driving wheel 84 which is allotted to the tenths decimal place of the column totalizer 1 and cor-

responds to the main driving wheel 33 of the hundredths calculating place.

The Maltese wheel portion 80 of this locking wheel 82 bears on the flange 30 of the main driving wheel 33 of the hundredths calculating place, and the spur gear portion 81 of the locking wheel 82 can cooperate with the tens-transfer teeth 27 of the main driving wheel 33.

A locking bar 85 extends through a slot 86 in the locking-wheel lever 71 and is secured in the side walls 13 and 14. In the inactive position, a gap between the teeth of the Maltese portion 85 of the locking wheel 82 of the tenths decimal places engages over the locking bar 85, as shown in Fig. 2.

A forked member 87 of the locking-wheel lever 71 engages the free end 88 of a coupling lever 89, as best seen in Fig. 5. The coupling lever 89 and the coupling wheel 47 which is mounted to turn on it, correspond as to their arrangement to the coupling arm 41 and its coupling gear 43 for the hundredths calculating place. As plainly shown in Fig. 5, the train of gear allotted to the hundredths place and comprising the gear wheels 33, 53, 55, 50, 58, 10, 44 and 45 is also allotted to the tenths decimal calculating place and these parts of the tenths decimal place will not be detailed.

In the next higher, or comma, place of the column totalizer 1, a calculating operation must not occur. To prevent a calculating operation, a comma locking member 90, Figs. 2, and 5, is provided on the shaft 15 of the column totalizer 1 which abuts against the rod 20 with a tooth 91. The member 90 is forked at its lower end 92, Fig. 5, and when the parts move into active position, the finger 19 engages in this fork 92 and cannot perform its movement in the direction of the arrow 93 in Fig. 2, since the tooth 91 bears against the rod 20 and arrests the comma locking member, so that no calculating operation can be started in the column totalizer.

It may be necessary to effect a tens transfer from the tenths decimal place of the column totalizer 1 to the units calculating place in the same column totalizer. For this purpose, the main driving wheel 94, as shown in Fig. 7, which is allotted to the comma place, is connected to the main driving wheel 84 of the tenths decimal calculating place by rivets 95 so that the main driving wheels 94 and 84 act as a unit.

In the comma place, instead of the trains of gears allotted to all other calculating places of the column totalizer 1, a spacer 96, Fig. 7, is inserted on the corresponding shafts 54 of the totalizer, and a blank roller 97 is arranged on the shaft 60, Fig. 1, instead of a number roller 10.

The mechanisms described for the hundredths and tenths decimal places of the column totalizer 1, as shown in Fig. 5, are also allotted alternately to the next higher calculating places that is, the units, tens, hundreds, etc., places. The arrangement of these parts will therefore not be detailed. It should be noted, however, that the locking levers of the units calculating places etc., are equipped with a unit locking wheel as wheel "82" in the tenths decimal place (Fig. 5).

At the left of the units calculating place, a lever 98, as best seen in Fig. 5, is mounted to swing on the shaft 15. Its upper end 99 extends forwardly and into a notch in the flap 67 at 100. A holding member 101 is attached to the flap 67, and its rear arm 102 is positioned below the end 99 of the lever 98. A spring 103 which is attached to the lever 98 at one end, and anchored on the rod 20

at the other, tends to turn the lever 98 clockwise about the shaft 15 and the end 99 of the lever 98 exerts pressure on the arm 102 at the rear end of the holding member 101 of the flap 67, the holding member 101 turning the flap 67 anticlockwise about its trunnions 68. In consequence, the flap 67 bears on the backs of the abutments 22 and 73 of the respective locking and locking-wheel levers 17 and 71 allotted to the calculating places of the column totalizer. This is the normal position of the flap 67 and to it corresponds the normal position of the lever 98 in which a locking tooth 104 on the lever 98 engages in that gap between the teeth 105 of the main driving wheel 106 of the tens place which is presented to the tooth at the time. By these means, the slack of the main driving wheels 33, 84 etc. produced by their cooperation with the locking wheels 82, 107 and so on, and in the connected trains of gears at the individual places of the column totalizer 1, is made up for.

The arrangement of such a lever 98 and the parts cooperating therewith has also been selected at the left of the eighth calculating place or ten thousandths place.

(3) *The operation of the column totalizer when a value is introduced*

The operations which are performed when a value is introduced into the column totalizer 1, are substantially similar in the individual calculating places, and therefore only the introduction of a value into the units calculating place of the column totalizer 1 will be described by way of example.

When the locking wheels 82, 107 etc., of the individual calculating places engage in the teeth of the main calculating wheels 84, 111 etc., with their spur gears 79, 108 (Fig. 2), the main driving wheels 84, 111 cannot be rotated. Unintentional rotation of each individual main driving wheel 33, 94, 111 etc., is prevented by the teeth of the Maltese wheel 80, 112 of the locking wheels 82, 107 etc., which bear on the flange 30, 119 of the main driving wheel 33, 84, 111 etc. allotted to the next lower calculating place.

After the units place of the column totalizer 1 has moved into active position, and the well known calculating key—not shown—for the value to be introduced has been depressed the releasing finger 19 is turned in the direction of the arrow 93, and, since it projects into the fork 113 of the locking lever 114 allotted to the units place, it swings the locking lever anticlockwise about the bar 15, Fig. 3, against its spring 115. At the same time, the abutment 116 of the locking lever 114 is lifted clear of the screw 117 in the bar 24 and the flap 67 is swung clockwise about its trunnions 68. The arms 102 of the holding members 101 secured in the flap 67 act on the arms 99 of the two levers 98 in Fig. 3, only one lever 98 is illustrated and swing the levers 98 anticlockwise about the bar 15 against their springs 103. The locking teeth 104 of the levers 98 clear the teeth 105 of the main driving wheels 106 and 118 so that these are free to turn. The locking wheel 107, Fig. 13, of the locking lever 114 at the units place partakes in its anticlockwise movement, and the spur gear 108 of this locking wheel 107 clears the teeth 110 of the units main driving wheel 111. At the same time, the Maltese wheel 112 is moved off the flange 119 of the main driving wheel 94 of the comma place, and since the flange 121 (Fig. 7) of the main driving wheel 111 of the units place can

rotate freely past the teeth of the Maltese wheel 122 of the locking wheel 123 at the next higher place, that is, the tens place, the main driving wheel 111 of the units place can be turned by driving wheel 12.

When the locking lever 114 of the units place has been swung anti-clockwise by the finger 19, one of the gaps of the Maltese wheel 112 at the locking wheel 107 engages about the bar 124 and thus prevents rotation of the locking wheel 107 on the said locking lever 114.

When the locking lever 114 of the units place is swung anti-clockwise, the prong 125 of the fork 126 at the end of the arm 127 of the locking lever 114 engages the edge 120 of the coupling arm 129 at the units place a short time after the locking lever has started and swings the coupling arm 129 clockwise about the boss 130 of the corresponding spur gear 130 and the coupling gear 131 on the arm 129 partakes in this movement and clears the locking bar 40. When the coupling arm 129 has completed its movement the coupling gear 137, as shown in Fig. 11 meshes with the pair of transmission wheels 132, 133 at the units place.

The value is now introduced into the column totalizer 1, and the driving wheel 12 is rotated in the direction of the arrow 134 through an angle corresponding to the value introduced. Since the wheel 12 meshes with the teeth 110 of the main driving wheel 111 of the units place, this wheel is rotated in the direction of the arrow 136 in Fig. 3, and transfers the value to the wheels 136, 130 and 137 which rotate in the directions of the arrows 135 in Fig. 3. The number roller 10 of the units place partakes in the rotation of its spur gear 137 in the direction of the arrow 135 and displays the value in the inspection opening 6 in the cover plate 4 of the column totalizer 1. The transmission of the rotation of the spur gear 130 to the corresponding transmission gear 132 and to the accumulator 2 through gears 131 and 133 will be described in section (6).

When the value has been introduced, the releasing finger 19, returns into its initial position, as shown in Fig. 2, and releases the locking lever 114 whose abutment 116 now is returned against the screw 117 in the bar 24 by its spring 115. At the same time, the back of the abutment 116 releases the flap 87 and, through parts 99, 101 and 102, the levers 96 return into their initial positions, Fig. 2, under the pull of their springs 103. Their teeth 104 now re-engage the gaps between the teeth 105 of the allotted main driving wheels 106 and 116.

The locking wheel 107 of the locking lever 114 at the units place partakes in the return of this lever into its normal position and the spur gear portion 100 engages in the teeth 110 of the main driving wheel 111 of the units place. The Maltese portion 112 of this locking wheel 107 re-engages the flange 119 of the main driving wheel 94 at the comma place, and locks the main driving wheel 111 against rotation.

When the locking lever 114 returns, the prong 125 of its fork 126 release the edge 120 of the coupling arm 129 at the units place which now swings about the boss 136 of the spur gear 130 by gravity. When the locking lever 114 has about completed its return, the prong 130 of the fork 126 re-engages the edge 140 of the coupling arm 129, causing a gap in the coupling gear 131 to engage about the locking bar 46.

The operations performed in the units place

are now completed, the value is typed on the paper supported by the paper carriage, and the carriage is fed for the next step.

#### (4). *The tens transfer in the column totalizer*

If, owing to the preceding introduction of a value, such value is already present in the units place of the column totalizer 1, and a tens transfer to the tens place becomes necessary by the introduction of the subsequent value, this is performed as follows while the value is being introduced:

It is known that the number rollers 10 rotate clockwise. When the number roller 10 of the units place turns from "9" to "10", one of the tens transfer cams 140 of the main driving wheel 111 of the units place, which rotates anti-clockwise strikes a tooth 142 of the locking wheel 123, Fig. 13, on the locking wheel lever of the tens place, and the locking wheel 123 is turned clockwise through one pitch. This turning is not interfered with by the Maltese wheel 122 since when the locking wheel 123 is turned, one of the recesses 143 in the flange 121 of the main driving wheel 111 of the units place is presented to the corresponding tooth of the Maltese wheel.

When the locking wheel 123 at the tens place is turned through one pitch, the main driving wheel 106 of the tens place is rotated anti-clockwise about the bar 32 since the spur gear portion of the locking wheel 123 meshes with the teeth 105 of the main driving wheel. Through the train of gears 145, 146 Fig. 7 which corresponds the gears 136, 130 a unit is transferred to the number roller 10 of the tens place in additive direction. The transmission gear 147 Fig. 11 of the tens place is also turned for one unit but does not exert any action. To prevent rotation of the gear 140 during this idle movement of 147, means such as a blade spring 149 Fig. 2 in the shape of a comb may be provided, with tongues 150 projecting into a gap in each of the gears 140, 133 etc. at the individual places. After the locking wheel 123 of the tens place has been moved through one unit, the main driving wheel 111 of the units place has turned so far that the solid portion of the flange 121 on the main driving wheel 111 is again presented to the Maltese wheel 122 of the locking wheel 123 and this is locked.

#### (5) *The operation of the column totalizer when total taking*

When it is desired to eliminate the value which has been introduced, by total taking, the following operations occur in the individual places of the column totalizer, as will now be described for the units place.

When the units place of the column totalizer has moved into calculating position, the well known total taking key, not shown, is depressed and the releasing finger 10 is turned in the direction of the arrow 93, turning the locking lever 114 anti-clockwise about the bar 15. This swinging movement of the lever 114 causes the unlocking of the train of gears 111, 136, 151, 130, 137 as described in section (3).

Furthermore the zero stop 57 is shifted in the direction of the arrow 153 in Fig. 5, and moved into the path of the two zero setting teeth 154 on the disk 151 of the spur gear 136, Fig. 5.

Now, the main driving wheel 12 is rotated against the arrow 134 in Fig. 5, and the main driving wheel 111 of the units place and the train of gears 136, 151, 130 and 137 allotted to the



units place are driven in the direction of the arrows 155 in Fig. 3. At the movement the number roller 10 of the units place is turned from "1" to "0", one of the zero setting teeth 154 on the disk 151 of spur gear 136 engages the zero setting stop 57, Fig. 5, and limits the rotation of the said train which occupies its zero position, as shown in Fig. 2. At this moment, the releasing finger 19 releases the locking lever 114 of the units place whereupon this, and the parts connected to it, return into their initial positions, as also described in section (3), and shown in Fig. 2. The zero setting stop 57 is returned into its normal position against the arrow 153 in Fig. 5.

#### THE ACCUMULATOR

##### (6) *The arrangement of the mechanism in the accumulator*

The accumulator 2 is pivoted on the shaft 158 which is secured in an eye 156 of the right-hand side plate 13 and in an eye 157 of the left hand side plate 14, of the column totalizer 1, as best seen in Fig. 19. Inwardly crooked bearings 159a and 160a respectively, on the right- and left-hand side plates 159 and 160 of the accumulator 2 are placed on the shaft 79 between the eyes 156 and 157.

The side walls 159 and 160 of the accumulator 2 are connected by transverse bracing members 161, 162 and 163, Figs. 2, 3 and 4, to which the cover plate 4 is secured by screws 164 Fig. 1.

At the front side of the double totalizer, lugs 167 and 165 on the side plates 159 and 160, respectively, of the accumulator, are arranged for cooperation with abutments 168 and 166 on the respective side plates 13 and 14 of the column totalizer 1, as best seen in Fig. 19. A crooked guiding strip 170 projects upwardly from the side plate 13 of the column totalizer 1, and a similar strip 169 is provided on the other side plate 14 as best shown in Figs. 14 to 17.

In the lowest calculating place, that is, in the hundredths place of the accumulator 2, the following parts are arranged.

The transmission spur gear 45 of the said place is arranged for cooperation with the teeth 141 of a driving wheel 66 on the shaft 175. The driving wheel 66 as shown in Figs. 5, is similar to the driving wheels 33 in the column totalizer 1, having three tens transfer teeth 65 and a flange 174 with depressions 173. A pinion 176 on a shaft 177 meshes with the teeth 171 of the driving wheel 66. The ends 178 and 179 of the shaft 177 are guided in slots 180 and 181 in the side plates 159 and 160, respectively.

Arranged above the shaft 177 is another shaft 183 which is secured in the side plates 158, 160 of the accumulator 2 by screws 162, Fig. 1, and support a wheel 164 meshing with the teeth 171 of the driving wheel 66. This pinion, through a spur gear 185, operates the number roller 6 of the hundredths place of the accumulator 2 shown in Fig. 1. All the number rollers 6 of the accumulator are mounted to rotate about a shaft 187 which is held by screws 186. The arrangement of the numbers on the roller 6 is shown in Fig. 3, and is similar to that of the numbers on the rollers 10.

In the initial position of the hundredths place of the accumulator 2, a locking tooth 188, Fig. 5, on a locking lever 189 engages in one of the gaps between the teeth 171 of the driving wheel 66, holding the wheel 66 against rotation. The locking lever 189 is mounted to swing about a shaft

181 which is secured by screws 180, Fig. 1. A spring 192 which is attached to the upper end of the lever 189 and anchored on a rod 194, pulls the lever against a screw 197 which is adjustable in a bar 196, this being the normal position of the lever 189. The ends 198 of the bar 196 are inserted in holes 199 of the side plates 159 and 160, and held against turning. Only the hole 199 in the side plate 159 is shown in Fig. 5.

The tooth 200, with its curved front edge 201 at the lower end of the locking lever 189 which is engaged by the tooth 34 of the locking lever 17 is already described in Section 2.

An incline 202 is provided on the back of the locking lever 189 for cooperation with a locking flap 203. The flap 203 has a pair of headed trunnions 204, one of which is shown at the right in Fig. 19, mounted to rotate in the side plates 159 and 160, and extends over all the ten calculating places of the accumulator 2. A curved face 205 at the front side of a hook 206 on the flap 203 can cooperate with the rear edge 207 of a lug 208 on the locking lever 169, and can also project into a recess 208, in the rear edge of the locking lever 188.

A locking bar 211 secured in the side plates 159 and 160 extends, with a clearance, through a slot 210 in the locking lever 169.

A shaft 212 is secured at the rear of the shaft 191 in the side walls 159, 160 by screws 213, Fig. 1. A locking wheel lever 77, Fig. 5, is mounted to swing about this shaft in the tenths place of the accumulator. A spring 215 anchored on a rod 214 holds an abutment 216 of the lever 77 against a screw 217 in the bar 196. A tooth 216 at the lower end of the locking wheel lever 77 has a curved front edge 219 for cooperation with a crooked lug 76 on the locking wheel lever 71 at the tenths calculating place of the column totalizer, as shown in Fig. 5.

An incline 220 on the back of the locking wheel lever is arranged for cooperation with the locking flap 203, whose curved front edge 205 can cooperate with the edge 221 of a lug 222 on the locking wheel lever 77, or project into a recess 223 in the lever 77.

A locking bar 225, Fig. 2, secured in the side plates 159 and 160 extends, with a clearance, through a slot 224 in the lever 77.

A headed rivet 226 is inserted in the lever 77 and supports a tens transfer and locking wheel 227 which will be briefly referred to as the locking wheel and is similar to the locking wheel 82 at the tenths place in the column totalizer 1. The locking wheel 227 comprising a spur gear 228, a Maltese wheel 229, and a spur gear 230, Fig. 11. The teeth 226 of the locking wheel 227 mesh, in the initial position of the lever 77, as shown in Fig. 2, with the teeth 231 of the driving wheel 232 which is allotted to the tenths place and corresponds to the driving wheel 66 of the hundredths place. The Maltese teeth 229 of the wheel 227 rest on the flange 174, Fig. 11, of the driving wheel 66 in the hundredths place, and the other set of teeth 230 can cooperate with the tens transfer teeth 65 of the flange 172 of the wheel 66.

As appears from Fig. 5, a train of gears 233, 234, 235 and 6 is allotted to the tenths calculating place which corresponds to the train of gears of the hundredths calculating place, and so these parts of the tenths calculating place will not be described.

The next higher place is the comma place where no values must be transferred to or from the column totalizer 1. This place is consequently

without the train of gears and locking levers of the other places. The driving wheel 232 of the tenths calculating place, Fig. 11, is connected to the driving wheel 238 at the comma place by rivets 237 for the purpose of any tens transfer which may be required from the tenths place to the units place. Instead of a number rollers 8, a blank roller 238, Fig. 7, is allotted to the comma place, while a spacer 236, Fig. 5, is arranged on the shafts 183 and 191.

The parts allotted to the next higher, that is, the units place, in the accumulator, correspond substantially to those of the hundredths place, but the locking lever 240 of the units place is equipped with a locking wheel 241, as allotted to the tenths place. The teeth 242 (Fig. 2) of this locking wheel 241 mesh with the teeth 243 of the driving wheel 244 of the same place, its Maltese wheel 245 is arranged to cooperate with the flange 246 of the driving wheel 238 of the comma place, and its teeth 247 to cooperate with the tens-transfer teeth 248 of the flange 249 on the wheel 238.

The parts which have been described with reference to the hundredths and tenths calculating places of the accumulator 2, are also allotted, alternately units to the tens, hundreds, etc. calculating places in the accumulator, and will not be detailed.

Mounted to swing on the shaft 191 at the left-hand side of the locking wheel lever 240 at the units place of the accumulator 2 is a three-armed lever 250. A tooth 251 at the end of the arm 252 of this lever engages in a notch 253 in the flap 283 and is arranged to cooperate with an arm 254 of a member 255 which is fixed in the flap 203 behind the notch 253. A spring 257 connected to another arm 256 of the lever 250 and anchored on the rod 194 turns the lever anti-clockwise and causes its tooth 251 to swing the flap 203 clockwise through the arm 254 of the member 255 until the flap bears on the inclines 258 or 220 of the respective locking and locking wheel levers 189 and 77, and this defines the normal positions of the flap 203 and of the three-armed lever 250. In this normal position, a tooth 260 at the free end of the third arm 256 of the lever engages between the teeth 261 of the driving wheel 262 at the tens place, and this makes up for the slack resulting from the cooperation of the driving wheels 66, 232 etc., and the locking and tens transfer wheels 227, 241 etc. which increases from place to place.

A tooth 263 projects from the rear edge of the three-armed lever 250 for cooperation with a stay 264 in a locking frame 265. This frame, as best seen in Fig. 17, comprises a pair of arms 266 and 267 which are mounted to swing about a shaft 270 secured to the side plates 159 and 160 of the accumulator 2 with their rear ends, and with their front ends support a rod 269 which has the profile of a tooth and extends over all the driving wheels 66, 232 etc., of all places in the accumulator, for preventing unintentional rotation of the driving wheels. Each arm of the frame 265 is equipped with a spring 271, as shown for the arm 266 in Figs. 3, 4 and 17 which is secured to the adjacent side plate 159 or 160 by a pin 272. The springs turn the frame 265 clockwise and hold the profiled rod 269 between the teeth 171.

The three-armed lever 250 and the parts 253 and 255 which are cooperating with it, are also arranged at the left-hand side of the thousandths place in the accumulator 2.

(7) *The operation of the mechanisms when total taking in the column totalizer and transferring the value to the accumulator additively*

The operation of the parts allotted to the individual calculating places of the accumulator 2 is the same in each place, and so only the operation at the units place of the accumulator 2 will be described in detail.

In their initial positions, the locking levers 240 and the locking wheel levers 77, through their locking wheels 227, 241, etc., prevent rotation of the allotted driving wheels 232, 244 etc., in the same manner as described for the locking of the wheels 62, 107 etc. of the column totalizer 1 in section (3).

When it is desired to withdraw a value which has been introduced into the units place of the column totalizer 1, from the totalizer by total taking, and, at the same time, to transfer this value additively into the accumulator 2, the manipulating handle 3—whose arrangement and operation will be described in section (14)—is thrown over from the uncoupling position in Figs. 2 and 14 into the coupling position in Figs. 3 and 15. The accumulator 2 is swung clockwise about the shaft 158 until the lugs 187 and 165 on the side plates 159 and 160 of the accumulator 2 bear on the abutments 168 and 166 on the side plates 13 and 14 of the column totalizer 1. The driving wheels 66, 232 etc. of the calculating places in the accumulator 2 now mesh with the corresponding transmission wheels 45, 273 at the corresponding calculating places in the column totalizer 1.

When the column totalizer 1 moves into active position with its units place, the locking lever 114, as described in section (3), is turned anti-clockwise by the releasing finger 19 about the bar 15, as shown in Fig. 3, and its tooth 274 acts on the tooth 275 at the lower end of the locking wheel lever 240 at the units place of the accumulator 2, swinging the lever 240 clockwise about the shaft 191 against its spring 276. The incline 258 at the back of the lever turns the flap 203 anti-clockwise and the front edge 205 of the flap 203 engages in the recess 277 in the lever 248 while at the same time it engages the lugs 207 or 221 of the other locking levers 189 and locking wheel levers 77 which are in their normal positions, and are prevented against unintentional turning. At the same time, through the noses 200 and 34 and 216 and 76, the locking and locking wheel levers 17, 71 in the column totalizer 1 are held against unintentional movement, that is, while an operation is performed in the units places of the column totalizer and the accumulator, all other places are locked against operation.

When the flap 203 is turned, the arms 254 of its members 255 act on the ends 251 of the three-armed levers 250 which, as viewed from the right and the front of the column totalizer 1 are arranged at the left of the fourth and eighth places of the accumulator 2, and turn such levers clockwise about the shaft 101 against their springs 257. In Fig. 5 only one of said levers 250 is illustrated. The teeth 260 of the levers 250 clear the teeth of the driving wheels 262 and 278 at the fifth and ninth places.

A short time before the three-armed levers 250 have completed their swinging movement, their teeth 263, through the stay 264, turn the locking frame 265 anti-clockwise about the shaft 270 against its springs 271. The profiled rod 269 is now retracted from the teeth 171, 231 etc. of the



driving wheels 66, 232 etc. of the accumulator 2 with its rib 268, and releases the wheels.

As the locking wheel lever 240 of the units place in the accumulator 2 moves clockwise about the shaft 191, the Maltese wheel portion 245 of its locking and tens transfer wheel 241 clears the flange 246 of the driving wheel 236 of the comma place, and its teeth 242 clear the teeth 243 of the driving wheel 244 in the units place. The driving wheel 244 and its train 279, 280 and 6 are ready for the reception of a value.

When the locking wheel lever 114 of the units place in the column totalizer 1 turns anti-clockwise, its fork 126 turns the allotted coupling arm 129 clockwise about the boss 130 of the spur gear 130, and the wide coupling gear 131, as described in section (3), connects the pair of transmission wheels 132 and 133 allotted to the units place.

The value which has been introduced in the units place of the column totalizer 1 is now withdrawn by total taking, as described in section (5) and, as the driving wheel 12 is rotated in the direction of the arrow 281, the train of gears 111, 136, 130, 137, and the number roller 10 of the units place rotate in directions 155 indicated in Fig. 3 until one of the zero setting teeth 154 of the flange 151 engages the zero stop 57. In this position the number roller 10 of the units place displays "0."

When the spur gear 130 of the units place is turned backwards in the direction of the arrow 155 in Fig. 3, the transmission wheel 132 is also turned anti-clockwise, and the coupling wheel 131 which meshes with it is turned clockwise and turns the other wheel 133 anti-clockwise. The wheel 133, through its teeth turns the driving wheel 244 of the accumulator in the direction of the arrow 282. The driving wheel 244 now transfers the total value on the corresponding number wheel 6 through pinions 279 and 280 which number wheel turns in additive or clockwise direction and indicates the total withdrawn from the column totalizer 1.

The releasing finger 19 now releases the locking lever 114 on the units place in the column totalizer 1 and the lever returns into its initial position, as shown in Fig. 2. At the same time, the nose 274 of the locking lever 114 releases the nose 275 at the lower end of the locking wheel lever 249 at the units place in the accumulator 2 whose spring 276 returns it into its normal position, Fig. 2, with its abutment bearing against the screw 284 in the bar 198. The incline 258 of the returning locking wheel lever 240 releases the flap 203, and by the cooperation of the arms 254 of the members 255 on the flap 203, and the teeth 251 of the three-armed levers 250, the latter become free to return into their normal positions, Fig. 2 and their teeth 263 clear the stay 264 of the locking frame 265 which is now returned into its normal position by the springs 271 turning it clockwise about its shaft 278, and the rib 268 of the rod 269 engages between the teeth of the driving wheels 66, 232 etc. and locks them, as shown in Fig. 2.

The teeth 263 of the three-armed levers 250 are so positioned with respect to the stay 264 that the rib 268 of the rod 269 in the locking frame 265 is already between the teeth 171, 231 etc. before the coupling gear 131 is moved clear of the transmission wheels 132, 133 owing to the return of the locking lever 114 in the units place of the column totalizer 1. This prevents overthrowing of the train 244, 285, 279, 288 after the throwing out of the coupling wheel 231.

In the locking position of the frame 265, Fig. 2, the rib 268 of its rod 269 exactly aligns the number rollers 6 displayed through the slot 5 in Fig. 1.

When the flap 203 has returned into its initial position its inner side again engages the inclines 258, 202 and 220 of the levers 109, 240 and 77 in the places of the accumulator, and its front edge 205 leaves the recess 277 in the locking wheel lever 240 at the units place and recedes from the edges 207 and 221 of the parts 208 and 222 of the locking and locking wheel levers 109 and 77 at the other calculating places, releasing the said levers, as shown in Fig. 2.

When the three-armed levers 250 have returned into their normal positions as shown in Fig. 2, their teeth 280 again engage between the teeth of the driving wheels 262, etc.

When the locking wheel lever 240 at the units place of the accumulator 2 has returned into its initial position Fig. 2, the teeth 242 of its locking wheel 241 again come into mesh with the teeth 243 of the driving wheel 244 of the units place and its Maltese wheel 245 again engages the flange 246 of the driving wheel 236 in the comma place, and now all parts of the unit place in the accumulator 2 have returned into the initial positions, shown in Figs. 2 and 5.

When it is desired that when total taking from the column totalizer 1 the value should be transferred to the accumulator 2 subtractively, the handle 3 is thrown into the position illustrated in Fig. 4 to engage the train of gears 295 in the accumulator 2 with the transmission gears 133 of the column totalizer 1. In this case, the train 244, 279 and 280 of the units place is rotated against the arrows 202 in Fig. 3. The operation need not be described.

### (8) The tens transfer in the accumulator

The operations which are performed during a tens transfer in the accumulator 2, are substantially similar to the operations described with respect to the column totalizer 1 in section (4), and will therefore not be described.

It should be noted, however, that a rotation of the driving wheel 262 in the tens place in combination, for instance, with a tens transfer from the units to the tens place in the accumulator 2, and the corresponding rotation of the mating transmission wheel 286 (Fig. 7) at the tens place of the column totalizer 1 does not influence the tens calculating place in the column totalizer since the not illustrated locking wheel lever of the tens place which corresponds the lever 11 is not swung by the releasing finger 19, and the coupling gear of the tens place is not coupled with the transmission wheels 287, 296 of the tens place, and the transmission gear 287 turns idly with respect to transmission gear 286. In order to obtain an effective tens transfer in the accumulator 2, it was necessary to provide a pair of transmission wheels 44, 45 and 273, 289 etc. for each driving wheel 63, 232 etc.

### (9) The additive introduction of a value into the column totalizer and the additive transfer to the accumulator

When an accounting problem requires the additive introduction of a value into the column totalizer 1 and an additive transfer of this value into the accumulator 2, the manipulating lever 3 is moved into the position illustrated in Fig. 16. The gears 175, 233, 285 etc. in the accumulator 2 engage with the transmission gears 45, 273 etc.

in the column totalizer 1 in a manner which will be described in section 12. Since the operations in the column totalizer 1 have already been described in section 3, this will not be repeated here.

When the locking lever 114 of the units place in the column totalizer 1 is swung, the parts 107, 129, 131, 67, 101 and 60 operated by it are moved into the active position shown in Fig. 4. At the same time, the nose 274 of the lever 114 acts on the nose 275 of the locking wheel lever 240 allotted to the units place of the accumulator 2, so that the lever 240 together with the cooperating parts 203, 255, 250, frame 265, and locking wheel 241 are moved into the positions shown in Fig. 4.

When the main driving wheel 111 of the units place in the column totalizer 1 is rotated in the direction of the arrow 135 in Fig. 4, in conformity with the value to be introduced the wheel transfers the value to the corresponding number roller 10 through gears 136, 130 and 137. The number roller is now rotated in the direction of the arrow 135 and indicates the value. When the spur gear 130 at the units place rotates in the direction of the arrow 135, the transmission gear 132, and through the coupling gear 131, the transmission gear 133, are rotated clockwise. The rotation of the transmission gear 133 is transmitted to the spur gear 285 of the units place in the accumulator 2. The spur gear 285 rotates in the direction of the arrow 289 and rotates the driving wheel 244 and the other train 279, 280 and 8 in the direction of the arrows 282 in conformity with the value to be introduced, whereby this value is transmitted positively to the corresponding number roller 6 at the units place in the accumulator 2.

(10) *The introduction of a value into the column totalizer additively and the subtractive transfer to the accumulator*

If the accounting problem requires the additive introduction of a value into the column totalizer 1 and subtractive transfer to the accumulator 2, the manipulating lever 3 is moved into the position shown in Fig. 15 for connecting the driving wheels 66, 232, 244, etc. in the accumulator 2 to the transmission gears 45, 273 etc. of the column totalizer 1, Figs. 3 and 7. When now the train 111, 136, 130, 131, 137, 10 for example of the column totalizer 1 is rotated in conformity with the value to be introduced, in the direction 135 in Fig. 3, the transmission gear 133 which is rotated anti-clockwise by 132 and 131, the driving wheel 244 which meshes with 133, and by the wheel 244, the train 279, 280 and 8 of the accumulator 2 are rotated against the arrows 282 and the value is subtractively transferred to the number roller 6.

(11) *The cancellation of the accumulator*

The cancellation of a value which has been indicated by the number roller 6 of the accumulator 2, requires backward transmission of this value into the column totalizer 1 after this has been set to zero by total taking.

The manipulation lever 3 is moved into the position in Fig. 15, whereby the driving wheels 66, 232, 244 etc. of the accumulator 2 are connected to the transmission gears 45, 273 etc. of the column totalizer 1.

For instance, if the number roller 6 of the units place indicates the value "3" in the accumulator 2, this value "3" is cancelled as follows:

When the units place of the column totalizer

1 has moved into active position, the calculating key for the value "3"—not shown—is depressed for introducing the value "3", the units places of the column totalizer 1 and of the accumulator 2 are unlocked by the levers 114 and 240, and the train of gears 111, 136, 151, 130, 137 and 10 of the unit place in the column totalizer 1 is rotated in additive direction three times, as shown by the arrows 135 in Fig. 3, the spur gear 130 transmitting the value "3" to the transmission gear 133 through 132 and 131. The transmission gear 133 now rotates clockwise and rotates the train 244, 270, 280 and 8 at the units place in the accumulator 2 for three units against the arrows 282. When this rotation has been completed, the number roller 6 of the units place in the accumulator 2 again displays a "0", while the number roller 10 of the units place in the column totalizer 1 displays "3". This value "3" in the column totalizer 1 is canceled by total taking in the column totalizer 1, after the manipulating lever 3 has returned the accumulator 2 into its initial position, as shown in Figs. 2 and 14.

(12) *The arrangement of the coupling and locking means for the accumulator*

A headed screw 290, Figs. 14 to 17, is inserted in the left-hand side plate 14 of the column totalizer 1 as the pivot for the left-hand arm 203 of the manipulating lever 3, a bore 292 in the arm being seated on the shank 291 of the headed screw 290, as shown in Fig. 17. A blade spring 295 is riveted to the arm 293 at 294 and its free end supports a pin 298 sliding in a hole 297 in the arm 293. The inner end of the pin 298 which projects from the hole 297 in the arm 293 is hemispherical for cooperation with three hemispherical depressions 298, 299, and 300 in the left-hand side plate 160 of the accumulator 2, holding the manipulating arm in one of the three positions.

The lower end of the arm 283 is made with a camplate 301 whose front edge 302 is curved. In the normal position of the manipulating lever 3, Figs. 2 and 14, the curved front edge 302 bears below the end 179 of the pinion shaft 177 which it will be remembered, is mounted to slide in the arcuate slots 180 and 181 in the side plates of the accumulator 2. The pinion shaft 177 is now held against downward movement. At the lower end of the front edge 302, a semicircular seat 304 is formed by the upper edge of a hook 303 in continuation of the front edge 302 which engages below the end 179 of the shaft 177 when the manipulating lever 3 is in the position shown in Fig. 15. A slot 305 is made at the upper end of the front edge 302 in which the end 179 is free to slide when the manipulating lever 3 is in the position shown in Fig. 16.

An angular cam slot 307 is made in the rear portion 306 of the camplate 301, and into this projects a pin 308 secured in the left-hand side plate 160 of the accumulator 2. In the position according to Fig. 15, this pin is in the straight part 310 of the cam slot, and in the position illustrated in Fig. 16 it is in the curved part 309. By the cooperation of the pin 308 and the cam slot 307, a definite position is given to the accumulator 2 which swings about the shaft 150 on the column totalizer 1, for all positions of the manipulating lever 3. A recess 311 is made in the lower edge of the angular slot 307 in its curved portion 309. In the initial position of the manipulating lever 3, as shown in Figs. 1, 14 and 17, an abutment 312, projecting from the left-hand side plate 160 of the accumulator 2 engages in

the recess 311. The abutment 312 is the left-hand end of a locking rack 313, as best seen in Fig. 18. The edge 314 of the abutment is curved and, upon corresponding movement of the manipulating lever 3 can cooperate with the lower edge 315 of the curved part of the angular slot 307, or with a hook 318 at the side of the recess 311.

The locking rack 313 is guided in a slot in the left-hand side plate 160 by its abutment 312, and in a similar slot in the right hand side plate 159 by an extension 317. A spring 318 which is attached to a pin 319 in the rack 313 at one end, and to a pin 320 in the side plate 160 at the other pulls the rack in the direction of the arrow 321 and a lug 322 on the rack bears against the inner side of the plate 160 to define the normal position of the rack. In this position, the ten teeth 323 of the rack engage between the teeth of the driving wheels 66, 232 etc. in the accumulator 2 and prevent unintentional rotation.

The right-hand arm 324 of the manipulating lever 3 is made exactly like the left-hand one 293, but its cam slot is without the recess 311.

(13) *The operation of the coupling and locking means for total taking from the column totalizer and additive transfer to the accumulator*

For this operation, the manipulating lever 3 is placed into the position shown in Figs. 3 and 15. The arms 293 and 324 turn clockwise about their headed screws 290. The pins 296, 325 leave the depressions 298, 327 in the side plates 159 and 160. At first, the curved parts 309, 328 of the camslots 307, 329 move idly past the pins 308, 330 but then their edges 331, 332 engage the pins and the accumulator 2 is swung about the shaft 158 clockwise until the lugs 167 and 165 engage the abutments 159 and 160. In this position, the pins 296, 325 engage in the depressions 299, 334 in the side plates 159 and 160. In this position of the accumulator, the teeth of the driving wheels 66, 232 etc. in the accumulator 2 engage with the transmission gears 45, 273 etc. in the column totalizer 1. The ends 178 and 179 of the shaft 177 are held at the upper ends of their arcuate slots 180 and 191 by the semicircular seats 304.

When the manipulating lever 3 is moved anti-clockwise into the position in Figs. 14 and 17, the hook 316 of the arm 293 pushes the abutment 312 of the rack 313 against the arrow 321 in Fig. 18, so that its teeth 313 clear the teeth of the driving wheels 66, 232 etc. and a gap 337 in the rack is presented to each row of the teeth of said driving wheels 66, 232 etc. The driving wheels are now free to rotate when a value is introduced.

When it is desired to uncouple the accumulator 2 from the column totalizer 1, the manipulating lever 3 is returned into the position shown in Figs. 2 and 14. First, the pins 296, 325 leave the depressions 299, 334 in the side plates 159 and 160 and the edges 338, 339 of the camslots 307, 329 in both arms engage the pins 308, 330 and return the accumulator 2 into its normal position by swinging it anti-clockwise about the shaft 158 and the pins 308, 330 are now again in the curved parts 309, 328 of the camslots 307, 329. At the same time, the hook 316 of the arm 293 at the left releases the rack 313 and the spring 318 again forces the lug 322 of the rack against the inner side of the side plate 160. The teeth 323 of the rack again lock the driving wheels 66, 232 etc. through their teeth. The pins 296, 325 engage in the depressions 298, 327 and the teeth of the driving wheels 66, 232 etc. in the accumulator

clear the transmission gears 45, 273 etc. of the column totalizer 1.

(14) *The operation of the coupling and locking means for total taking from the column totalizer and subtractive transfer to the accumulator*

For this operation, the manipulating handle 3 is moved into the position in Fig. 16. The pins 296, 325 leave the depressions 298, 327 and the curved edges 302, 335 of both arms 293 and 324 clear the ends 178 and 179 of the shaft 177, until the upper edges 341 of the slots 305 act on the shaft 177 whose ends 178 and 179 now descend in the direction of the arrow 343 in Fig. 16. As the shaft 177 descends the pinions 176, 233 etc. of the individual places which are free to rotate on the shaft, roll on the teeth of the driving wheels 66, 232 etc. and, when the manipulating lever 3 has completed its stroke, mesh with the transmission gears 45, 273 etc. in the column totalizer 1.

As the manipulating handle 3 moves into the position in Fig. 16, the curved portion 308, 328 of the camslots 307, 329 slide idly past the pins 308, 330 in both side plates 159 and 160. The hook 315 of the arm 293 pushes the rack 313 against the arrow 321 and its teeth 323 clear the teeth of the driving wheels 66, 232 etc. The pins 296, 325 engage in the depression 300, 344 of the side plates 159 and 160.

When the manipulating lever 3 is returned into the normal position in Fig. 14, the edges 345, 346 of the slots 306, 340 raise the shaft 177 against the arrow 343 so that its pinions 176, 233 etc. are moved clear of the transmission gears 45, 273 etc. roll on the teeth of the driving wheel 66, 232 etc. and return into their normal positions. The curved edges 302, 335 of the arms 293 and 324 again engage the ends 178 and 179 of the shaft 177 and hold it in its normal position. The hook 315 of the left-hand arm 293 releases the rack 313 which, returning in the direction 321, locks the driving wheels 66, 232 etc. The pins 296, 325 engage in the depressions 298, 327 in the side plates 159 and 160.

If it is desired to transfer additively to the accumulator 2 a value additively introduced into the column totalizer 1, the manipulating lever 3 is moved into the position according to Figs. 4 and 16, and the operations which have been described above for negative transfer are repeated.

On the other hand, if it is desired to transfer subtractively to the accumulator 2 a value which has been introduced additively into the column totalizer 1, the manipulating handle 3 is moved into the position shown in Figs. 3 and 15, and the operations described in section 13 are performed.

(15) *The suspension and securing means for the double totalizer*

The side plates 13 and 14 of the column totalizer 1 are equipped with hooks 350 and 349, respectively, as best seen in Fig. 19, at their lower rear ends which engage the lower edge 351 of the dove-tailed rail 11. For suspending the column totalizer 1 from the rail, the following arrangement is provided.

A suspension bar 352 which is shown partly broken away in Fig. 19, and has a hook-shaped ridge 357 at its free end for engaging the upper edge 358 of the rail 11, as shown on larger scale in Fig. 2, is mounted to swing between the side plates 13 and 14 of the column totalizer 1 by means of trunnions 353 and 354 in holes 355 and 356 in the respective side plates 13 and 14.

For securing the column totalizer 1 against

lateral displacement on the rail 11, a catch 359 is mounted on the trunnion 353 and rigidly connected to the suspension bar 352. The rear end of the catch is forked, forming a hook 360 which bears on the upper edge 359 of the rail 11 and a tooth 361 for engaging between the teeth of the rack 347 to secure the column totalizer 1 against lateral displacement. A pin 362 extends between the bar 352 and the catch 359 on which is attached a spring 364 whose lower end is secured to a pin 363 in the right hand side plate 13. This spring tends to turn the bar 253 clockwise, forcing the ridge 357 of the bar and the hook 360 of the catch 359 against the upper edge 358 of the rail 11.

A cam 366, Fig. 20, at the lever edge of the catch 359 is provided for cooperation with a pin 367 of a locking arm 368 which extends through an arcuate slot 369 in the right-hand side plate 13. The locking arm is fulcrumed about a headed screw 370 in the side plate 13 and its movement is limited by the ends 371 and 372 of the slot 369.

A lug 373 which extends upwardly from the front end of the catch 359 is arranged for cooperation with a lug 375 of a bellcrank 374 which is mounted to turn about the shaft 158. A torsion spring 377 is wound about the shaft 158 and its longer arm 378 engages in a recess 376 in the transverse stay 163 of the accumulator 2, as best seen in Fig. 2. This spring tends to turn the bellcrank 376 anti-clockwise about the shaft 158 and forces the lug 375 against the lug 373 of the catch 359. The strength of the spring is just sufficient for holding the two lugs engaged, but it cannot turn the catch 359 anti-clockwise against the spring 364.

A tooth 382 on the bellcrank 376 is arranged for cooperation with the flap 203, and a handle 383 on the bellcrank projects through a slot in the cover plate 4 of the accumulator.

*(16) The operation of the suspension and securing means*

When it is desired to remove the double totalizer from the rail 11, the locking lever 368 is turned clockwise from the locking position in Fig. 21 into the unlocking position in Fig. 20 in which the pin 367 is against the end 372 of the slot 369. The pin now clears the lower edge 265 of the catch 359. By means of the handle 384, the bellcrank 376 is now turned anti-clockwise and its lug 375, through the lug 373 on whose upper edge 374 it acts, turns the catch 359 and the suspension bar 352 anti-clockwise about the trunnions 353 and 354. The ridge 357 of the bar 352 and the hook 360 now clear the upper

edge of the suspension rail 11, and the tooth 361 of the catch 369 clears the rack 347, so that the double totalizer can now be removed.

When the handle 384 is released, the bar 352, the catch 359, and the bellcrank 376 are returned into their normal positions by the spring 364, and the tooth 362 of the bellcrank 376 turns the flap 203 anti-clockwise about its trunnions 204 and its edge 305 is placed against the edges 207, 221, 259 etc. of the levers 189, 77 etc. in the totalizer 2, so that unintentional turning of the wheels in the column totalizer 1 and the accumulator 2 is prevented.

*(17) Placing the double totalizer on the suspension rail*

When it is desired to place the double totalizer on the suspension rail 11, the handle 384 is pressed, the column totalizer 1 is placed on the rail, and the handle is released. Spring 364 now turns the bar 352 and the catch 359 clockwise, the ridge 357 and the hook 360 again engage the upper edge of the rail 11, and the tooth 361 returns between the teeth of the rack 347. The bellcrank 376 returns into the position shown in Fig. 20. The locking arm 368 is now turned anti-clockwise into its locking position, Fig. 21, in which its pin 367 bears against the end 371 of the slot 369. The pin 387 raises the catch 359 by its cam 366 and the upper edge 358 of the rail 11 is firmly engaged by the ridge 357 and the hook 360.

*(18) A modification*

It is not necessary that the totalizer 2 which is preferably an accumulator, should be pivoted to the column totalizer 1, as has been described. The totalizer or accumulator 2 may be arranged independently on the suspension rail 11.

Or it might be arranged for vertical displacement, and be coupled with one of a set of cross totalizers 385 as shown in Fig. 22. The coupled cross totalizer 385 now replaces the column totalizer 1 of the previously described system.

When the accumulator 2 has been placed in position above the cross totalizer 385, this is moved along on its slide 386 by the idle totalizer 387 in time with the accumulator 2.

Obviously, in this case the headed screws 290 the manipulating lever 3 is fulcrumed about, must be arranged on the accumulator 2, and not at the cross totalizer 385. The accumulator must, however, be able to occupy the positions illustrated in Figs. 2 to 4.

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