

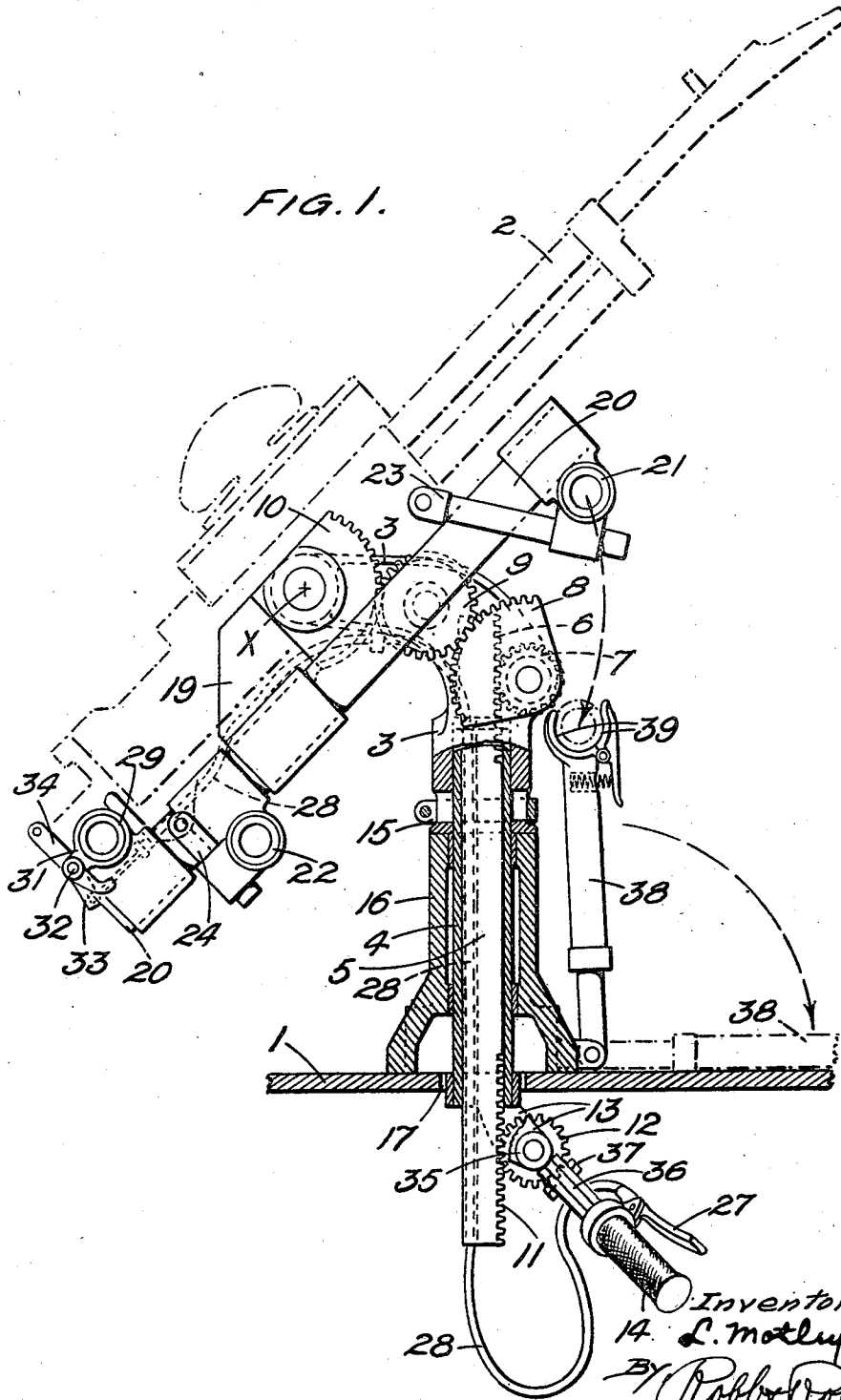
Jan. 11, 1949.

L. MOTLEY
GUN MOUNTING

2,458,956

Filed July 16, 1943

6 Sheets-Sheet 1



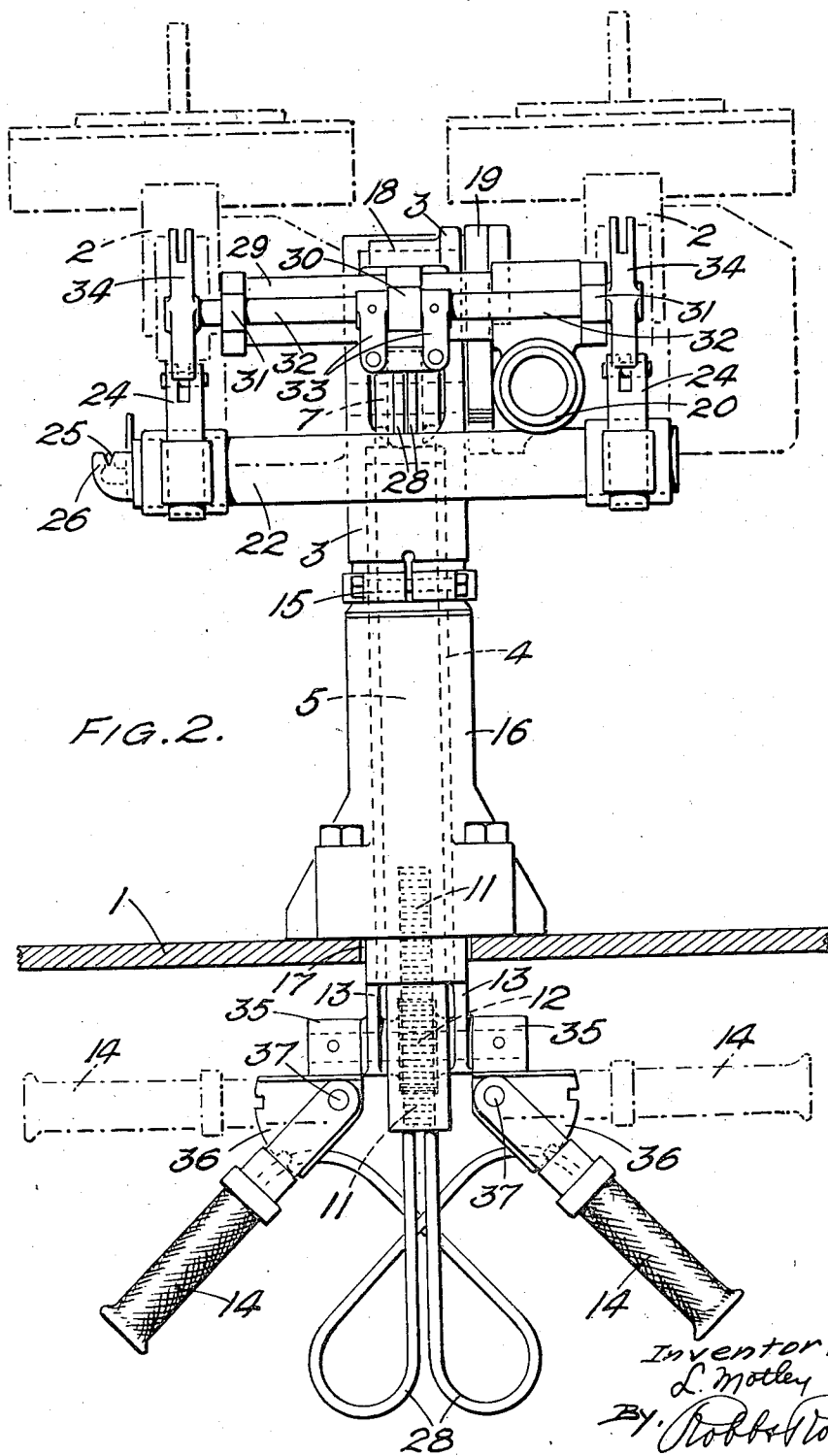
Jan. 11, 1949.

L. MOTLEY
GUN MOUNTING

2,458,956

Filed July 16, 1943

6 Sheets-Sheet 2



Jan. 11, 1949.

L. MOTLEY
GUN MOUNTING

2,458,956

Filed July 16, 1943

6 Sheets-Sheet 3

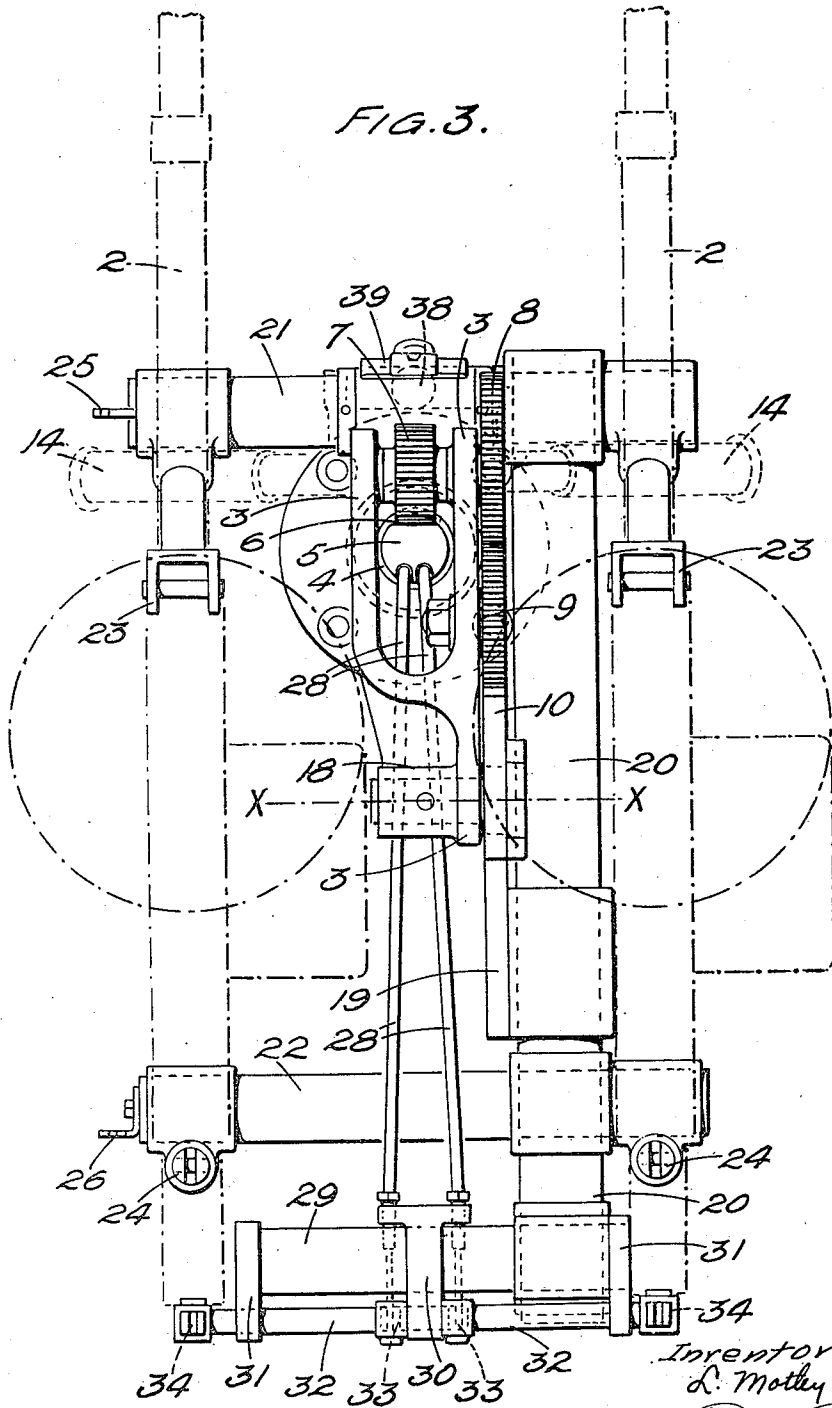


FIG. 3.

Inventor,
L. Motley
By Robb & Robb
ATTORNEYS

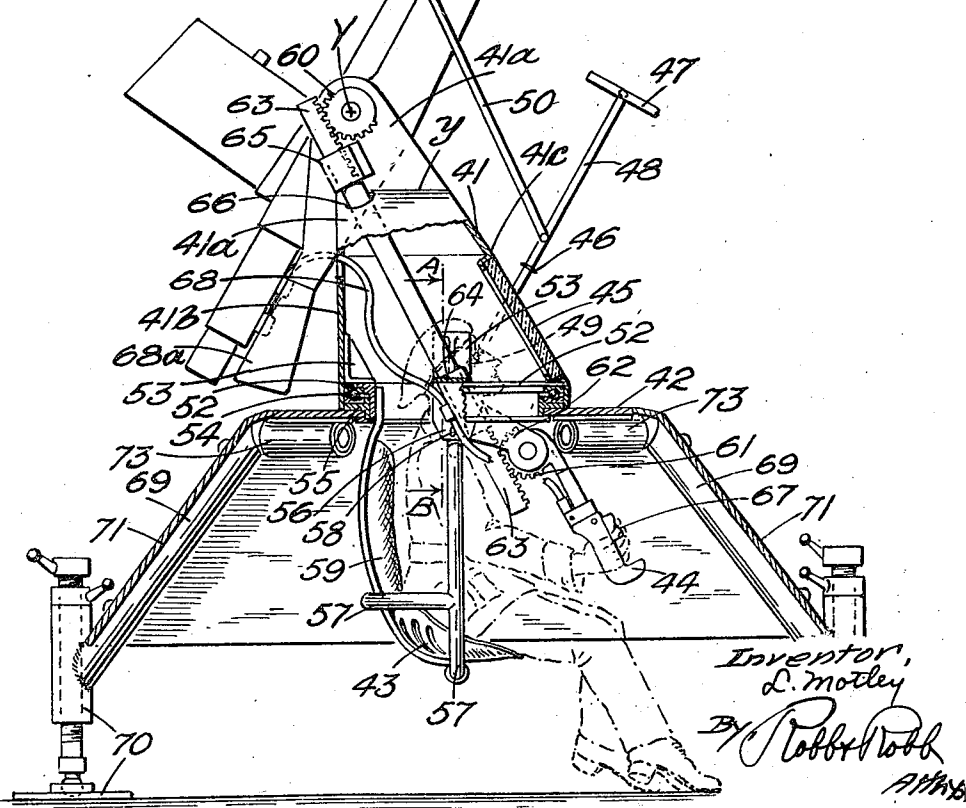
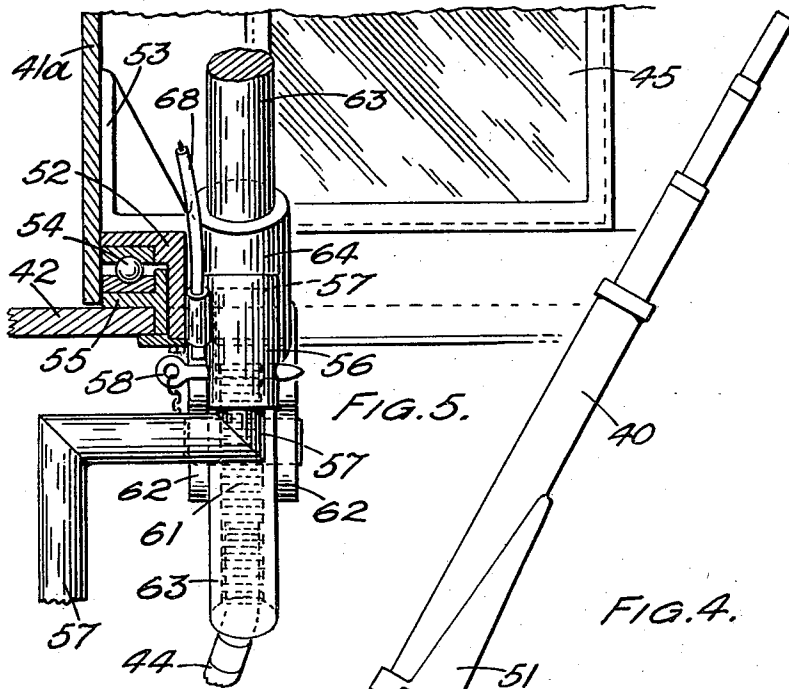
Jan. 11, 1949.

L. MOTLEY
GUN MOUNTING

2,458,956

Filed July 16, 1943

6 Sheets-Sheet 4



Inventor,
L. Motley
By *Robb Robb*
ATTORNEY

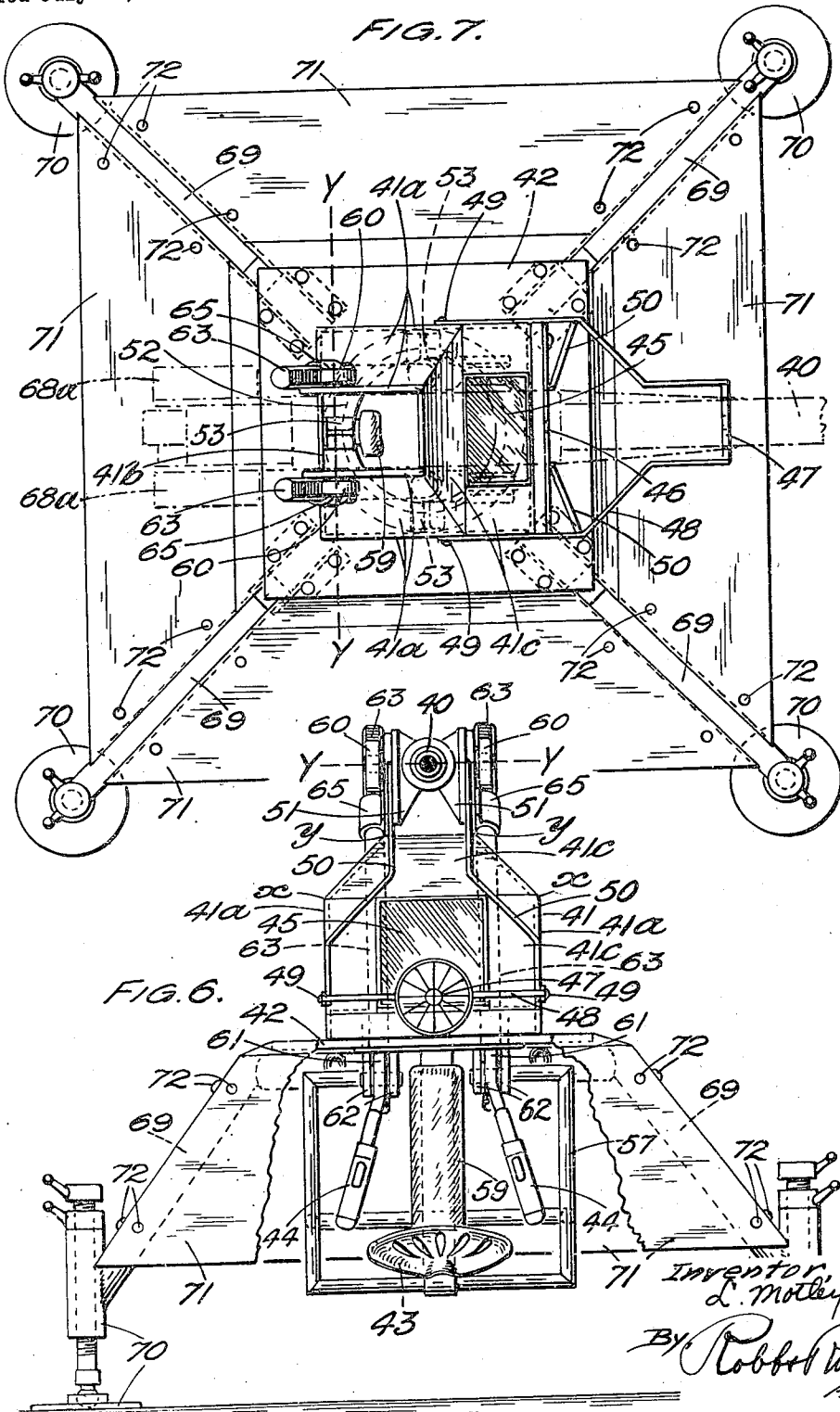
Jan. 11, 1949.

L. MOTLEY
GUN MOUNTING

2,458,956

Filed July 16, 1943

6 Sheets-Sheet 5



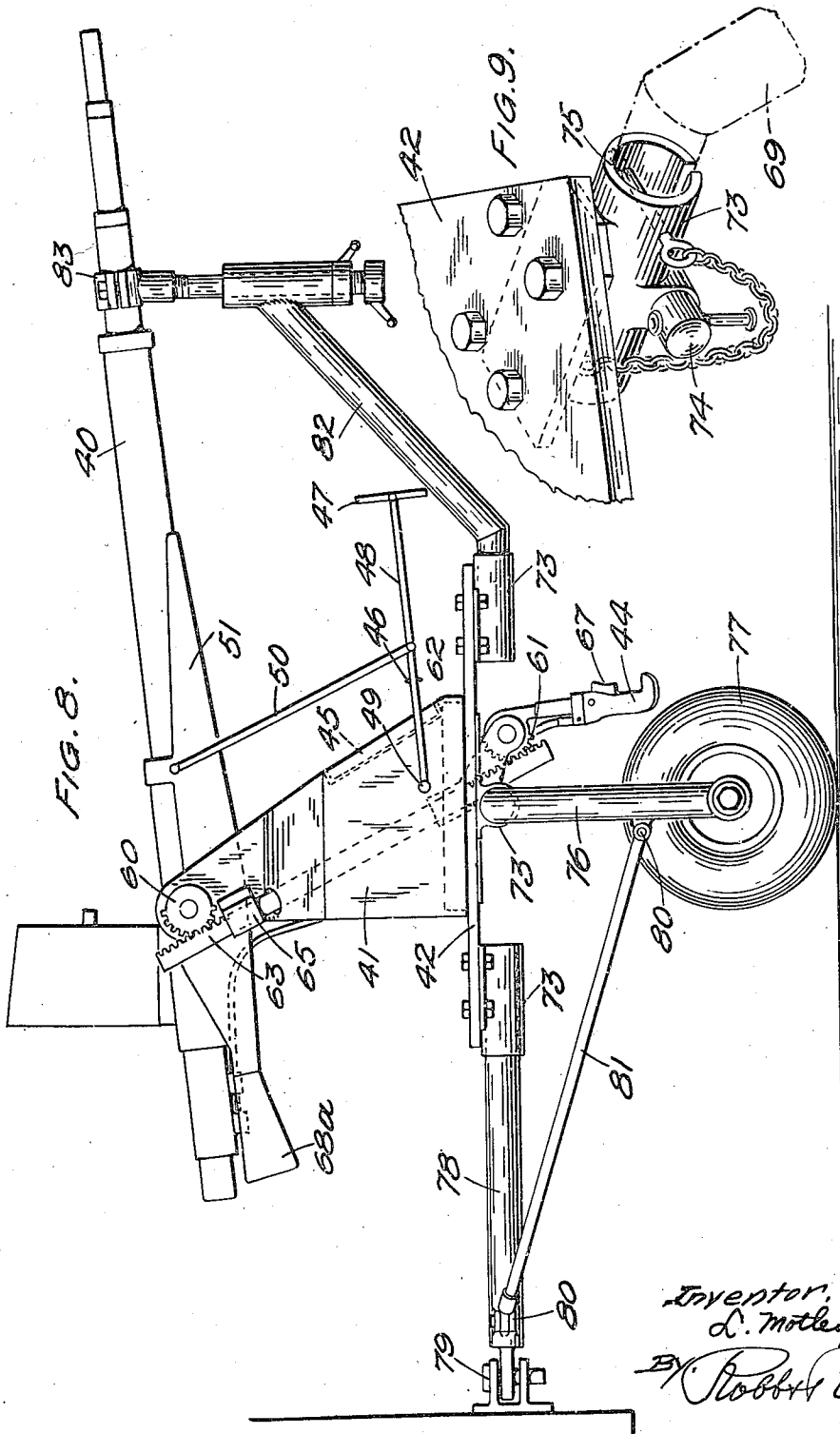
Jan. 11, 1949.

L. MOTLEY
GUN MOUNTING

2,458,956

Filed July 16, 1943

6 Sheets-Sheet 6



Inventor:
L. Motley
By: *Robb & Cobb*
Attys.

UNITED STATES PATENT OFFICE

2,458,956

GUN MOUNTING

Lewis Motley, London, England

Application July 16, 1943, Serial No. 494,992
In Great Britain June 26, 1942

3 Claims. (Cl. 89—37)

1

This invention relates to gun mountings, particularly but not exclusively for rapid fire guns and guns for antiaircraft purposes. The object of the invention is the provision of an improved gun mounting which will enable the gunner to be fully protected by armour.

In accordance with the invention the mounting is of the kind in which the gun is pivotally mounted for elevation on a supporting unit which in turn is rotatably mounted for traverse on a relatively fixed base, the movement of the gun for elevation being effected, through the medium of a suitable transmission, by means of a handle mounted on said supporting unit, and the invention resides in the arrangement that the relatively fixed base takes the form of an armoured chamber and the supporting unit is mounted on the roof of said armoured chamber at or in an opening in said roof whereby the actuation of the handle for elevation and the rotation of the supporting unit for traverse are both effected from within said chamber.

In order that the invention may be the more clearly understood certain gun mountings in accordance therewith will now be described, reference being made to the accompanying drawings wherein—

Figure 1 is a side elevation, shown partly in section, of a mounting in accordance with the invention for twin guns, the guns being shown elevated at an angle of about 45°.

Figure 2 is a rear elevation of the same to a somewhat larger scale, the guns being horizontal.

Figure 3 is a plan of the same scale as Figure 2, with the guns again horizontal.

Figure 4 is a side elevation shown largely in section of a mounting in accordance with the invention, the gun being elevated at an angle of over 45°.

Figure 5 is an enlarged section on line A—B of Figure 4.

Figure 6 is a front elevation of Figure 4, with the gun horizontal.

Figure 7 is a plan of the same with the gun horizontal, part of the top hamper being removed for clearness as shown in dotted lines.

Figure 8 shows the mounting in its disassembled and packed position being towed behind a trailer.

Figure 9 is a fragmentary view illustrating a portion of Figures 4 to 8.

Referring first to Figures 1 to 3 the gun mounting is mounted on the roof 1 of a tank. The two guns 2 are mounted, so as to pivot about a horizontal axis X—X for elevation, on a member 3

2

which extends, as shown, upwardly and rearwardly from the upper end of a vertical tubular shaft 4 which passes down through the said roof 1 of the tank and has its lower end just inside the tank as shown. This tubular shaft is rotatable about its axis for traverse of the guns. The rotation of said tubular shaft for traverse and also the rotation of the guns about the axis X—X for elevation are both effected from inside the tank as will hereinafter appear, and thus the gunner is protected by the tank armour.

The transmission for rotation of the guns in elevation comprises an axially movable rod 5 passing through the tubular shaft 4 and having rack teeth 6 formed at its upper projecting portion, a pinion 7 mounted on the part 3 and in mesh with said rack teeth, a toothed quadrant 8 rigid on the shaft of said pinion 7, a pinion 9 also mounted on the part 3 and in mesh with said toothed quadrant, and a toothed quadrant 10 also mounted on the part 3 coaxial with the axis X—X and rigid with the two guns. Thus as the rod 5 moves upwardly the guns are depressed, and as said rod moves downwardly said guns are elevated.

For moving the rod 5 up and down in the tubular shaft 4 the lower projecting end of said rod is formed with rack teeth 11, and a pinion 12 rotatably mounted, about a horizontal axis parallel to that of the pinion 7, between two parallel lugs 13 which are rigid on the lower end of the tubular shaft 4, is in mesh with said rack teeth 11. The shaft of this pinion 12 has mounted on its two ends which project beyond the lugs 13 two hand levers 14 which are adapted to be held in the two hands of the gunner. By means of these handles 14 the pinion 12 is adapted to be rotated, the rod 5 moved up and down, and the guns 2 accordingly moved in elevation. If the pinions 12 and 7 are made equal in size, and if the quadrants 8 and 10 are also made equal in size, the angles of movement of the hand levers 14 about the axis of the pinion 12 will be equal to the angles of movement of the gun in elevation.

It will be seen that the hand levers 14 serve to move the gun in traverse as well as in elevation, since if the levers are moved around the vertical axis of the shaft 4, said shaft 4, and therefore the part 3 and the guns, will rotate in one piece with said hand levers about said axis.

In construction it will be seen that the member 3 has a short tubular bottom portion which is clamped on to the upper end of the tubular

3

shaft 4 by means of a clamping device 15. The portion of the tubular shaft 4 extending downwardly from the member 3 passes coaxially through a fixed supporting column 16 which is rigidly mounted on the roof 1 of the tank over the hole 17 through which said shaft passes and which is provided with journal bearings for said shaft as will be clear from the drawing. The down thrust is taken by the bottom portion of the member 3 resting on the top of said supporting column.

It will be seen that the member 3 extends first upwardly and then rearwardly from its bottom tubular portion and is hollowed for the accommodation of the upper end of the rod 5 and also for the pinion 7. The quadrant 8, pinion 9 and quadrant 10 are all mounted on one side of said member 3 as will be clear from the drawings. The quadrant 10, which rigidly supports the guns and all the parts that move with them, is pivotally mounted on the part 3 by means of a heavy pivot pin which passes through a boss 18 on said part 3.

For securing the guns to the quadrant 10 the latter is formed with a rearward plate extension 19 whereby it is rigidly secured, in a manner which will be sufficiently understood from the drawings, to a strong tubular longitudinal frame member 20 extending fore and aft parallel to the guns. The frame member 20 at its forward end supports a transverse tubular frame member 21, and, near its rear end a similar transverse frame member 22. The frame member 21 carries two forward fixtures 23 to mate with corresponding forward fittings of the respective guns, and the frame member 22 carries two rear fixtures 24 to mate with corresponding rear fittings of the respective guns.

The mounting is provided with a fore sight 25 and a rear sight 26 mounted respectively on the frame members 21 and 22. The gunner is enabled to observe these sights through a slot or slots formed in the roof of the tank. The guns are particularly intended to operate against aircraft and therefore the gunner, while remaining in the tank, will be able to place his eye in the line of the sights.

The firing of the guns is effected by means of triggers 27 mounted on the respective handles 14 through the medium of respective Bowden wires 28 passing up through small slots in the rod 5 as shown. The frame 20 at its rear extremity has a transverse frame member 29 rigidly mounted on it, and this frame member 29 carries a centre bracket 30 and two end brackets 31 whereby two coaxial transverse rocking shafts 32 are supported. Adjacent the centre bracket 30 each rocking shaft has a downwardly depending arm 33 rigidly mounted on it, and, beyond the end brackets 31, each rocking shaft has an arm 34 rigidly mounted on it. The Bowden wires 28 are respectively connected to the arms 33, and when either Bowden wire is tensioned by the respective trigger 27 the respective rocking shaft 32 is rocked and the respective arms 34 operate to fire the respective gun. Each gun continues to fire as long as its respective trigger is actuated.

It will be seen that, in construction, the securing of the hand levers 14 to the projecting ends of the shaft of the pinion 12 is effected through the medium of two collars 35 which are secured on the ends of said shaft and have quadrant plates 36 attached to them in a plane at right angles to that of the pinion. The hand levers 14 have bifurcated ends, and each bifur-

4

cated end straddles a respective quadrant plate 36 and is pivoted to it by means of a pivot 37 concentric with the quadrant arc. Notches are provided on the quadrant edge as shown and the hand levers 14 are provided with spring loaded catches which engage in said notches to retain the hand levers in fixed relationship to the quadrants. While in use the hand levers are secured in the conveniently spread position illustrated in Figure 2. When not in use they are raised to the horizontal position shown in dotted lines in Figure 2 at which they are out of the way near to the roof of the tank.

When the guns are not in use the mounting is adapted to be parked with the guns horizontal and pointing forwardly as shown in Figures 2 and 3. In this position an arm 38 which is pivoted at one end to the base of the fixed column 16, and which has manually releasable spring jaws 39 at its other end as shown, can be raised from the out-of-the-way horizontal position indicated in dotted lines to the position shown in full lines in Figure 1 where its jaws engage and retain the centre of the frame member 21.

Referring now to Figures 4 to 8 the gun 40, which is an anti-aircraft gun, is pivotally mounted about an axis Y—Y for movement in elevation, on the top of a pedestal part 41 which, at its bottom end, is rotatably mounted about a vertical axis for movement in traverse on the roof 42 of a fixed armoured chamber which forms a protective housing for the gunner.

The gunner, within this armoured chamber, sits on a bucket type of seat 43 which is suspended rigidly from said pedestal part 41 and thus, for effecting movement of the gun in traverse, the gunner simply swivels himself and his seat and thereby swivels the pedestal part 41 and the gun 40 which is mounted thereon. For effecting movement of the gun in elevation, a transmission mechanism is provided extending between the gun on the one hand and two handles 44 for the gunner on the other, by movement of which handles relative to the seat structure and pedestal part 41 the gun is elevated and depressed. Means are provided whereby, by depression of a trigger on one of said handles 44, the gun is fired. The gun is of the automatic type which continues firing so long as the trigger is depressed.

To enable the gunner to sight the gun on the target his head extends up, as shown in Figure 4, through the roof 42 of the armoured chamber into the hollow lower portion of the pedestal part 41. This lower portion of the pedestal part is armoured for the protection of the gunner's head and the armour includes a thick pane 45 of toughened glass immediately in front of the gunner's face. Located suitably in the gunner's line of vision are back and fore sights 46 and 47 mounted on a frame 48 which, at its rear end, is pivoted at 49 on each side of the pedestal part 41 so as to rotate about an axis parallel to the elevation axis Y—Y of the gun, and which is linked, by means of links 50, to the gun cradle 51 so as to move with the sights always in a line parallel to the gun.

In construction the pedestal part 41 consists primarily of two upstanding side plates 41a in the form each of a right angled triangle with its shortest edge horizontal and underneath and its sloping edge forwards as best shown in Figure 4. These side plates each extend vertically upwards to the line *x*, then slope towards one another to the line *y* and then again extend vertically upwards to their apexes, and the upper portions

5

of said side plates 41a carry bearings for the trunnions of the gun cradle 51 whereby the latter rotates about the axis Y—Y. Armour plate 41b extends between the back edges of said two side plates 41a up to the level shown in Figure 4, and armour plate 41c extends between the front edges of said two side plates 41a up to the level of the lines y. The glass pane 45 is, as shown, let into the armour plate 41c.

At their lower ends the four plates 41a, 41b, 41c forming the pedestal part 41 are rigidly secured to a horizontal bearing ring 52 lying within their confines, by means of angle pieces 53, and this bearing ring bears rotatably, through the medium of a ball race 54, on a base ring 55 which is mounted around an opening in the roof 42 of the armoured chamber. Thus said pedestal part can swivel very freely for traverse on the roof 42 and the gunner can project his head into the armoured space in the lower portion of said pedestal part.

For rigidly suspending the seat 43 from the pedestal part 41 the two side angle pieces 53 are each made integral with a downwardly depending vertical socket 56 (Figure 5), and, into these sockets 56, are inserted the upwardly projecting ends of a tubular frame structure 57 which supports the seat as will be clear from the drawing. Said upwardly projecting ends of the frame structure 57 are secured in said sockets 56 by means of a transverse pin 58. The seat also has a back portion 59 which extends upwardly and rests freely against the inside of the bearing ring 42.

The aforesaid transmission mechanism for effecting movement of the gun in elevation consists of two parallel transmission trains from the two aforesaid handles 44 to the two respective trunnions of the gun cradle 51. Each of these transmission trains comprises an upper pinion 60 rigidly mounted on the respective trunnion on the outside of the adjacent side plate 41a, a lower pinion 61 rotatably mounted within the armoured chamber between two lugs 62 which are integral with the angle piece 53 and socket 56 at the appropriate side, with which lower pinion the respective handle 44 forms a rigid extension, and a rack 63 which is in engagement with both of said pinions 60 and 61. Said rack is mounted so as to slide longitudinally in a lower bearing 64 which is integral with the angle piece 53, socket 56 and lugs 62, and an upper bearing 65 which is mounted on the side plate 41a. It will be seen that each rack 63 throughout the major part of its length lies within the armoured chamber and the pedestal part 41. Towards its upper extremity it passes through a hole 66 in the sloping part of the plate 41a. The bearing 65 is on the outside of said plate 41a. It will be seen that, as the handles 44 are pulled downwardly, the racks 63 will move upwardly and the gun will be depressed. Conversely when the handles are pushed upwardly the gun will be elevated. By making the pinions 60 and 61 of the same size the angular movements of the gun will always be the same as the angular movements of the handles.

The firing of the gun is effected by means of a trigger 67 pivoted on one of the handles 44 and connected through a Bowden wire 68 (shown broken away in Figure 4) with the firing mechanism of the gun. The reference 68a designates a counterweight for balancing the gun.

The armoured chamber is, as shown, roughly in the form of a truncated pyramid, having a relatively small flat roof 42 and expanding towards

6

the ground so as to form room for the legs and feet of the gunner. In the arrangement shown the flat roof 42 is square and is supported at its four corners by four massive tubular legs 69 which incline outwardly towards the ground and terminate in feet 70 which are vertically adjustable to admit of mounting on uneven ground with the flat roof 42 level. The chamber is completed as shown by four truncated triangular sheets of armour 71 mounted on these four legs by means of screws 72. This side armour will afford quite adequate protection without extending right down to the ground.

Figure 9 shows the manner in which the legs 69 are secured to the corners of the flat roof 42. Thus at each corner the flat roof has a split tubular socket 73, secured on its under side and in these sockets the horizontally bent upper ends of the legs 69 fit. Each socket 73 is adapted to be tightened on the end of the respective leg 69 by means of a screw 74 and in addition a transverse pin 75 is provided adapted to transfix the socket and leg as shown.

When the gun mounting is to be transported, the side armour 71 is removed from the legs by unscrewing the screws 72; the legs 69 are removed from the flat roof 42 by unscrewing the screws 74 and removing the pins 75, and the seat structure is removed by taking out the pins 53. The flat roof 42 is then mounted by means of an opposite pair of the sockets 73 on two tubular legs 76 bearing road wheels 77 at their lower ends. A third one of the tubular sockets 73 has a straight horizontal tubular coupling rod 78 clamped in it whose other end is adapted to be coupled at 79 to a towing vehicle. To ensure that the legs 76 shall remain rigidly in place, they and the coupling rod 78 are provided with fitments 80 for links 81 whereby said legs 76 are linked to said coupling rod 78. The pedestal part 41 and gun 40 are then swung round the traverse axis until the gun faces diametrically oppositely to the link member 78, and the gun is turned about its elevation axis until it is horizontal at the position illustrated in Figure 8. At this position the gun is fixed by means of a tubular parking member 82 clamped at one end in the remaining socket 73 and secured at its other end to the gun as shown in Figure 8. It will be seen that except that the foot 79 has been replaced by a fastening device 83 this parking member may be the same as one of the legs 69.

In this way the gun mounting can be safely transported with ease over relatively rough ground, the removed side armour 71, legs 69 and the seat structure being stowed in the towing vehicle.

It will be obvious that the gun mounting illustrated in Figures 4 to 7 could be mounted on a tank or armoured car instead of on the fixed armoured chamber. Thus the flat roof 42 would become the roof of the tank and the gunner's seat 43 would be suspended down into the tank which would constitute the armoured chamber for the gunner. Again the armoured chamber could be a fixture on the deck of a ship.

The arrangement illustrated can be modified in a variety of ways. For example instead of the gunner rotating himself and the unit comprising the seat and pedestal part directly by means of his feet on the floor, suitable gearing could be provided by which he could effect the rotation of this unit.

Again the gears 61 could be made much smaller than the gears 60 so that the handles 44 have a

considerable mechanical advantage in moving the gun in elevation, or, indeed, there could be a gear train between the handles 44 (which could be designed to make several rotations) and the rack 63 so as to increase this mechanical advantage still further.

Again the seat 43 could be dispensed with so that the gunner stands within the armored chamber. In this case he could rock the pedestal part 41 either by moving the handles 44 bodily round with said pedestal part or through the medium of gearing as just described.

It may also be found preferable to locate the elevating axis Y—Y vertically over the traverse axis A—B.

Obviously instead of one gun two or more guns moving as a unit could be employed.

What I claim and desire to secure by Letters Patent is:

1. In a gun mounting of the class described, including a main armored chamber provided with a roof having an opening therein of a size at least sufficiently large to accommodate the passage of the head of a gunner therethrough, an auxiliary head-protecting armored chamber mounted on the roof of the main armored chamber over the opening aforesaid and freely rotatable bodily relative thereto, said auxiliary chamber having provision for pivotally mounting a gun thereon for movement in elevation relative thereto about a horizontal axis, with the gun disposed wholly outside of both armored chambers, and said gun being also freely movable in traverse about a vertical axis responsive to rotation of the auxiliary chamber, the combination of transmission means extending from the gun to a point outside of the auxiliary chamber and accessible to the gunner from within the main armored chamber for adjusting the gun in elevation, said transmission means comprising a longitudinally shiftable rack member geared at the outside of the auxiliary chamber to the gun, at one end, and a hand-control member disposed within the main armored chamber and geared to the rack member at its other end, said hand-control member being mounted on the auxiliary chamber for bodily movement therewith.

2. In a gun mounting of the class described, including a main armored chamber provided with a roof having an opening therein of a size at least sufficiently large to accommodate the passage of the head of a gunner therethrough, an auxiliary head-protecting armored chamber mounted on the roof of the main armored chamber over the opening aforesaid and freely rotatable bodily relative thereto, said auxiliary chamber having provision for pivotally mounting a gun thereon for movement in elevation relative thereto about a horizontal axis, with the gun disposed wholly outside of both armored chambers, and said gun being also freely movable in traverse about a vertical axis responsive to rotation of the auxiliary chamber, the combination of transmission means extending from the gun to a point outside of the auxiliary chamber and accessible to the gunner from within the main armored chamber for adjusting the gun in elevation, said transmission means comprising two parallel transmission trains, each including a longitudinally shiftable rack member geared to the gun at the outside of the auxiliary chamber on opposite sides of the latter, and a pair of hand-

control members disposed within the main chamber in spaced relation to each other and respectively geared to the rack members of the parallel transmission trains, said hand-control members being mounted on the auxiliary chamber for bodily movement therewith.

3. In a gun mounting of the class described, including a main armored chamber provided with a roof having an opening therein of a size at least sufficiently large to accommodate the passage of the head of a gunner therethrough, an auxiliary head-protecting armored chamber mounted on the roof of the main armored chamber over the opening aforesaid and freely rotatable bodily relative thereto, said auxiliary chamber having provision for pivotally mounting a gun thereon for movement in elevation relative thereto about a horizontal axis, with the gun disposed wholly outside of both armored chambers, and said gun being also freely movable in traverse about a vertical axis responsive to rotation of the auxiliary chamber, the combination of transmission means extending from the gun to a point outside of the auxiliary chamber and accessible to the gunner from within the main armored chamber for adjusting the gun in elevation, said transmission means comprising two parallel transmission trains, each including a longitudinally shiftable rack member geared to the gun at the outside of the auxiliary chamber on opposite sides of the latter, and a pair of hand-control members disposed within the main chamber in spaced relation to each other and respectively geared to the rack members of the parallel transmission trains, said hand-control members comprising hand levers pivotally mounted on the auxiliary chamber and bodily movable with the auxiliary chamber for adjusting the gun in traverse, and said transmission trains being operable by pivotal movement of the hand levers for adjusting the gun in elevation.

LEWIS MOTLEY.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,333,446	Ross	Mar. 9, 1920
1,371,891	Haller	Mar. 15, 1921
1,376,793	Becker	May 3, 1921
1,481,469	Krammer	Jan. 22, 1924
1,700,902	Le Prieur	Feb. 5, 1929
1,865,882	Palmer	July 5, 1932
2,016,292	Rarey	Oct. 8, 1935
2,029,692	Zindel	Feb. 4, 1936
2,066,326	Brett et al.	Jan. 5, 1937
2,237,833	Lanciani	Apr. 8, 1941
2,370,148	Colby	Feb. 27, 1945
2,370,585	Scott	Feb. 27, 1945
2,380,289	Burnelli	July 10, 1945

FOREIGN PATENTS

Number	Country	Date
798,595	France	Mar. 10, 1936
155,807	Switzerland	Sept. 16, 1932
213,631	Switzerland	June 3, 1941
438,717	Great Britain	Dec. 14, 1934
448,250	Great Britain	June 4, 1936
354,652	Italy	Dec. 1, 1937
346,460	Italy	Feb. 16, 1937