

March 8, 1955

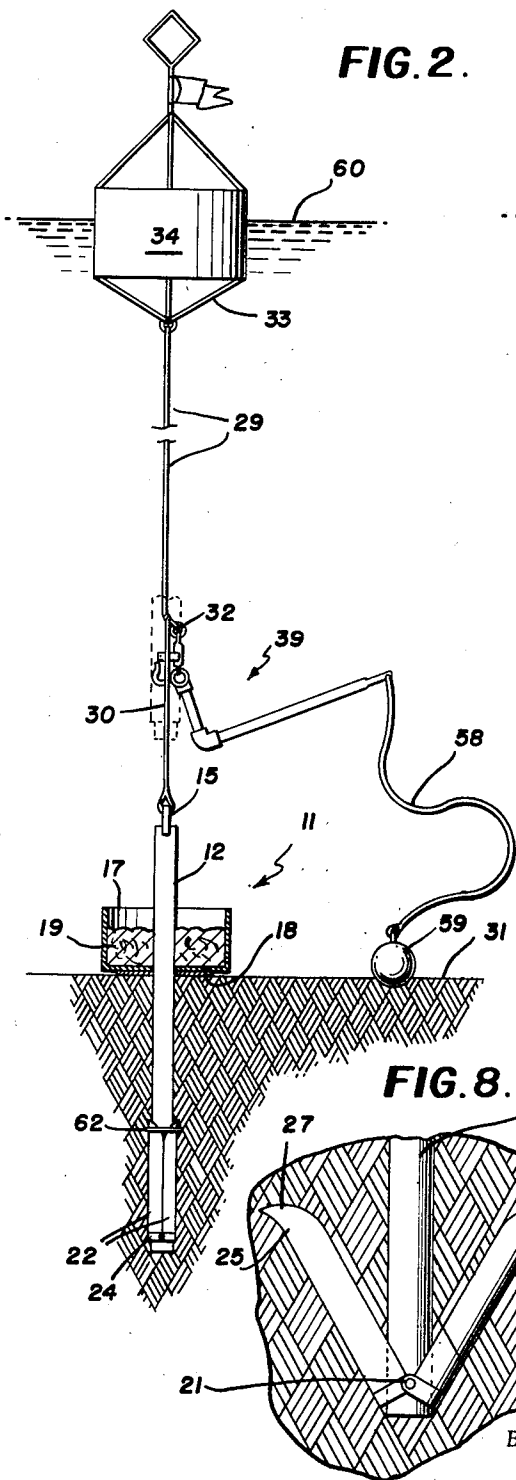
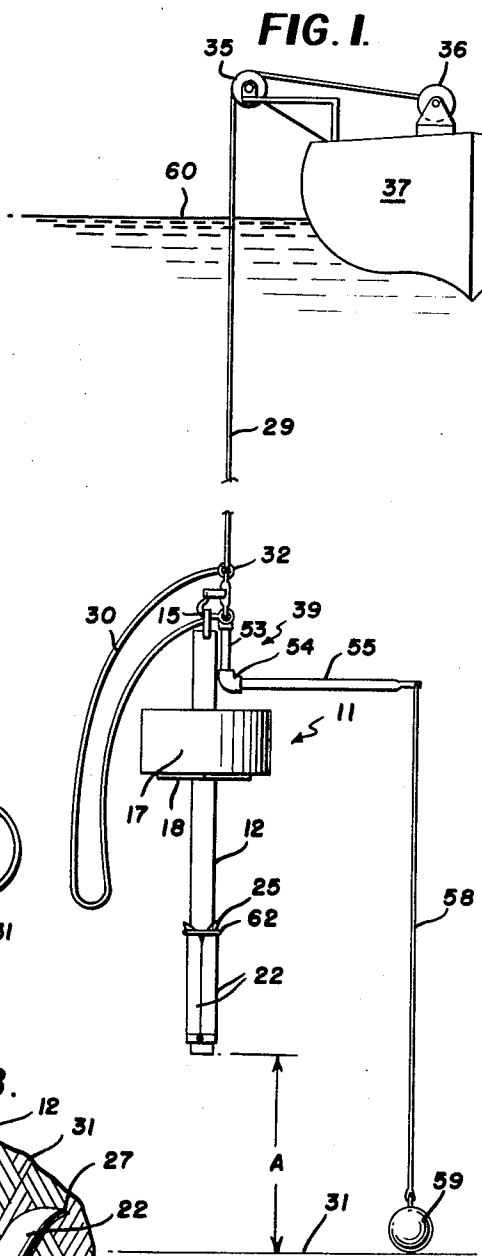
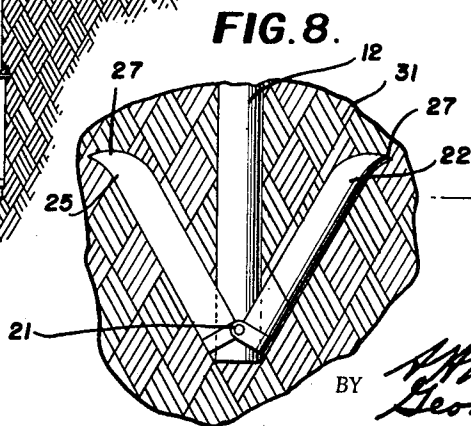
W. M. EWING ET AL

2,703,544

DEEP-SEA ANCHOR

Filed July 11, 1952

3 Sheets-Sheet 1



INVENTOR:

WILLIAM M. EWING
JOHN L. WORZEL

BY

George Siplin

ATTORNEYS

March 8, 1955

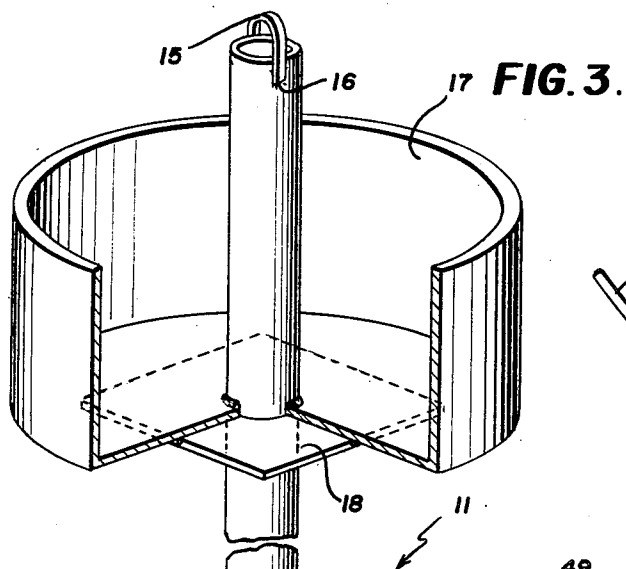
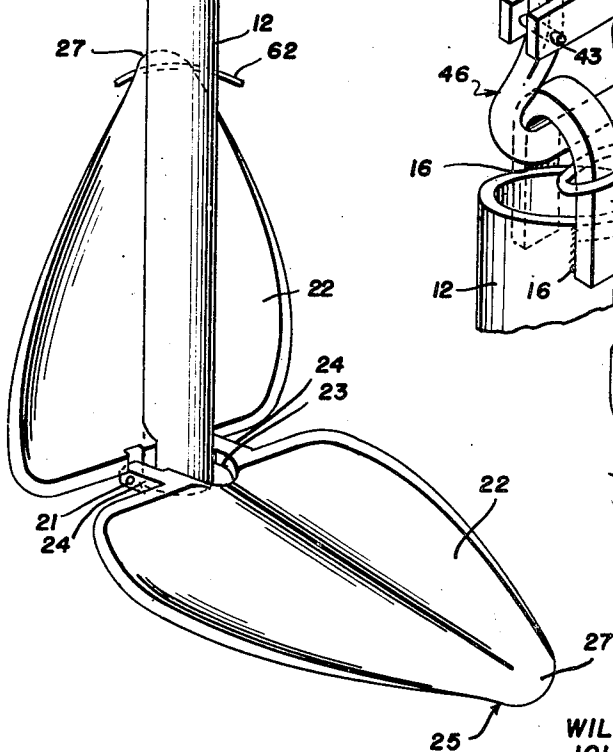
W. M. EWING ET AL

2,703,544

DEEP-SEA ANCHOR

Filed July 11, 1952

3 Sheets-Sheet 2



INVENTORS
WILLIAM M. EWING
JOHN L. WORZEL
BY *George S. Lipkin*
ATTORNEYS

March 8, 1955

W. M. EWING ET AL
DEEP-SEA ANCHOR

2,703,544

Filed July 11, 1952

3 Sheets-Sheet 3

FIG. 5.

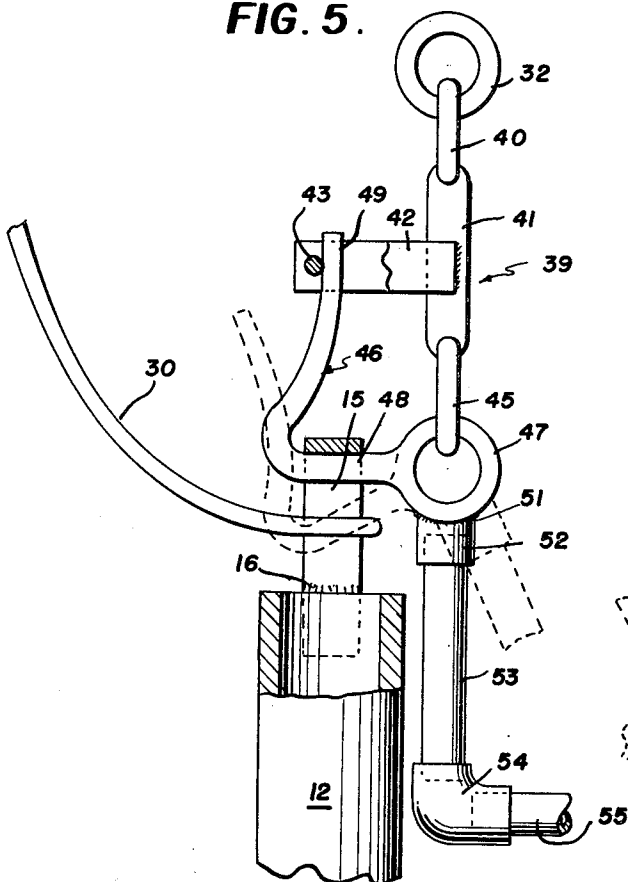


FIG. 6.

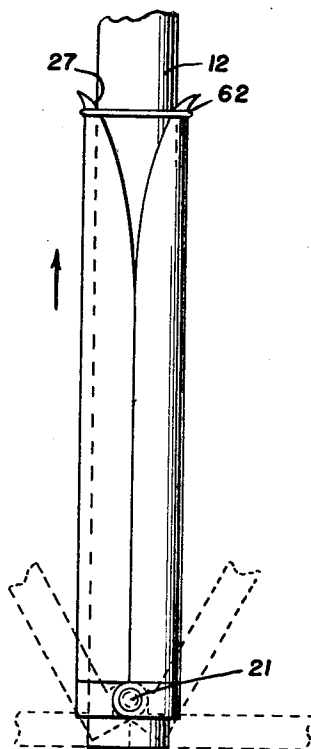
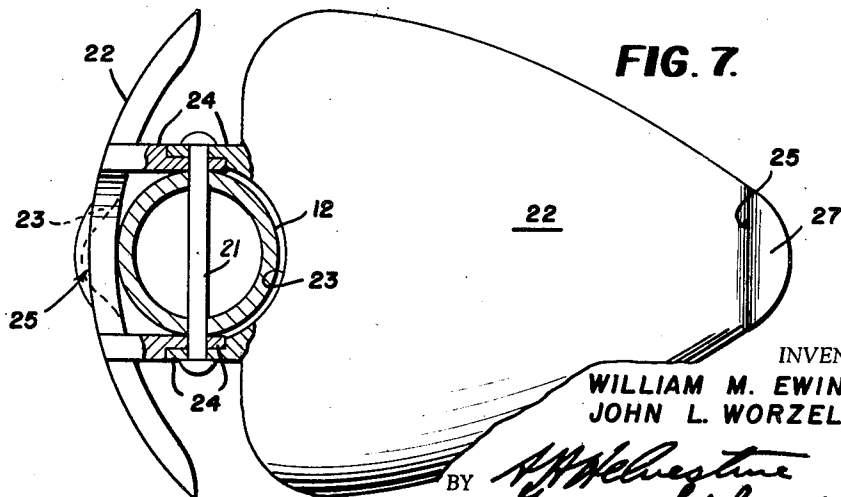


FIG. 7.



INVENTORS

WILLIAM M. EWING
JOHN L. WORZEL

BY

H. H. Westlake
George Sipton

ATTORNEYS

1

2,703,544

DEEP-SEA ANCHOR

William M. Ewing and John L. Worzel, Palisades, N. Y.,
assignors to the United States of America

Application July 11, 1952, Serial No. 298,273

7 Claims. (Cl. 114—206)

The present invention relates to improvements in anchoring apparatus comprising anchors; and more particularly relates to anchors for ocean-going vessels, buoys, etc., having automatically releasable flukes.

Anchors are known which are dropped over the side of a launching vessel and allowed to sink so that they fall substantially unhindered for the full distance from the vessel to the ocean bed. However, upon reaching the ocean bed such anchors usually either do not penetrate the ground forming the ocean bed to any significant extent or penetrate the ground at an angle to the ocean bed and then only to a minor extent. Such an anchor, even when provided with flukes, does not firmly hold the vessel, buoy or other object to which it is attached because the anchor can be readily dragged along the ocean bed when the anchored object is moved by surface currents or tides.

A principal object of the invention is to provide a fluke-type anchor with control and release means that causes the anchor to penetrate the ground for increased holding power.

Another object of the present invention is to provide an anchoring device comprising an anchor that initially falls with the aid of a ballast, but which falls freely after it reaches a predetermined point somewhat above the ocean bed and imbeds itself into the ground.

A further object of the invention is to provide an anchoring device of a type described having an anchor provided with movable flukes that are closed against the anchor shank during fall of the anchor, but which tend to open after the anchor becomes imbedded in the ground and is acted upon by a force tending to drag or otherwise move the anchor away from its position.

In accordance with certain aspects of the invention, an anchor is provided that comprises foldable flukes attached to the end of the anchor-shank, the flukes being held along the side of the shank by a releasable locking-means. During lowering of the anchor, the flukes are tied to the sides of the shank so as to provide a minimum of resistance to falling. In order to imbed the anchor into the ocean bed where the flukes will be most effective, the anchor has associated therewith an extra length of loose cable. This cable is held by a releasable holding mechanism until the mechanism is released or unlocked by a trigger means when the anchor has fallen to a depth which is a predetermined distance above the ocean bed. The anchor then falls freely and imbeds itself into the ground.

Other objects and features of the invention will be discernible from the following description of a preferred form thereof. The description is to be taken in conjunction with the accompanying drawings, on varying scales, in which:

Figure 1 is an elevational view of an improved anchoring apparatus embodying a preferred form of the invention, after the apparatus has been launched from a craft and has sunk to a point at which its anchor is about to be released by the trigger means in order to allow the anchor to fall freely;

Figure 2 is an elevational view, similar to Figure 1, but showing the anchoring apparatus attached to a buoy and its anchor imbedded in the ocean bed;

Figure 3 is a fragmentary perspective view with parts broken away, of the anchor, a fluke being opened for illustrative purposes;

2

Figure 4 is a fragmentary perspective view of the releasable holding mechanism in its locked position;

Figure 5 is a sectional view taken on the line 5—5 of Figure 4 for showing the operation of the releasable holding mechanism;

Figure 6 is a fragmentary front elevation view for showing the operation of the anchor flukes, the solid lines showing the position of the flukes during lowering of the anchoring, and the broken lines showing two fluke positions as they open;

Figure 7 is a sectional view through the anchor shank, showing one fluke in open position;

Figure 8 is a fragmentary view for illustrating the action of the flukes when the anchor tends to leave the imbedded position shown in Figure 2.

Referring now to the drawings, and more particularly to Figures 3—7, an anchor 11 is shown as comprising a shank 12 which is preferably an open ended tube.

The upper end of the shank 12 has a U-shaped strap 15 attached thereto, as by a weld 16. The upper end of the shank 12 also carries, below the strap 15, a ballast tank 17, and a ballast tank reinforcing member 18. The ballast tank 17 can be filled with ballast 19 to any desired extent. The lower-end of the shank 12 carries a pin 21 which pivotally carries a pair of curved flukes 22 having a cut out portion 23 for the purpose of allowing the flukes to be rotated to a snug fit about the shank 12, a pair of interlocking shouldered positioning lugs 24 at one end and curved portions 25 at the other end. The curved portions 25 have outwardly directed curved broad-faced tips 27, as indicated in Figures 3, 7, and 8.

Attached to the strap 15 at the uppermost end of the shank 12 by any suitable means is an anchor cable 29 with a looped length or portion 30 that is substantially twice the length of the distance from the ocean bottom through which the anchor is to fall freely. This free fall distance is indicated at "A" in Figure 1, and is for the purpose of insuring a penetrating "free fall" force to imbed the anchor into the ocean bottom 31.

The anchor cable 29 may be supported at the upper end of its looped length 30 by looping and braiding the anchor cable 29 through and around a ring 32 that is attached to the anchor 11 as subsequently described. The upper end of the cable may be attached to a buoy bridle 33 of a buoy 34 by any suitable means, as shown in Figure 2; or the cable may be threaded through a pulley 35 to a reel 36 which is attached to a launching vessel 37 by any suitable means, for the purpose, for example, of launching the buoy as shown in Figure 1, or for other purposes.

The ring 32 is connected to the anchor 11 through a cable-holding mechanism indicated generally by the reference numeral 39. This releasable mechanism 39 when locked provides a direct support for the anchor 11 by the cable 29, exclusive of the cable-loop 30. To this end the releasable holding mechanism 39 comprises a latch-bar and a release hook. The latch-bar comprises an upper ring that is linked to the cable-ring 32, a rod 41, yoke bars 42 extending outward from the rod 41, a safety pin 43 which is removed after the apparatus is launched. This release hook is indicated by the reference numeral 46 and comprises a pivot ring 47 linking the ring 45, a release hook shank 48 and a release hook tongue 49. This release hook 46 swings about the ring 45 and its tongue 49 can be inserted through the strap 15 of the anchor 11 and then latched by safety pin 43.

Secured preferably by a weld 51 to the release hook pivot ring 47 is a rigid member preferably an internally threaded pipe coupling 52, to which may be threadedly attached one end of a short section 53 of pipe, the other end of which receives a pipe elbow 54 and a relatively long section 55 of pipe. At the extreme end of pipe 55 is a flattened portion 56 having an aperture 57 that receives a length of cable 58, on the end of which is attached by any suitable means a weighted spherical ball 59, or other weighted means. The product of the weight of the trigger weighted means times the length of the trigger arm 55 is chosen to exceed the product of the anchor weight times the length of the release hook shank 48. The trigger weight is normally about $\frac{1}{10}$ to $\frac{1}{20}$ that

of the anchor weight. The cable 58 extends below the bottom of the anchor 11 for any desired distance. The operation of the device is as follows:

Assume that the anchor 11 is launched by hand, or other suitable means from a launching vessel 37 by use of the reel 36, the pulley 35 and the cable 29. As said anchor descends through the water 60 it travels by its own weight aided by the weight of a ballast 19 in the ballast tank 17, and the weight 59.

During descent of the anchor, the release hook 46 acts as a lever system fulcrumed or pivoted on the ring 45, with the weight of the anchor 11 tending to turn the hook 46 counterclockwise with respect to Figure 1, and the weight of the weighted mass 59 tending to turn the hook 46 clockwise. The moment resulting from the latter, that is, the weight of weight 59 times the perpendicular distance from its line of action to the pivot, is made greater than that resulting from the anchor 11, the ballast tank 17 and the ballast 19, in any manner well known to the art. As a result the tongue 49 remains in upright position during descent of the anchor; while the ballast tank 17 and ballast 19 help to provide a smooth and rapid fall for the anchor.

When the anchor 11 approaches to within a predetermined distance A of the ocean bottom 31, the ball or weight 59 strikes the ocean bottom 31. As the ball 59 strikes said ocean bottom the tension on cable 58 is relieved while the anchor 11 continues to fall of its own weight. The weight of the anchor 11 and the ballasts are now the only forces acting downward on the release hook 46, and tend to turn the hook counterclockwise. The release hook 46 pivots about ring 45 and turns relatively thereto until it slopes downwardly, allowing the U-shaped strap 15 attached to anchor shank 12 to slip over the tongue 49. The loose loop 30 allows the anchor 11 to fall freely and imbed itself in the ocean bed 31. The imbedding of the anchor 11 is aided by the weight of the ballast 19 and the ballast tank 17.

The complete length of the cable in the looped portion 30 of the cable 29 must obviously be longer than the anchor length of the anchor from the upper ring 32 to the lower pin-end 21. Preferably, it should be twice this anchor-length. This means that the length of the cable 58 should be at least as much as that of the part of the cable in the looped portion 30. The looped portion 30 is a continuation of the cable 29 having its end attached to the strap 15 at the top of the anchor-shank 12. This provides a way for raising the anchor when desired.

After the anchor 11 has imbedded itself in the ocean bed 31, tides, underwater currents, storms and other causes tend to shift the buoy 34 or other object that is anchored by the anchor 11. To resist this tendency, the flukes 22 come into operation. While the anchor is dropping, the flukes 22 are held, preferably by a wire 62, in a position substantially parallel to and snug against the anchor shank 12. In this position the flukes interfere as little as possible with the falling and imbedding action of the anchor. After the anchor has become imbedded, any tendency of the anchor to rise or shift will spread the flukes or they may be forcibly spread by a temporary pull on the cable 29 by the launching vessel. When such moving force initially acts on the anchor 11, the broad-faced tips 27 of the flukes are brought against the ground or sediment of the ocean bed 31, causing a camming action that spreads the flukes 22. When this camming action is strong enough, the safety wire 62 breaks, allowing the flukes to open freely. As the flukes open, the opening force cumulatively increases so that the flukes spread for resisting further movement or shift of the anchor 11, except when subjected to a much larger force adequate to raise the anchor.

Various modifications are contemplated and may obviously be resorted to by those skilled in the art without departing from the spirit and scope of the invention, as

hereinafter defined by the appended claims, as only a preferred embodiment thereof has been disclosed.

What is claimed is:

1. Anchoring apparatus comprising an anchor, a launching cable, means attaching said cable to said anchor with a loose looped portion, said means comprising a releasable member operable for releasing said looped portion, and a trigger means operatively coupled to said member for actuating said member when said trigger means contacts the ocean bottom.

2. Anchoring apparatus as defined in claim 1 but further characterized by said trigger means comprising a weighted mass and a supporting cable coupled to said releasable member.

3. An anchor for attachment to the end of an anchor cable comprising: a shank having folding curved flukes pivotally attached thereto, releasable locking means adapted to hold said flukes in a position against said shank of said anchor only when the anchor is lowered into operative position, a holding mechanism secured to the anchor cable and spaced from the end of said cable, said shank releasably attached to said holding mechanism, and weight means operatively coupled to said holding mechanism for releasing the anchor therefrom when contacting the bottom of a body of water.

4. An anchor for attachment to the end of a cable comprising: a shank with folding flukes attached thereto, said flukes having outwardly directed curved broad-faced tips, means comprising a ballast tank and ballast attached to said shank of said anchor to aid in the rapid, smooth descent of said anchor and to aid in obtaining a penetrating free fall force to imbed said flukes into the ocean bottom to prevent removal thereof by elements of tide, currents or weather, holding means coupling said anchor to the cable at a point spaced from the end thereof, and weight means pivotally connected to said holding means and operative to release said anchor from said holding means when contacting the ocean bottom.

5. An anchor comprising: a shank with folding flukes attached thereto, a ballast tank and ballast attached to said shank of said anchor, an anchor launching cable having a loose looped portion at one end thereof, means attaching said end of said cable to said shank of said anchor, holding means attaching said shank to said looped portion at a point spaced from said end thereof, and a counterbalancing releasing means for releasing said shank from said looped portion at said point spaced from said end thereof to thereby enable said anchor to free-fall the extent of said looped portion into the ocean bottom.

6. Anchoring apparatus as defined in claim 1 but further characterized by said trigger means comprising a weight, and the first named means comprising a leverage system with said member pivotally mounted thereon, said anchor releasably supported by said member, said weight being attached to said member to counterbalance said anchor thereon and thereby prevent any pivotal action of said member, and said weight being supported so as to be lower than said anchor.

7. Anchoring apparatus as defined in claim 6 but further characterized by said anchor having a ballast concentrically secured thereon to thereby provide said leverage system with a counterweight for said weight.

References Cited in the file of this patent

UNITED STATES PATENTS

744,421	Small	Nov. 17, 1903
814,229	McGillivray et al.	Mar. 6, 1906
1,427,560	Sperry	Aug. 29, 1922
1,731,785	Mansell	Oct. 15, 1929
1,758,911	Hamilton	May 13, 1930
2,170,889	Allin	Aug. 29, 1939
2,490,460	McAvoy	Dec. 6, 1949