

March 6, 1962

A. MEIXNER

3,023,685

FOCAL PLANE SHUTTER FOR PHOTOGRAPHIC CAMERAS

Filed May 28, 1957

2 Sheets-Sheet 1

FIG. 1

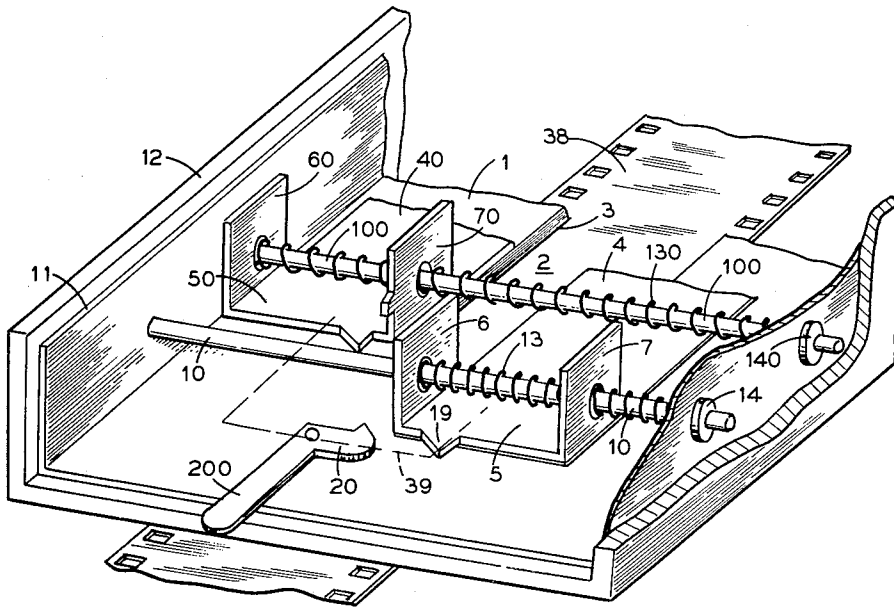
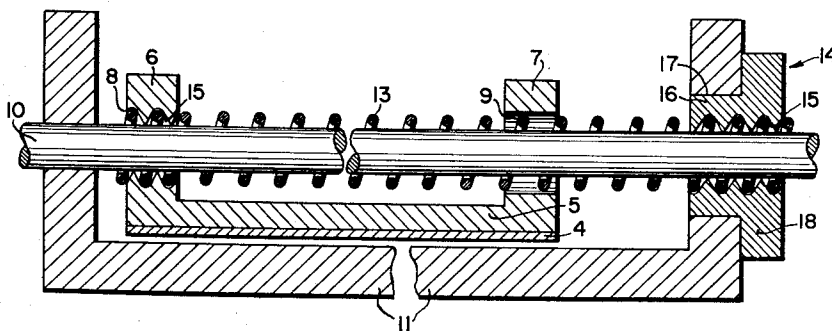


FIG. 2



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FIG. 3

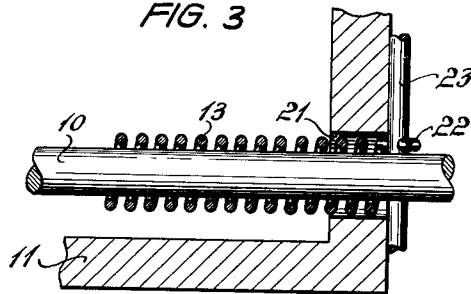


FIG. 4

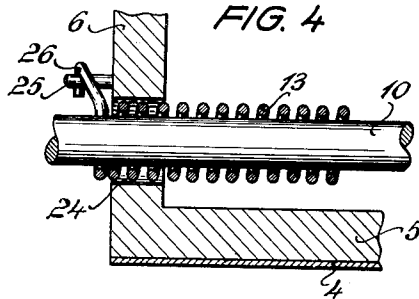
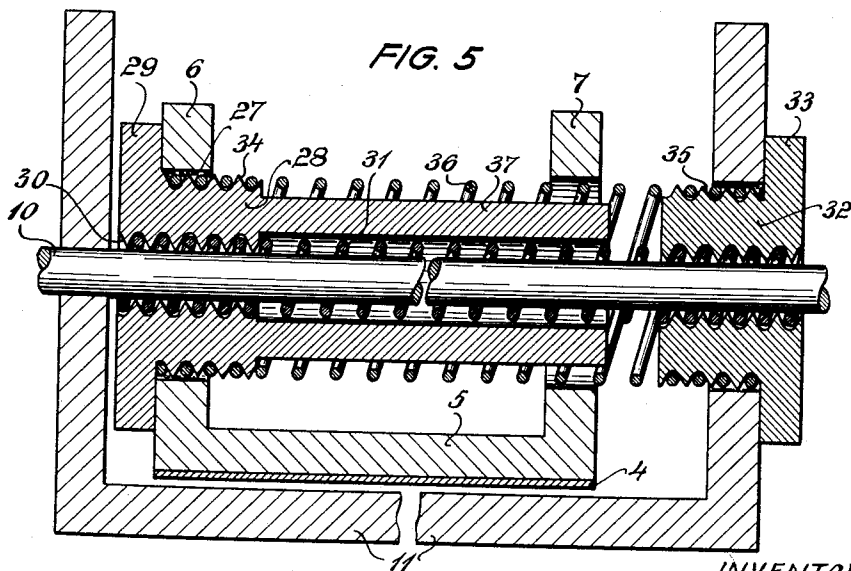


FIG. 5



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FOCAL PLANE SHUTTER FOR PHOTO-
GRAPHIC CAMERAS

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Filed May 28, 1957, Ser. No. 662,280

Claims priority, application Germany June 2, 1956

7 Claims. (Cl. 95—55)

This invention relates to focal plane shutters for photographic cameras, and it has particular relation to shutters of this type in which the image aperture is opened and closed by spring biased slides guided by guide rods arranged at least at one side of the image aperture.

The main object of the present invention is to provide focal plane shutters of the above type in which tension springs acting on rigid slides are arranged in an advantageous, simple and space-saving manner.

In conventional focal plane shutters, in which a slot is formed by rigid slides, the tension or draw springs, which cause movement of the slides during a running down period of the shutter, engage flaps connected with and laterally extending from the slides, or engage spring eyelets. Thus, the draw springs are located laterally of the guide means of the slides. Apart from the extra space thus required another defect consists in that the draw springs not only move the slides, but, due to their laterally offset disposition, cause canting of the slides relative to their guide means, so that part of the spring force is needed for overcoming the resulting increased friction and is lost as far as the fast movement of the slides is considered.

The above described conventional arrangement is particularly disadvantageous in focal plane shutters in which the rigid slides are guided, on both sides of the image aperture, by rails or slots. However, even in focal plane shutters in which the rigid slides are guided only on one side of the image aperture, considerable additional friction losses occur.

In order to avoid such losses, according to the present invention, in focal plane shutters of the above outlined type, each slide is under the effect of a draw spring which is wound with play around its guide rod and is fastened, on the one hand to the slide, and on the other hand, to a fixed point of the shutter casing. As a result of this arrangement of the draw springs, each spring moves its slide almost free from canting on its guide rod, so that the slide moves along its guide rod with low friction. Furthermore, no additional space laterally of the guide rod is needed for the draw springs.

It has been found to be of advantage to hold each of the slides on its guide rod by means of a guide piece, whereby the guide piece has at least the width of the slide. The draw spring, which is wound around the guide rod, is thereby fastened to that side of the guide piece further from the fixed point of the draw springs in the shutter casing. The guide piece may be a bent portion of the rigid slide, or a separate part which is connected to the slide. In order to keep the mass to be moved as low as possible, it is of advantage if the guide piece—which may be, for example, U-shaped—consists of a guide bar or web, the length of which corresponds at least to the width of a slide, and of flaps bent from said bar or web and formed with bores receiving the guide rod and the draw spring wound around the same. Thereby, the draw spring is fastened to the flap which is further from the fixed point of the draw spring in the casing. The guide piece flap which is nearer the fixed point of the draw spring in the casing glides, upon movement of the slide, with its bore on the outer peripheral surface of the draw spring. As, in the case

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of a slide movement, the draw spring moves at the same time due to its contraction in the same direction, the friction between the inner surface of the bore and the peripheral surface of the draw spring will be low.

The free ends of the draw springs may be connected in any suitable manner to the shutter casing and guide piece, respectively. For example, the free ends of the springs can be bent to engage in eyes which are hung in noses, pins and the like. These points of support are then located laterally adjacent the guide rods, so that only slight canting between guide rod and guide piece will occur. As a result of this, the friction which has to be overcome during movement of a slide will be lower than in the before described known arrangement.

In order to further reduce friction, it has been found to be of particular advantage if the draw springs are fixed at their end points over at least one winding or turn of the spring. Such fixing can be preferably carried out in such a manner that the bearings for the draw springs in the casing and in the slides, respectively, consist of bores provided in the walls, which are located around the guide rods and have at least one internal thread-like passage, the dimensions of which are suitably selected so that the ends of the draw springs can be screwed thereto and can thus be fixed. These threaded bores can be provided directly in the shutter casing, or in the wall of the shutter slide, or in the wall of the guide piece connected with the shutter slide. However, according to a modification, particular fixing or fastening means, provided with bores having a thread-like passage, can be fastened to the shutter casing or to the slide to be moved.

According to an advantageous embodiment of the invention, it is contemplated that each draw spring be fastened at one end in a bore, provided with an internal thread-like passage, in the flap of a guide member connected with a slide and with its other end in a fixing or fastening member which is fixedly arranged on a wall of the shutter casing. By such fastening of the ends of the draw springs, the springs will act on the slides almost without canting, so that the friction between the slides and their guide elements is reduced to a relatively low value. Such reduction of the friction results in an increase of the running down velocity of the rigid slides.

In order to further increase this velocity, in a focal plane shutter of the above described type, each of the slides can be under the simultaneous action of two draw springs, the windings of which have different diameters and are coaxially arranged in such a manner that the draw spring having the smaller diameter is wound with play around the guide rod of its slide and both draw springs are fixedly connected with one of their ends to a slide and with the other of their ends to a stationary point on the shutter casing. The fastening of the spring ends to the slide, as well as to the fixed point on the shutter casing, can be carried out in any suitable manner. However, it is advantageous if the corresponding ends of the two springs are secured respectively to the slide and to the shutter casing by common fixing or fastening members, each of which is tubular in form having both internal and external helical grooves on the cylindrical surfaces. The internal helical groove has a diameter such that the end of the drawspring of smaller diameter can be screwed thereto, and the external groove has a diameter such that the end of the drawspring of larger diameter may be screwed thereover. These fastening means are fastened to the slide and to the shutter casing, respectively, in such a manner that they are co-axial with the guide rod. Thus, both draw springs can act on a slide simultaneously, whereby, due to the manner of their engagement of the slides along the guide means, the springs move the slide almost free from canting.

The fixing or fastening means can be fixedly connected

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with the slides and the wall of the shutter casing, respectively, for example by screwing. However, such fixed connection is not necessary if the fixing or fastening members have a shape such that in their predetermined position by the draw springs fastened to them. In this case the fixing or fastening members are preferably cylindrical bodies provided with a collar of larger diameter than that of the cylindrical portion, whereby in or on the cylindrical portion thread-like passages are provided for fastening the drawing spring or springs. These fixing or fastening members are arranged on the slides and on the wall of the shutter casing, respectively, in such a manner that their cylindrical portion passes through a bore provided in said parts and is held by its collar, against the wall containing the bore, by the force of the draw spring or springs connected to them.

The spring biased movement of the slides can be limited by the slide, or its guide member, directly engaging a wall of the shutter casing or a stationary stop. In order to lessen the impact of the slide or its guide member against the wall or stop, the spring securing member mounted in the slide is preferably provided with a collar engaging the side of the guide member furthest from the point of securement of the spring to the shutter casing, and the spring securing member is provided with an extension projecting from that side of the guide member nearest the end of the spring fixed to the shutter casing. Thereby, the spring biased movement of the slides is limited by the projecting portion of the spring securing member engaging a stationary part of the casing.

It will be understood that the above description, which relates to the arrangement and guiding of, and the spring action on, a single slide, equally applies to the second slide provided in the focal plane shutter of the type here in question. In other words, in a focal slide shutter, the so-called opening slide which runs down first and exposes the image aperture, as well as the so-called closing slide which runs down after a predetermined period of time and covers and seals from light the image aperture, can be both arranged, guided and affected by the springs in the above described manner.

Furthermore, the above description also applies to shutter slides which are arranged on guide rods provided on both sides of the image aperture. In this case, for each slide a similar guide device provided with one or two draw springs is used on each side of the image aperture. The draw springs must then be dimensioned in such a manner that they act on both sides of the slides with equal force so that the slides are not subjected to canting by spring forces of different strength.

The present invention can be applied also to focal plane shutters, of a known type, in which the opening slide as well as the closing slide is composed of several individual slides, whereby, during a running down period of the shutter, the individual slides move from a telescopically assembled position, in which they are slid one upon the other or one within the other, or from a drawn apart position, to a position in which they are drawn apart or telescopically slid one over another or one within the other. In this case the main slides provided in the opening slide group and in the closing slide group, respectively, which control and move the other slides of their group, are arranged, guided and operated by the spring or springs, in the above described manner.

The appended drawings illustrate by way of example some specific embodiments of and best modes for carrying out the invention, to which the invention is not limited.

In the drawings:

FIG. 1 is a perspective view of one form of slide operating means embodying the invention;

FIG. 2 is a longitudinal sectional view of the slide operating means of FIG. 1;

FIGS. 3 and 4 are partial sectional views, correspond-

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ing generally to FIG. 2, illustrating alternative arrangements for fastening a spring; and

FIG. 5 is a view similar to FIG. 2 illustrating two concentric coil springs operating on a single slide.

Referring now to the drawings in detail, in FIG. 1 reference numeral 1 denotes the wall of a focal plane shutter casing, in which an image aperture 2 is provided. However, this wall 1 can also be the wall of a camera body. The film 38 to be exposed lies against the wall surface 3, i.e. the lower surface with reference to the drawing. The image aperture 2 is covered and exposed, in a manner known by itself, by rigid slides. This takes place, in the conventional manner, whereby in set position of the shutter, one slide covers the image aperture and seals it from light, while the front edge of the other slide is located near one side of the image aperture, but does not project into the range of the image aperture. Upon release of the shutter, the first mentioned slide, the so-called opening slide, is released from its up to then arrested position, whereby it is removed from the range of the image aperture which thus becomes exposed. The so-called closing slide, which starts movement after a predetermined period of time, will then move into the range of the image aperture and finally covers the latter and seals it from light.

For the sake of a clear illustration, in FIG. 1 only portions of an opening slide 4 and of a closing slide 40 are illustrated. Opening slide 4 is shown in an intermediate position, whereas closing slide 40 is shown in its set position before release. As shown in FIGS. 1 and 2, a guide element 5 is fastened to slide 4 and has ends bent to form guide flaps 6 and 7 provided with bores 8 and 9 through which a guide rod 10, fixed against longitudinal movement, extends. Rod 10 passes through the upright walls of a U-shaped partition 11 of the shutter casing, these upright walls being connected with camera side walls 12, which latter are perpendicular to wall 1. Guide rod 10 is embraced with play by draw spring 13, one end of which is fastened to flap 6 and the other in a holding member 14. In order to secure the ends of the drawspring 13, the bore 8 of the guide flap 6 (see FIG. 2) is formed with a helical groove 15 having a diameter and pitch which respectively correspond to those of draw spring 13, so that by a screwing movement this spring can be introduced into bore 8 and fixed therein. In order to safely fix the end of spring 13 in this manner, it is advisable to provide a complete turn 15, but by corresponding dimensioning of the thickness of flap 6, several turns may likewise be used. The initial tension of the draw spring can be adjusted in dependence on the depth to which the spring is screwed in. Draw spring 13 extends with play through the bore 9 of guide flap 7 and is screwed into a helical groove 15 formed interiorly in securing member 14. Member 14 has a cylindrical portion 16 extending through a bore 17 in partition 11, and has a collar 18 held against the outer surface of partition 11 by the tension of spring 13.

The closing slide 40 is guided by a rod 100 arranged and mounted similarly to the rod 10, and rod 100 is embraced by a coil spring 130. A guide element 50 is secured to, or forms part of, the closing slide 40 and has perpendicular flaps 60 and 70 through which the guide rod 100 and the spring 130 extend. One end of spring 130 is secured in the flap 60 in the same manner as the corresponding end of spring 13 is secured in the flap 6. The spring 130 extends through an aperture in the flap 70 and has its other end secured in a member 140 mounted on partition 11 in the same manner as the corresponding end of spring 13 is secured in the securing member 14.

As best seen in FIG. 1, member 5 is provided with a nose 19 which, in the set position of slide 4, is engaged by a holding lever 20 pivotally mounted on partition 11 and having an arm 200 forming a release handle therefor. However, arm 200 may be connected in a known manner through intermediate members to a conventional shutter

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release key for operation by the latter. When lever 20 is operated to disengage nose 19, slide 4 runs down under the tension of spring 13 until guide flap 7 abuts partition 11. The broken line 39 interconnecting the members 5 and 50 indicates any suitable type of known mechanism, common in focal plane shutters, for effecting release of closing slide 50 from its set position a predetermined time after opening slide 5 has been released from its set position so that slide 50 can be drawn down by the tension of spring 130 to close the aperture 2.

Due to the particular disposition and arrangement of the drawspring 13 and 130, the movement of the two slides under the tension of the respective springs takes place in such a manner that no canting of the respective guide pieces 5 or 50 on the guide rods occur.

However, shortly before, nose 19 encounters lever 39, which is located in its runway, and causes tilting thereof. Thereby slide 240, which lies against lever 39, is displaced. Said slide 240 causes tilting of lever 41 against the force of spring 142 acting on said lever, whereby lever 41 releases nose 42 located on guide member 50. Thus, slide 40—which is detained by lever 41 in the position shown in the drawing—can now run down under the effect of draw spring 130 and close image aperture 2 in lighttight manner. Limitation of this running down step is brought about by a projection 43 provided on guide flap 70, when said projection encounters guide flap 6 of guide element 5. Fastened to flap 6 of said element 5 is a rope 44, the other end of which is fastened to drum 45, which is seated on shaft 46 rotatably arranged in partition 11. By turning shaft 46, rope 44 can be wound on said drum, whereby guide element 5 and guide member 50, which lies against said element by projection 43, can be brought to set position, in which they are then detained by levers 20 and 41 until the next release of the shutter. This setting and release device has been disclosed in detail in co-pending application Ser. No. 634,660 filed in the United States Patent Office in the name of Alfred Meixner January 17, 1957, now Patent No. 2,950,665.

FIGS. 3 and 4 illustrate some modified arrangements for fastening the ends of draw springs 13 and 130. As these arrangements are identical for both springs 13 and 130, they will be shown and described as applied only to spring 13 in order to simplify the description of the invention.

According to FIG. 3, draw spring 13, respectively 130, wound with play around the guide rod, passes through bore 21 of partition 11 and has its free end bent to form a loop 22 engaged by a pin 23, which is held by the springs against partition 11.

An example of fastening the other end of the spring is shown in FIG. 4. According to this figure, draw spring 13 passes through a bore 24 in guide flap 6, to which a pin 25 is fastened. The end of spring 13 is bent to form a loop 26 which is engaged with pin 25.

In the embodiment shown in FIG. 5, a single slide is simultaneously under the effect of two draw springs. In guide flap 6, which consists of a bent portion of member 5, a bore 27 is provided and the cylindrical part of a fastening member 28 passes through this bore. Member 28 has a collar 29 engaging guide flap 6, and has a central bore formed with several turns of a helical groove or thread 30, in which one end of draw spring 31—which is wound with play around guide rod 10—is fastened, spring 31 being held on its other end in similar manner in a holding member 32, which passes through partition 11 and has a collar 33 engaging partition 11. The outer surfaces of each of the cylindrical portions of members 28 and 32 are formed with several turns of a helical groove or thread such as 34 or 35, to which the ends of the second drawspring 36 may be secured by a screwing movement. Member 28 has a cylindrical extension 37 which extends throughout members 28 and 32, is provided with several windings of an outer thread-like passage 34 and 35, re-

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spectively, to which the ends of a second draw spring 36 are fastened by a screwing movement. Member 28 has a cylindrical extension 37, which extends the entire length of member 5, passes through guide flap 7 and projects from the latter over an additional short distance.

Upon termination of a running down movement of the slide, which is effected by draw springs 31 and 36, the projecting end of extension 37 abuts against the inner end of holding member 32, whereby the movement of holding members 28 and 32 toward each other is limited. As there is no rigid connection between members 28, 32 and the parts in which they are journaled, i.e. guide flap 6 and partition 11, respectively, when extension 37 abuts member 32, the guide piece formed by parts 5, 6 and 7 and the slide 4 connected therewith, can move away from collar 29 of member 28 until guide flap 7 abuts partition 11. This abutment does not take place directly under the force of springs 31 and 36, and guide flap 7 abuts only with the force of the inherent kinetic energy of the beforementioned guide piece and slide 4. Thus, the effect of the two draw springs 31 and 36, which simultaneously act on slide 4, is limited at two different places and at two different moments, so that the elastic forces will have no harmful effect on the parts of the shutter.

It will be understood from the above that this invention is not limited to the specific elements, designs, arrangements, steps and other details specifically described above and illustrated in the drawings and can be carried out with various modifications without departing from the scope of the invention, as defined in the appended claims.

What is claimed is:

1. A focal plane shutter for photographic cameras comprising, in combination, a first wall formed with an image aperture having a pair of opposed substantially parallel edges; means forming a pair of second walls substantially perpendicular to said first wall and extending parallel to and spaced from said pair of opposite edges of said aperture; a guide rod, fixed against movement, extending in laterally spaced relation to said aperture through aligned apertures in said second walls and in spaced parallel relation to said first wall; a shutter slide movable along said first wall relative to said aperture to open and close the latter; means forming a pair of ears extending substantially perpendicular to said slide from opposed edges of the latter, said ears being formed with aligned apertures receiving said rod; said apertures in said ears and the apertures in one second wall having a diameter in excess of that of said guide rod to provide annular spaces therearound; a tension coil spring embracing said rod with clearance and extending through each of said annular spaces so as to be interposed between the slide and the guide rod, said coil spring being anchored at one end to said one second wall and at the other end to the one of said ears further from said one second wall, and biasing said slide to move toward said one second wall; and releasable latch means cooperable with said slide normally retaining said slide in a cocked position with said coil spring under tension, for movement of said slide across said image aperture by said spring upon release of said latch means.

2. A focal plane shutter as claimed in claim 1 in which plural end turns of said spring are anchored in said one second wall and in said one ear.

3. A focal plane shutter as claimed in claim 1 in which the apertures in said one second wall and in said one ear are threaded to receive plural coils of said spring.

4. A focal plane shutter as claimed in claim 3 in which the aperture in said one second wall is formed in an annular holding member having a cylindrical portion engaged in a relatively large opening in said one second wall and a collar engaging the outer surface of said one second wall.

5. A focal plane shutter as claimed in claim 1 in which

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said spring is anchored to pin means on said one second wall and on said one ear.

6. A focal plane shutter as claimed in claim 4 in which the apertures in said ears are formed in a second holding member, having a tubular portion extending through openings in both of said ears and a collar engaging said one ear; said second holding member being threaded internally adjacent said collar to receive the end turns of said coil spring; a second tension coil spring surrounding said second holding member with clearance therewith; said first holding member having an external thread receiving end turns of said second coil spring on one end thereof, and said second holding member having an external thread in the portion extending through the open-

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ing in said one ear and receiving turns of said second coil spring on the opposite end thereof.

7. A focal plane shutter as claimed in claim 6 in which the tubular portion of said second holding member projects beyond the opening in the other ear to abut the inner end of said first holding member when said slide is moved by said springs.

References Cited in the file of this patent

UNITED STATES PATENTS

597,134	Adams	Jan. 11, 1898
1,361,939	Wallace	Dec. 14, 1920
2,206,105	Mihalyi	July 2, 1940