July 17, 1934. C. W. KABISIUS 1,966,448

MECHANICAL CRAWL STROKE SWIMMING INSTRUCTOR

Original Filed Feb. 12, 1927 3 Sheets-Sheet 1

Fig. 1

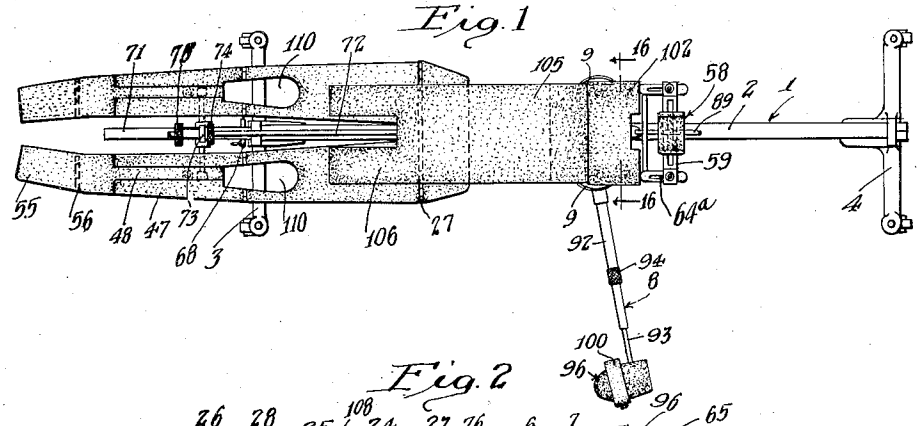
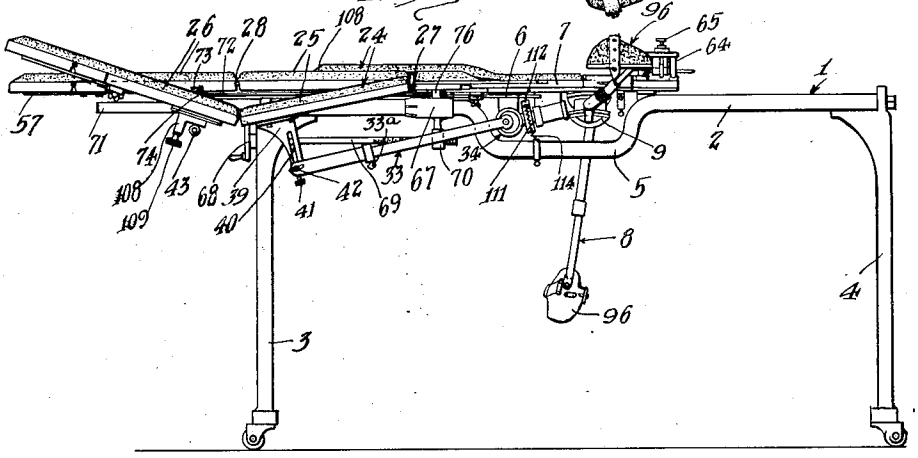


Fig. 2



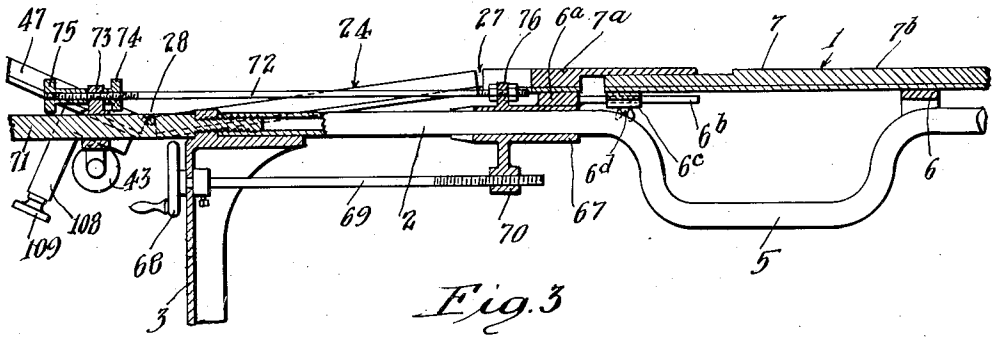


Fig. 3

Inventor
Charles W. Kabisius

By Lyon & Lyon Attorneys

July 17, 1934. C. W. KABISIUS 1,966,448

MECHANICAL CRAWL STROKE SWIMMING INSTRUCTOR

Original Filed Feb. 12, 1927 3 Sheets-Sheet 2

Fig. 4

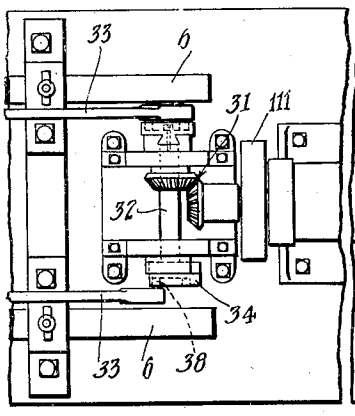


Fig. 5

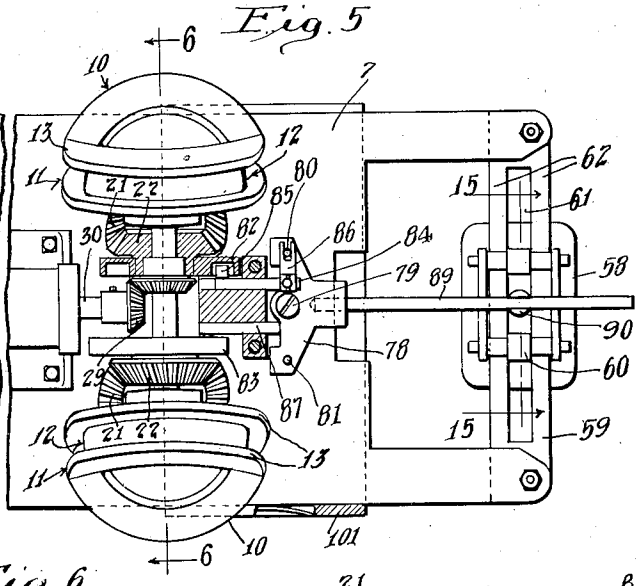


Fig. 6

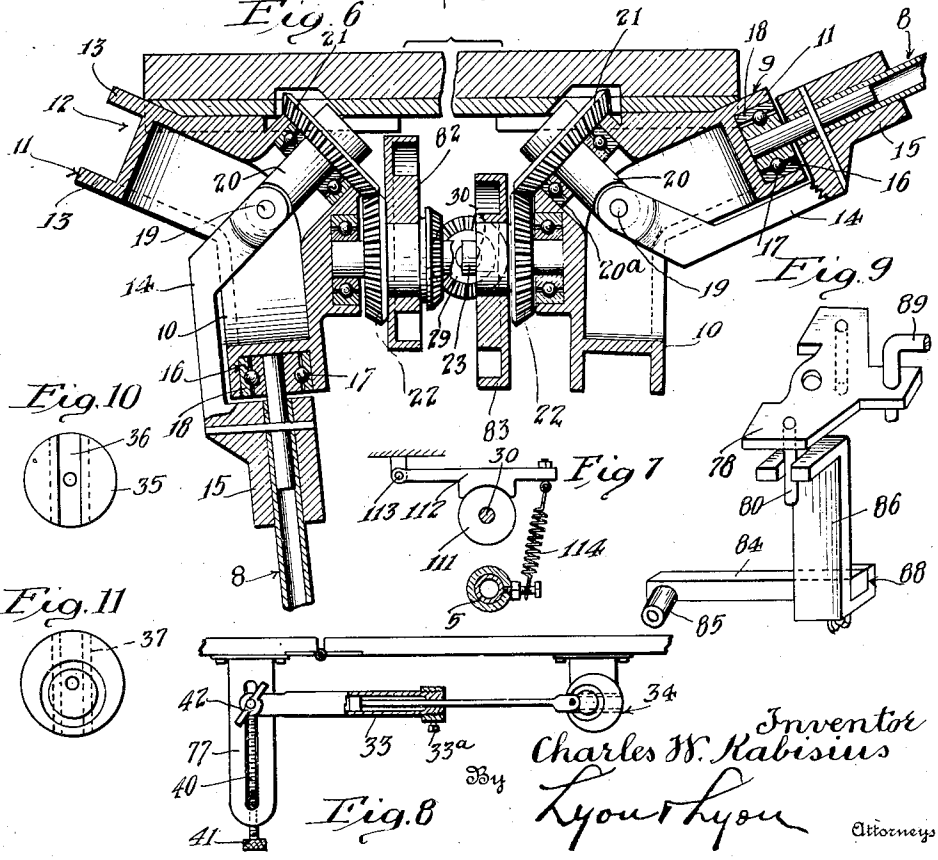


Fig. 9

Fig. 10

Fig. 7

Fig. 11

Fig. 8

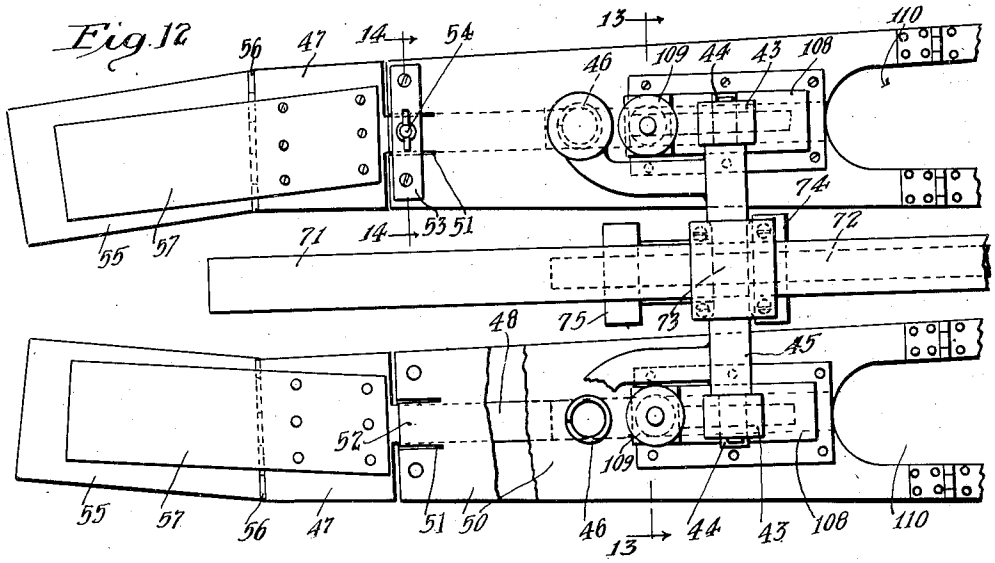
Inventor
Charles W. Kabisius
By
Lyon & Lyon
Attorneys

July 17, 1934. C. W. KABISIUS 1,966,448

MECHANICAL CRAWL STROKE SWIMMING INSTRUCTOR

Original Filed Feb. 12, 1927 3 Sheets-Sheet 3

Fig. 12



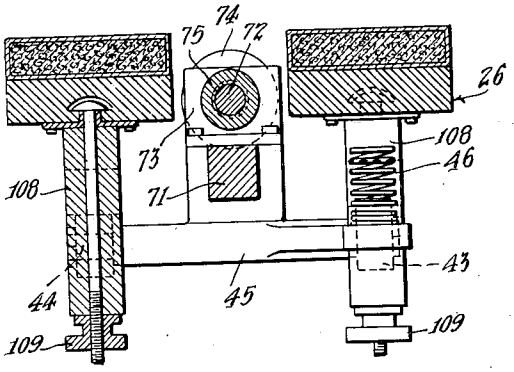


Fig. 13

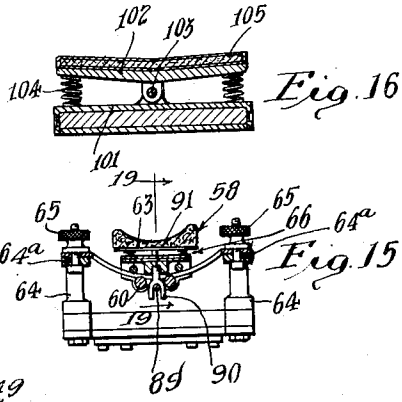


Fig. 15

Fig. 16

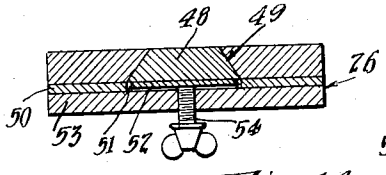


Fig. 14

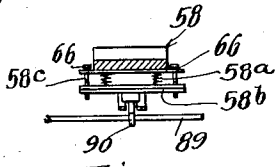


Fig. 19

Fig. 18

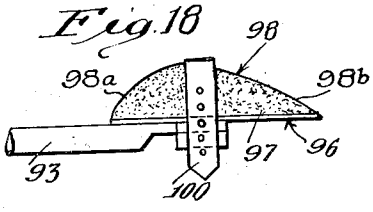
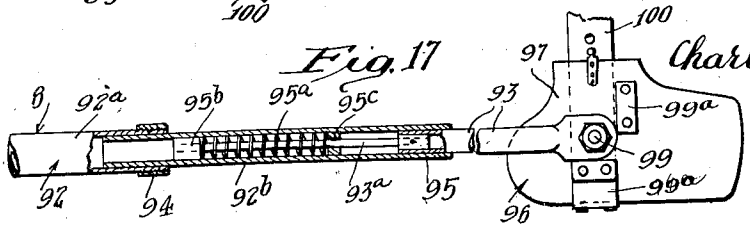


Fig. 17



Inventor
Charles W. Kabisius
Lyon & Lyon
Attorneys

Patented July 17, 1934 1,966,448

UNITED STATES PATENT OFFICE

1,966,448

MECHANICAL CRAWL STROKE SWIMMING INSTRUCTOR

Charles W. Kabisius, Santa Monica, Calif.

Original application February 12, 1927, Serial No. 167,813. Divided and this application January 14, 1928, Serial No. 246,676. Renewed January 31, 1933

20 Claims. (Cl. 272—71)

This invention relates to an apparatus the purpose of which is to facilitate the teaching of the movements employed in the American crawl and similar swimming strokes.

In this "stroke" and similar strokes, there is a synchronous operation of the head and legs with the arms. During the pull or rearward stroke of either arm under the body, the forward movement of the other arm is made with the arm raised above the surface of the water and with a natural bend at the elbow. This movement causes the swimmer's body to rock slightly on its longitudinal axis. The swimmer's head is oscillated to one side or the other to breathe. The legs oscillate up and down in timed relation with the arm movements.

The general object of this invention is to provide a simple apparatus which will enable the swimmer's arms and legs to be guided in synchronism to execute the movements necessary in producing this form of swimming stroke and also to provide the apparatus with means for resting the swimmer's head and if desired for oscillating the same in synchronism with the arm movements.

A further object of the invention is to provide the apparatus with a breast support which may be used, if desired, for supporting the swimmer's breast to facilitate the rocking of his body to simulate the natural motion of the body when using this form of swimming stroke.

A further object of the invention is to provide a construction for the parts which will enable the degree of the leg movements to be regulated and to provide a construction which will enable the shin and foot of the swimmer to be moved in a desired relation.

A further object of the invention is to provide a construction for the frame and supports for the parts which will enable the apparatus to be readily adapted to persons of different size. A further object of this invention is to provide sectional leg levers for supporting the student's legs along their length and for oscillating them up and down simultaneously and oppositely in a plane perpendicular to the body rest in the flutter movement of this form of stroke, the cycles of the oscillating movements of the leg levers to be at a predetermined ratio to the cycle of movements of the arm levers.

The apparatus includes arms corresponding to the arms of the swimmer and one of the objects of the invention is to provide improved means for guiding these arms to execute the desired stroke and to construct the said arms in such a way that in the forward movement of the swimmer's arm when out of the water, the arm of the apparatus tends to flex the arm of the "swimmer".

A further object of the invention is to provide the arms of the apparatus with means tending to hold the swimmer's hand in an extended and cupped position with the fingers together, assuming a position the swimmer's hand should assume in executing this stroke.

A further object of the invention is to construct the leg supports in such a way that the joint of the swimmer's knee may be brought into position so that it will substantially coincide with the axis of the joint connection between the thigh section of the leg support and the shin section.

Further objects of the invention will appear hereinafter.

The invention consists of the novel parts and combination of parts to be described hereinafter, all of which contribute to produce an efficient mechanical swimming instructor.

A preferred embodiment of the invention is described in the following specification, while the broad scope of the invention is pointed out in the appended claims.

In the drawings:

Figure 1 is a plan of an apparatus embodying my invention;

Figure 2 is a side elevation of the apparatus shown in Figure 1;

Figure 3 is a longitudinal central section through the middle portion of the apparatus shown in Figures 1 and 2 with certain parts broken away;

Figure 4 is a bottom plan view of the apparatus broken away and particularly illustrating an embodiment of the mechanism which is employed for oscillating the leg sections of the leg supports;

Figure 5 is a bottom plan view of the head end of the apparatus or machine with certain parts broken away and others shown in section; this view particularly illustrates the preferred means for oscillating the swimmer's head and also illustrates the guide cams for the arms of the apparatus;

Figure 6 is a vertical section taken about on the line 6—6 of Figure 5 and further illustrating details of the arm guides and the arrangement of the cams for oscillating the swimmer's head; this view also illustrates the connection between the arms of the apparatus;

Figure 7 shows the details of a brake apparatus that may be used for developing a resistance to the movement of the arms and leg supports of the apparatus; this view is a vertical section taken in a longitudinal plane adjacent the brake device, certain parts being broken away;

Figure 8 is a detailed side elevation with certain parts broken away and shown in section; this view particularly illustrates a modified embodiment of the connecting rod for oscillating the leg sections of the leg supports;

Figure 9 is a perspective illustrating details of

means which I employ for adapting the same apparatus to enable the head of the swimmer to be oscillated to the left or to the right to suit the special desires of the "swimmer";

Figures 10 and 11 are details illustrating the preferred construction of the rotary member that oscillates the leg supports; Figure 10 shows a face view of the driving collar and Figure 11 shows a face view of a driven collar that carries the cam to which the cam roller on the connecting rod connects;

Figure 12 is a bottom plan of the foot end of the apparatus upon an enlarged scale, certain parts being broken away;

Figure 13 is a cross-section through the foot end of the apparatus taken about on the line 13—13 of Figure 12;

Figure 14 is a section taken about on the line 14—14 of Figure 12 and particularly illustrating details of an adjustment to enable the footboards of the apparatus to be extended;

Figure 15 is a section taken about on the line 15—15 of Figure 5 and particularly illustrating details of the construction of the head-rest and means for guiding the same to enable the swimmer's head to be oscillated;

Figure 16 is a vertical section taken at the location of the line 16—16 of Figure 1 and particularly illustrating the construction of a breast support which may be employed to support the swimmer's breast near the neck, and which is constructed to facilitate the rocking movement of the swimmer which characterizes certain forms of this swimming stroke;

Figure 17 is a detail of one of the arms of the apparatus broken away and partially shown in section and also illustrating the hand hold or block which is used at the end of the arm to be held by the swimmer's hand;

Figure 18 is a side elevation of the hand hold or block and showing a short portion of the outer extension of the arm of the apparatus; and

Figure 19 is a section on the line 19—19 of Figure 15, illustrating details of an adjustment that may be used in the construction of the head-rest.

The apparatus embodying this invention, as illustrated, includes a frame 1 having a substantially horizontal bar 2 supported on a foot leg or standard 3 and a head leg or standard 4. The middle portion 5 of the frame bar 2 is offset downwardly so as to accommodate the mechanism of the apparatus above the dropped portion. On the frame bar 1, near the extremities of the offset portion 5, two transverse frame bars 6 and 6a are provided, which assist in supporting the body rests and other parts of the apparatus. These parts include a breast board or body rest 7, which is supported in a horizontal position toward the head end of the device. On the under side of this body rest and at each side of it, two arms 8 are provided, which are mounted and guided on the swimming machine in such a way that they will operate as guides for guiding the arms of the "swimmer" to cause him to execute the desired swimming stroke, preferably the stroke known as the "American crawl". In order to guide the arms in this way, I provide two guides 9 which are in the form of cams. These cams include portions or extensions 10 and 11 located angularly to each other. Each cam is provided with a continuous guide track 12 which passes around its edge, said track being in the form of a channel-shape runway, with projecting flanges 13.

In the angle formed between the planes of the upper and lower portions of each cam, I provide an offset arm bracket 14. This arm bracket is supported for rotation in the angle between the two planes referred to, preferably in a bearing 20a, and the outer portion of each bracket is offset laterally and carries a sleeve 15 to which the inner end of the corresponding arm 8 is secured. (See Fig. 6.) At the inner end of each sleeve 15 a roller 16 is provided, carrying a roller bearing 17 to reduce friction. This roller includes an outer ring 18 which is of a diameter to enable it to fit neatly in the space between the flanges 13. The inner end of each arm bracket is attached by a pivotal connection, for example, a knuckle joint 19, and the construction is such that the arm at one side of the machine is connected to the arm at the other side of the machine, so that the arms will move in synchronism with each other. The arms are oppositely placed so that when the arm at one side is being guided along the upper portion of its cam, the arm at the other side is being guided along the lower portion of the other cam. This will cause the arms to move in a manner corresponding to the "American crawl" stroke. In this connection, attention is called to the fact that the lower portions 10 of the cams incline inwardly and converge toward each other in a downward direction. This will cause the arm to move under the body in passing toward the rear in the working portion of the stroke.

By reason of the angular elevation of the upper portion 11 of the cam, the "swimmer's" arm will be held in an elevated position as it passes forwardly. This corresponds to the forward movement of the "swimmer's" arm out of the water in executing this "stroke" or "crawl".

It should be understood that this apparatus provides mechanism for supporting the legs of the "swimmer" and for oscillating the same in synchronism with the arms. In order to accomplish this and at the same time connect the opposite arms 8 with each other, I provide a stub shaft 20 corresponding to each knuckle joint 19. This stub shaft carries a bevel gear 21 which meshes with a bevel gear 22 on a cross shaft 23. I utilize this shaft 23 to impart the other synchronized movements of the apparatus.

The foot end, 7a, of the breast board 7 carries two oppositely disposed leg supports 24 (see Fig. 1), and each of these leg supports includes a thigh section 25 and a shin section 26. The thigh section is connected by a suitable pivot joint or hinge 27 with the lower edge of the breast board, and a hinge joint or "knee" joint 28 connects the upper end of the shin section with the lower end of the thigh section. The mechanism which connects the shaft 23 with each leg support 24 to operate it is constructed in such a way that the degree of movement imparted to the leg support can be nicely regulated.

In order to drive the leg supports, I provide the cross shaft 23 with bevel gears 29 (see Fig. 5), which drive a counter shaft 30. This shaft 30 extends toward the foot end of the machine and through the medium of bevel gears 31 drives a cross shaft 32. At each end of this cross shaft a rotary device is provided for imparting movement to a connecting rod 33 to actuate the thigh section 25. The rotary device is preferably in the form of a cam 34, mounted in such a way that the eccentricity of the cam can be readily regulated as desired. The means for accomplishing this is illustrated in Figs. 10 and 11. In order to do this, the end of the shaft 32 is provided

with a collar 35, having a transverse under-cut slot 36 passing along the diameter of the collar. The inner side of the cam is provided with a corresponding dove-tail tongue 37 which is received in the under-cut or dove-tail groove 36. The cam 34 can be secured in any adjusted position by means of a set screw, not illustrated.

The end of each connecting rod 33 is provided with a roller 38 running in the groove of the cam. The rear end of each connecting rod 33 is attached by an adjustable device to the thigh section 25. By reason of the fact that the cam 34 is mounted so that its eccentricity can be adjusted, it will be evident that the amount of stroke imparted to the connecting rod 33 can be regulated as desired. Furthermore, I prefer to construct the connection of the rod 33 to the thigh section 25 so that it can also be adjusted. For this purpose, I provide the under side of the thigh section 25 with a bracket 39 which extends downwardly (see Fig. 2), and this bracket is provided with a long slot 40, in which the end of the connecting rod is attached. In order to adjust the end of the connecting rod upwardly and provide a stop against which it can rest, the lower end of the bracket is provided with an adjusting screw 41, the tip of which presses against the end of the connecting rod. The end of the connecting rod may be provided with a suitable pivot pin 42, with a suitable clamping nut.

To accomplish a correlated movement of the thigh and shin sections of the leg supports, I provide a relatively fixed support 43 for the under side of the leg section 26, near the "knee" joint 28. This support 43 is preferably in the form of a roller mounted to rotate on a horizontal pin 44 extending from the end of a cross head 45, which may be referred to hereinafter as the foot cross head of the machine. In order to cushion the downward movement of the shin section 26, the foot cross head 45 is provided with a buffer 46, in the form of a coil spring, which engages the under side of the shin section as it swings downwardly.

If desired, the lower end of each shin section may be provided with a foot board 47 (see Fig. 12), the body of which is attached to the lower end of the shin section by means of a tongue 48 of dove-tail cross section, which fits in a dove-tail groove 49 (see Fig. 14). On the under side of the shin section at this point a metal plate 50 is provided, which is provided with two oppositely disposed slots 51 which form the rear end of this plate 50 into a tongue 52. A cross bar 53 is provided at this tongue with a wing bolt 54 for clamping the tongue against the tongue 48 (see Fig. 14). In this way, each foot board 47 may be extended beyond the end of the shin section as far as desired. Each foot board includes a wing portion 55 which is connected by a hinge joint 56 to the body of the foot board, and this wing portion of the foot board is normally supported in a substantially horizontal position by means of a light spring 57 in the form of a thin plate of sheet metal, one end of which is riveted to the under side of the relatively fixed part of the foot board. The action of this foot board in the swimming movement will be described more in detail at another point.

The apparatus is provided with a headrest for supporting the swimmer's head and with means if desired for oscillating the head of the "swimmer" to simulate the natural movements of the head in swimming with this crawl stroke. In this connection, it is to be understood that in executing this stroke the "swimmer" turns his head from a central position either toward the right or left, in synchronism with the arm movements for the purpose of inhaling through the mouth. During a part of the stroke the face of the "swimmer" is under water, at which time the air is expelled through the nose. If desired in order to give the swimmer's head this oscillating movement, I provide means in contact with the head which is automatically moved by the mechanism so as to move the "swimmer's" head. In the present instance, this is accomplished by means of a head rest 58 (see Fig. 15), which is in the form of a carriage guided to slide to and fro on a curved guide or track 59. The carriage or rest 58 is provided with lower rollers 60 which roll in the slot 61 between the parallel bars 62 of the guide, and it also includes upper rollers 63 which roll on the upper side of the guide (see Fig. 15). The upper portion of the rest is upholstered to provide a comfortable support for the "swimmer's" chin. The ends of the guide 59 are supported on posts 64 running in adjusting slots 64^a, in which they are secured by means of thumb nuts 65. The head rest 58 is adjustable vertically (see Fig. 19). Any suitable construction may be used, but it preferably includes two compression springs 58^a supported on the base plate 58^b of the rest and let out by adjusting screws 58^c two of which are located at each end of the head rest.

In order to adjust the length of the machine to suit tall or short "swimmers", the apparatus is constructed so that the board or plate 7^a that carries the joints 27 of the leg supports can be adjusted toward or from the head end of the machine. For this purpose, the board 7^a is supported on a cross-head 67 (see Fig. 3). This cross-head is guided to slide on the main frame bar 2 and may be adjusted by means of a hand wheel 68 carried on the end of an adjusting screw 69, the forward end of which is threaded and passes through a threaded arm 70 extending down from the cross head. This cross head 67 constitutes the main cross head of the machine.

I provide means to bridge any gap that might form between the sections of the breast board. For this purpose the section 7^a of the breast board overlaps the upper section 7^b (see Fig. 3). This prevents forming a gap between these sections when the apparatus is lengthened.

To support the lower end of the breast board section 7^b, I provide the cross bar 6^a that is carried in cross-head 67 with two longitudinal tongues 6^b and provide guide brackets 6^c on the board 7^b to slide on the same, with thumb-screws 6^d for clamping these parts in any extended position.

The foot cross-head 45, already referred to, is mounted to slide on a tongue 71, which is preferably of square form to hold the foot cross head upright. The end of this tongue is fastened in the foot end of the frame (see Fig. 3). This cross head is provided with an adjusting screw 72 passing through a lug 73 on the cross head. Knurled nuts 74 and 75 are provided for holding the adjusting screw 72 in any position in which it is left. The forward end of the adjusting screw is secured in a lug 76 on the upper side of the main cross head (see Fig. 3).

The connecting rods 33 are preferably constructed of two telescoping tubes of different diameters, which may be secured in any adjusted length by means of a set screw 33^a (see Fig. 2).

A detail of this construction is illustrated in Fig. 8, which view, however, shows a slightly modified construction for the bracket 77 which is attached to the under side of the thigh board.

If desired, the chin rest or head rest 58 can be employed without any means for oscillating it, in which case the "swimmer" would learn to move his head from the center to the side without any movement being imparted to the head rest. However, I prefer to impart movement to this head rest, for which purpose I provide the mechanism illustrated in Fig. 5, including a rocker 78 which is supported on the under side of the breast board to rock on a vertical pivot 79. The under side of this rocker is provided with two pins 80 and 81, either one of which may be employed in imparting movement to the rocker, depending on whether the "swimmer" desired to turn his head toward the left or toward the right to "breathe". In order to actuate the rocker, I provide two cams 82 and 83, corresponding to the two pins 80 and 81. As illustrated in Fig. 5, the cam 82 is connected by a slide bar 84 with the pin 80. This slide bar has a roller 85 at its rear end which rolls in the slot of the cam. Its forward end carries a cross arm 86, with a fork receiving the pin 80.

On the other side of the longitudinal axis of the machine, a similar slide bar 87 is provided, but as illustrated this slide bar is not in use. The cross arm 86 is in the form of a bracket (see Fig. 9), and has an open socket 88 of channel form, which enables the slide bar 84 to be attached to it in the position shown in Fig. 5. If desired, the bracket arm 86 may be removed from this slide bar 84 and attached to the other slide bar 87 in a reversed position, so as to enable its fork to engage the pin 81 instead of the pin 80. This would give the rocker 78 an opposite movement at the same moment in the cycle of the machine, because the cams 82 and 83 are oppositely placed on the shaft 23.

Any suitable connection may be employed between the rocker 78 and the head rest 58. For this purpose, however, I prefer to employ a tongue 89 which extends forwardly from the side of the rocker 78. This tongue swings from a central position in which it is shown in Fig. 5 toward the right or the left, according to which one of the cams 82 and 83 is driving it. This tongue is straddled by a fork 90 on the lower end of a swivel pin 91, which is swiveled in the under side of the head rest 58 (see Fig. 16).

Each of the arms 8 is preferably constructed with an inner extension 92 and an outer extension 93 (see Fig. 18). If desired, the inner extension 92 may be made of two telescoping tubes 92^a and 92^b, the former of which is split and provided with a clamping nut 94 to clamp the end of the other section 92^b.

The outer extension 93 preferably forms a swivel joint at 95 and 95^b with the outer end of the section 92^b with which it telescopes, and at its outer end carries pivotally a hand hold 96, preferably in the form of a block 97, having a convex upper face 98 upon which the palm of the "swimmer's" hand rests. This causes the "swimmer" to hold his hand in cup shape in "swimming" on the machine.

The face 98 includes an abrupt rear face 98^a to receive the palm of the hand and an inclined face 98^b that holds the fingers of the hand extended at an angle to the palm. This hand hold is connected by a pivot pin 99 with the block, so as to enable the block to be swung on the "swimmer's" hand and stops 99^a are provided to engage the head of the extension 93 and limit the movement of the block. The axis of the pin 99 should coincide substantially with the position of the hand when resting on the block. A strap, or band, 100, is employed passing over the outer face of the fingers to hold them together while resting on the block.

Each arm is provided with a spring 95^a which thrusts against a collar 95^b attached to the inner end of a stem 93^a, which is secured in the inner end of the extension 93. This spring thrusts against a fixed collar 95^c mounted in the extension 92. This spring exerts its force in a direction to pull the extension 93 inwardly and shorten the arm 8. This is a desirable effect because it tends to have the "swimmer" bend his elbow in the forward movement of the stroke when the arm is supposed to be passing forwardly out of the water.

If desired, I may provide a rocking support for the breast of the "swimmer", located at the upper end of the breast board. Such a rocking support is illustrated in Fig. 16. It consists of a saddle plate 101 mounted to rest on the upper side of the breast board 7, and provided on its upper side with a rocker plate 102, mounted to rock on a pivot pin 103 extending along the longitudinal axis of the machine. This rocker is slightly dished on its upper side, and under each edge a coiled buffer spring 104 is provided. The breast board 7 is surmounted by a properly upholstered main pad 105 (see Fig. 1), the lower end of which is bifurcated and formed with tongues 106, which taper down in thickness toward their foot edge 107. This pad 105 is not secured in place but merely rests on the breast board 7. As illustrated in Fig. 1, the rocker breast board 102 is shown in place with the upper end of the breast pad 105 lying substantially against the edge of the saddle plate 101. If desired, however, the saddle plate 101 can be removed and the breast pad 105 slipped up toward the upper end of the machine so as to cover the space left vacant by the breast rocker.

In order to prevent destructive wear on the under sides of the shin extensions 26, their under sides are provided with metal brackets 108, which are adjustable longitudinally on the shin extensions and may be secured in any adjusted position by a set screw 109.

In order to enable the axis of the "knee" joint of the "swimmer" to coincide nearly with the axis of the hinge joints 28 that connect the shin sections with the thigh sections 25, I provide the thigh sections and the adjacent portions of the shin sections with knee openings 110 (see Fig. 1). These openings extend a considerable distance toward the upper end of the leg support, and receive the knee end of the thigh bone of the "swimmer". In this connection, it should be understood that the upper faces of the thigh section and shin section of the leg supports are properly padded, as also is the upper side of the foot boards.

The ends of the foot boards preferably converge toward each other (see Fig. 1), to correspond with the pigeon-toed position for the feet of the "swimmer".

If desired, the machine may be constructed so that a resistance will be offered to the movements of the "swimmer". For this purpose, any of the shafts of the machine may be provided with a brake wheel and adjustable brake. In the present instance, a brake wheel 111 is provided on the shaft 30 (see Fig. 4). Above this brake

wheel a brake lever 112 is provided, one end of which is pivoted at 113 on the underside of the breast board. A coil spring 114 is attached to the free end of this brake for pulling it down upon the wheel. Springs of different force may be employed, if desired, so as to regulate the resistance.

I shall now describe the general mode of operation of the machine. The "swimmer" lies extended on the apparatus, face downwardly, and with his knees thrust through the openings 110. His arms should extend over the arms 8 of the apparatus, and his hands should rest on the blocks 96 in an extended and cupped form with the fingers held together by means of the straps 100. The chin of the "swimmer" should be supported on the pad or head rest 58. The "swimmer" should then use his muscles to swing the arms 8 of the machine in a rear direction. These arms 8 guide the "swimmer's" arms under his body in the working part of the stroke, and through the operation of the cams 9, they guide the "swimmer's" arm outwardly and forwardly in the forward or return movement of the stroke. The movements of the arms 8 are imparted through the shaft 23 and the shaft 30 to the cross shaft 32 toward the foot end of the machine, and from this shaft the connecting rods 33 are driven to oscillate the leg supports 24 in the flutter movement.

Assuming that the "swimmer" breathes on the left side in swimming with this stroke, as the right arm passes toward the rear in the working movement the "swimmer's" head would oscillate over to the left, so as to raise his mouth to a higher level. This movement can be accomplished by the "swimmer" himself by simply pressing his chin against the rest 58 and twisting his head toward the left. If the automatic drive for the rest 58 is being employed, the rest will be moved by the tongue 89 carried by the rocker 78, which is in turn actuated by the cam 82 off of the cross shaft 23.

The head rest 58 may be adjusted in the slots 64a so as to adapt it to the "swimmer" using the apparatus.

In operating the machine, the "swimmer's" legs oscillate up and down simultaneously and oppositely in a plane perpendcular to the body rest. Thus, by means of the mechanical synchronism of the apparatus, the student is enabled to acquire a natural coordination of the movements of the head and legs with the movements of the arms in this form of swimming stroke.

The oscillation of the student's head from a central position to that of either side, may be performed with or without mechanical impulse.

What I claim is:

1. In a mechanical swimming instructor, the combination of a frame, a cam mounted on one side of the frame and another cam mounted on the other side of the frame, each of said cams having a continuous path with an upper portion disposed in one plane and a lower portion disposed in a plane extending at an angle to the plane of the upper portion, an offset arm-bracket supported in the angle between the said planes and having a pivotal joint, means for connecting the pivotal joints so that the arm-bracket on one side of the frame moves in synchronism with the arm-bracket on the other side, an arm carried by each bracket for supporting the arm of the swimmer and means for guiding each arm-bracket on its corresponding cam, said arm brackets being disposed so that when the guiding means of one arm is running on the upper portion of one cam the guiding means of the other arm is running on the lower portion of the other cam.

2. In a mechanical swimming instructor, the combination of a frame, a cam mounted on one side of the frame and another cam mounted on the other side of the frame, each of said cams having a continuous path with an upper portion disposed in one plane and a lower portion disposed in a plane extending at an angle to the plane of the upper portion, each of said cams having guide flanges with a runway between the same, an offset arm-bracket supported in the angle between the said planes and having a pivotal joint, means for connecting the pivotal joints so that the arm-bracket on one side of the frame moves in synchronism with the arm-bracket on the other side, an arm carried by each arm-bracket for supporting the arm of the swimmer, and a roller carried by each guide bracket and running in the runway between the said flanges, said arm brackets being disposed so that when the roller corresponding to one arm is running on the upper portion of one cam, the roller of the other arm is running on the lower portion of the other cam.

3. In a mechanical swimming instructor, the combination of a frame, a cam mounted on one side of the frame and another cam mounted on the other side of the frame, each of said cams having a continuous path with an upper portion disposed in one plane and a lower portion disposed in a plane extending at an angle to the plane of the upper portion, an offset arm-bracket with a bearing supported in the angle between the said planes, and having a pivotal joint, means for connecting the pivotal joints so that the arm-bracket on one side of the frame moves in synchronism with the arm-bracket on the other side, an arm carried by each arm-bracket for supporting the arm of the swimmer, and roller means carried by each guide bracket and running on the edges of the cams to guide the said arms, said arm-brackets being disposed so that when the roller means corresponding to one arm is running on the upper portion of one cam, the roller means corresponding to the other arm is running on the lower portion of the other cam.

4. In a mechanical swimming instructor, the combination of a frame, arms at the sides of the frame, means for guiding the said arms to cause them to execute a swimming stroke, and means for oscillating the swimmer's head in synchronism with the movement of the said arms.

5. In a mechanical swimming instructor, the combination of a frame having means for supporting the swimmer's body in a substantially horizontal position, an arm mounted at each side of the frame, means connecting the arms to synchronize the movements thereof, means for guiding each arm to enable the swimmer to execute a swimming stroke, a leg support at each side of the frame having a thigh-section and a shin-section with a joint connecting the same, and having an opening at the joint for the swimmer's knee, and means connecting the leg supports with the said arms to move the leg supports in synchronism with the arms.

6. In a mechanical swimming instructor, the combination of a frame having means for supporting the swimmer's body in a substantially horizontal position, an arm mounted at each side of the frame, means connecting the arms to synchronize the movements thereof, means for guid-

ing each arm to move in a continuous path rearwardly in one plane and forwardly in another plane, a leg support at each side of the frame having a thigh-section and a shin-section with a joint connecting the same, means connecting the leg supports with the said arms to move the leg supports in synchronism with the arms, means for supporting the shin-sections at a point beyond their joint connections with the thigh-section, and operating to effect a correlated movement of the thigh and shin sections, when oscillating up and down.

7. In a mechanical swimming instructor, the combination of a frame having means for supporting the swimmer's body in a substantially horizontal position, a leg support at each side of the frame having a thigh-section with a joint supporting the same on the frame and having a shin-section with a knee-joint connecting the same with the free end of the thigh-section, a foot-board having a joint connecting the same with the free end of the shin-section, the foot-board at each side being constructed so as to converge toward the foot-board on the other side, an arm mounted at each side of the frame and means for actuating the leg support in synchronism with the arms.

8. In a mechanical swimming instructor, the combination of a frame, an arm supported at each side of the frame, means for connecting the arms to move the same in synchronism, means for guiding the arms to move in a continuous path rearwardly in one plane and forwardly in another plane, and a breast support pivotally supported substantially in line with the longitudinal central axis of the frame to enable the breast support to rock to and fro in synchronism with the arm movements.

9. In a mechanical swimming instructor, the combination of a frame, a leg support having a thigh-section with a joint connecting the same to the frame and having a shin-section with a knee-joint connecting the same with the free end of the thigh-section, a foot section having a joint connection with the lower end of the shin-section, and a spring yieldingly supporting the foot section and operating to permit the free end of the foot section to be yieldingly depressed.

10. In a mechanical swimming instructor, the combination of a frame, an arm supported at each side of the frame, means for guiding the arm to cause the swimmer to execute a swimming stroke, and a block pivotally supported on the end of the arm having the form of the inner curvature of an extended and cupped hand to receive the swimmer's hand and operating to hold the hand in an extended and cupped position.

11. In a mechanical swimming instructor, the combination of a frame, an arm supported at each side of the frame, means for guiding the arm to cause the swimmer to execute a swimming stroke, a block carried on the end of the arm to receive the swimmer's hand and operating to hold the hand in an extended and cupped form, and means passing across above the face of the block and over the swimmer's hand to hold the fingers together.

12. In a mechanical swimming instructor, the combination of a frame, an arm supported at each side of the frame, means for guiding the arm to cause the swimmer to execute a swimming stroke, a block carried on the end of the arm to receive the swimmer's hand and operating to hold the hand in a substantially curved form, and a spring associated with the arm tending to pull the block inwardly on the arm.

13. In a mechanical swimming instructor, the combination of a frame, an arm supported on the frame, means for guiding the arm on the frame to cause the swimmer to execute a swimming stroke, said arm having an inner extension and having an extensible outer extension with a swivel connection to the inner extension, and a hand-rest pivotally attached to the outer extension.

14. In a mechanical swimming instructor, the combination of a frame, arms at the sides of the frame, means for guiding the said arms to move in a continuous path forwardly in one plane and rearwardly in another plane, means for oscillating the swimmer's head in synchronism with the movement of the arms, leg supports for the swimmer's legs, and means for actuating the same in synchronism with the said arms.

15. A cam having a continuous path with an extension lying in one plane and another extension lying in another plane making an angle with the first named plane, said cam having guide flanges extending along the edge thereof and cooperating to form a guide channel.

16. In a mechanical swimming instructor, the combination of a frame having a breast board for supporting the swimmer's breast and consisting of a relatively fixed section supported on the frame, and a relatively movable section, with means for adjusting the same longitudinally of the frame, said sections having means for bridging the gap formed by adjusting the movable section.

17. In a mechanical swimming instructor, the combination of a frame having means for supporting the swimmer's body in a substantially horizontal position, a leg support at each side of the frame having a thigh-section with a joint supporting the same on the frame and having a shin-section with a knee-joint connecting the same with the free end of the thigh-section, said sections at said joint having an opening to receive the knee of the swimmer and means operating to effect a correlated movement of the shin and thigh sections when oscillating up and down.

18. In a mechanical swimming instructor, the combination of a cam having a continuous guide path with portions extending in planes angularly to each other, said cam having guide flanges extending along the edge thereof and cooperating to form a guide channel, a shaft axially extending between said planes and a lever pivotally connected with the shaft and engaging the cam on an axis extending from the center of the shaft.

19. In a device of the class described, the combination of a frame, a body rest supported by the frame, an arm lever mounted at each side of the rest, means for guiding each arm lever to move in a continuous path in planes angularly to each other, a head rest, and means for guiding the head rest to move to the side in synchronism with the movements of the arm levers.

20. In a device of the class described, the combination of a frame, a body rest having a fixed section forwardly on the frame and a movable section adjustable longitudinally on the frame toward and away from the fixed section, leg supports connected to the movable section and operating to oscillate simultaneously and oppositely in a plane perpendicular to the movable section.

CHARLES W. KABISIUS.