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HANDBOOK

OF

DEVELOPING EXERCISES.

BY

DUDLEY A. SARGENT, A.M., M.D.,

DIRECTOR OF THE HEMENWAY GYMNASIUM, HARVARD UNIVERSITY,

CAMBRIDGE, MASS.

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DIRECTIONS FOR USING THE CHEST-WEIGHTS.

The movements on the chest-weights are arranged to rest one set of muscles while another set is in use.

By following the order and confining yourself to the prescribed movements and weights, you will avoid the danger of becoming what is commonly termed "muscle bound."

Grasp the handles, and stand far enough away from the apparatus to just clear the boxes from the rubber buffers before commencing the movement.

Keep the ropes straight, pull steadily, and do not allow the boxes to strike at the top or bottom.

The pulleys are placed shoulder-high in order that a greater variety of movements may be executed.

If one foot is placed before or behind the other for a brace, change the position frequently; otherwise the development will be one-sided.

In the second course the movements are for the most part carried through short spaces.

If the boxes strike at the top, step forward a little; if at the bottom, step backward.

Stand with feet together while executing the forward and backward movements with both hands.

After the exercise is finished do not release the grasp upon the handles until the weight-boxes touch the buffers on the floor.

The directions for passing from one movement to another are intended for the use of teachers in guiding their squads and classes and need not necessarily be followed by the individual when exercising alone.

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FIRST COURSE ON THE CHEST-WEIGHTS.

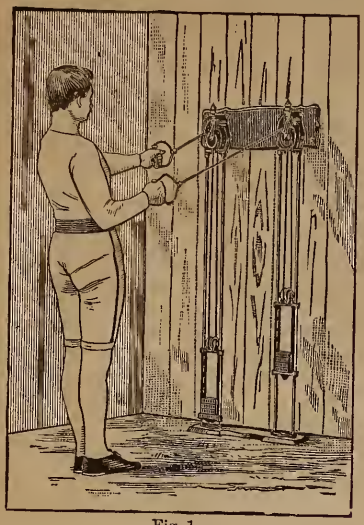

Fig. 1.

Exercise No. 1.

Weights. — 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16.

Times. — 5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 55, 60, 65, 70, 75, 80.

Rate per minute. — 25, 30, 35, 40, 45, 50, 55, 60, 65, 70, 75, 80, 85, 90, 95, 100, 105, 110, 115, 120.

Position No. 1. — Face the boxes, head erect, shoulders back, feet together, arms extended forward, palms in, handles perpendicular.

Movement No. 1. — Left and right alternate, beginning with left; pull straight back till handle nearly touches shoulder. (See Fig. 1.)

Principal Muscles brought into action. — Part of T^{10}, R^8, R^9, part of D^1, T^2, T^3, long head of T^{12}, L^1.

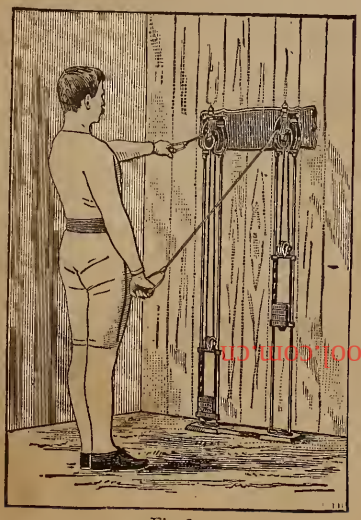

Fig. 2.

Exercise No. 2.

Weights. —

Times. —

Rate per minute. —

Position No. 2. — Body as in No. 1; resist any tendency to bend forward; palms down, handles horizontal.

Movement No. 2. — Right and left alternating, beginning with left; bring arm straight down at side, handle just passing the thigh. (See Fig. 2.)

Principal Muscles brought into action. — L^1, part of T^{10}, R^8, R^9, part of D^1, T^2, T^3, T^{12}, A^{10}.

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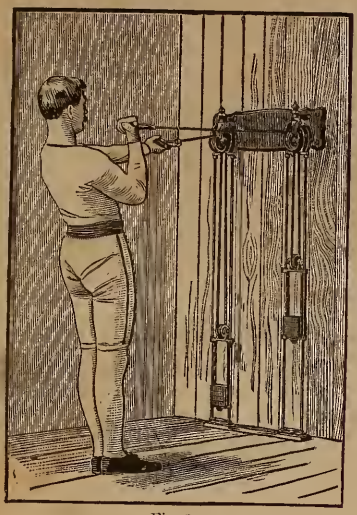

Fig. 3.

Exercise No. 3.

Weights. —

Times. —

Rate per minute. —

Position No. 3. — Body bent back, head held erect, elbows shoulder-high; palms up, handles horizontal.

Movement No. 3. — Left and right alternately, left first; bend arm to shoulder, carrying handles over. (See Fig. 3.)

Principal Muscles brought into action. — B^1, B^4, P^{13}, F^7, F^9, F^8, S^{26}, part of D^1, part of P^4, C^3.

Fig. 4.

Exercise No. 4.

Weights. —

Times. —

Rate per minute. —

Position No. 4. — Step fourteen inches nearer boxes with left foot; at same time place right handle underneath left handle, into fingers of left hand; grasp left handle with right hand; turn to right, bringing feet together, and back to boxes; palms in, handles perpendicular, top of handle level with top of shoulder. (See Fig. 4.)

Movement No. 4. — Together, extend arms straight forward, shoulder-high, keeping back and legs stiff, and chest thrown well to the front.

Principal Muscles brought into action. — Part of D^1, part of P^4, B^1, C^3, T^{12}, A^{10}.

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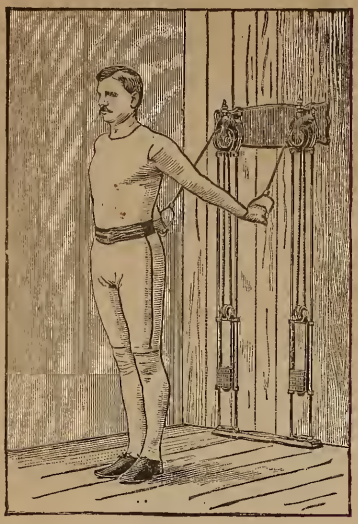

Fig. 5.

Exercise No. 5.

Weights. —

Times. —

Rate per minute. —

Position No. 5. — Step directly forward with left foot, eighteen inches; arms extended downward and backward, with palms forward; handles horizontal. (See Fig. 5.)

Movement No. 5.—Together, forward till handles pass thighs; keep arms straight, and head and shoulders well thrown back.

Principal Muscles brought into action. — Part of D^1, P^4, B^1, C^3, B^4, P^{13}, F^7, F^8, F^9, S^{26}.

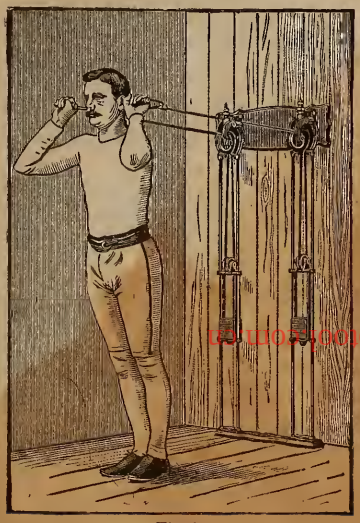

Fig. 6.

Exercise No. 6.

Weights. —

Times. —

Rate per minute. —

Position No. 6.— Step twelve inches toward boxes with right foot; at same time swing arms out at side; bring handles over shoulders, back of head, palms inward, handles horizontal. (See Fig. 6.)

Movement No. 6.—Together, directly forward, elbows shoulder-high, handles horizontal, and palms forward. Resist tendency to bend back.

Principal Muscles brought into action. — T^{12}, A^{10}, F^7, P^2, F^9, F^8, F^{14}, F^{11}.

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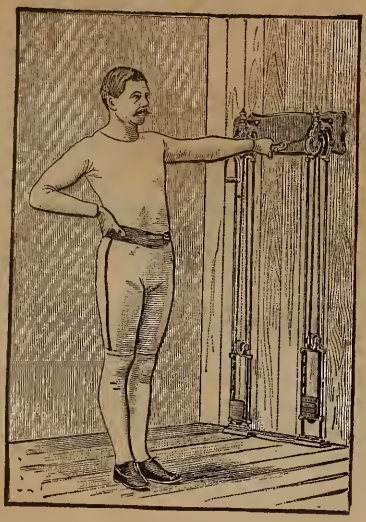

Fig. 7.

Exercises Nos. 7 and 8.

Weights. —

Times. —

Rate per minute. —

Position No. 7. — Step forward two feet with the right foot, at same time placing right hand on right hip, palm in, and left hand horizontal, palm down, arm extended. (See Fig. 7.)

Movement No. 7. — Left hand; bring arm straight down to side.

Position No. 8. — Reverse position in No. 7; turn to right.

Movement No. 8. — Right hand; bring arm straight down to side.

Principal Muscles brought into action. — No. 7: Part of P^4, L^1, B^1, B^4, P^{13}, F^7, F^9, F^8, S^{26}, on left arm and side.

No. 8: The same muscles on the right arm and side.

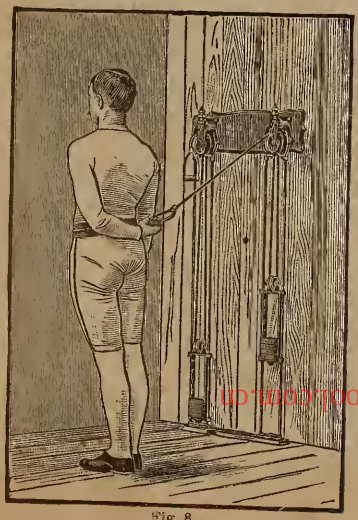

Fig. 8.

Exercises Nos. 9 and 10.

Weights. —

Times. —

Rate per minute.

Position No. 9. — Right arm, as before; pass left handle behind back and by the body, palm up, handle horizontal. (See Fig. 8.)

Movement No. 9. — Left hand; extend the arm six inches beyond left thigh, straightening it as it passes outward.

Position No. 10. — Reverse position of No. 9, and turn to left.

Movement No. 10. — Right hand; movement as in No. 9.

Principal Muscles brought into action. — No. 9: Part of D^1, T^{12}, A^{10}, E^4, E^3, E^{13}, E^7, E^6, E^{12}.

No. 10: The same muscles on the right arm and side.

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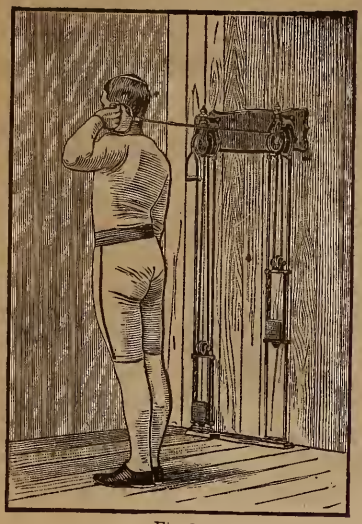

Fig. 9.

Exercises Nos. 11 and 12.

Weights. —

Times. —

Rate per minute. —

Position No. 11. — Turn to right; right side to boxes, right hand at side, palm in, handle horizontal; left hand behind head, handle perpendicular, palm in. (See Fig. 9.)

Movement No. 11. — Left hand; extend hand straight out, shoulder-high; bring palm downward, handle horizontal.

Position No. 12. — Reverse position of No. 11; turn to left.

Movement No. 12. — Right hand; movement as in No. 11.

Principal Muscles brought into action. — No. 11: T^{12}, A^{10}, F^7, P^2, F^9, F^8, F^{14}, F^{11}, on the left arm.

No. 12: The same muscles on the right arm.

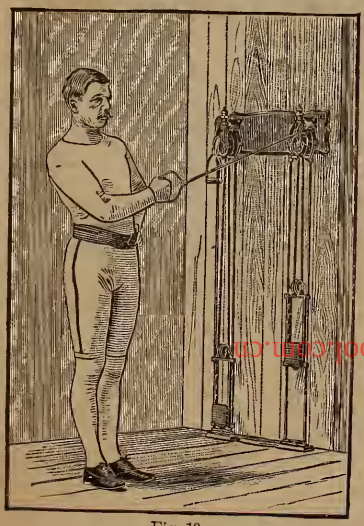

Fig. 10.

Exercises Nos. 13 and 14.

Weights. —

Times. —

Rate per minute. —

Position No. 13. — Turn to right; at same time bring right handle down, placing left handle into fingers of right hand; when right side is turned to boxes, change handles, right arm extended and palm down, handle horizontal; left arm across body, palm in, handle perpendicular.

Movement No. 13. — Left hand; elbows shoulder-high; extend across chest.

Position No. 14. — Turn to right, reversing as in No. 13. (See Fig. 10.)

Movement No. 14. — Right hand; movement as in No. 13.

Principal Muscles brought into action. — No. 13: Part of D^1, part of T^{10}, R^8, R^9, L^1, T^2, T^3, long head of T^{12}.

No. 14: Same muscles as No. 13 on right arm and side.

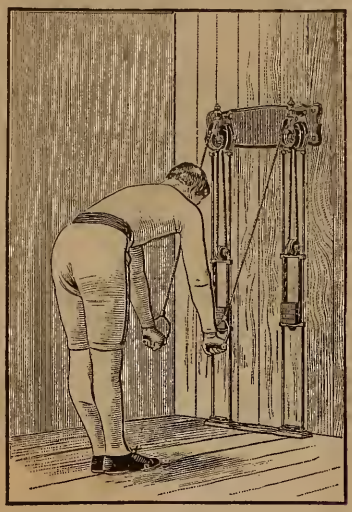

Fig. 11.

Exercise No. 15.

Weights. —

Times. —

Rate per minute. —

Position No. 15. — Turn to left; face boxes, palms downward, handles horizontal.

Movement No. 15. — Together, bring to knees (see Fig. 11), arms straight, bending forward; turn palms upward; bring hands in a curve over shoulders, straightening the body (see Fig. 12).

Principal Muscles brought into action. — No. 15: R^1, P^{16}, O^1, O^2, P^{14}, P^{15}, P^4, P^5, S^{10}.

Second part of movement. — T^{10}, R^8, L^1, S^{11}, S^{12}, S^1, L^4, S^{14}, S^7, M^2, I^6, part of D^1, part of P^4, B^1, C^3, B^4, P^{13}, F^7, F^9, F^8, S^{26}.

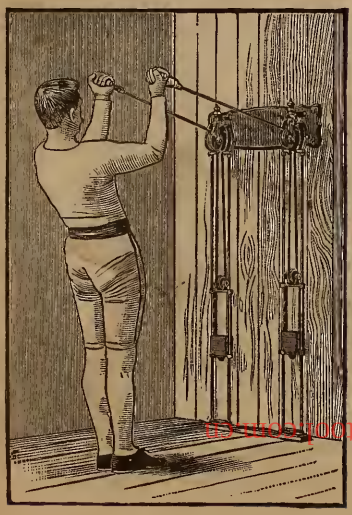

Fig. 12.

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SECOND COURSE ON THE CHEST-WEIGHTS.

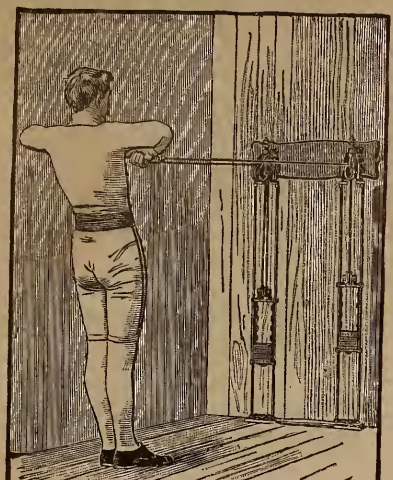

Fig. 13.

Exercise No. 1.

Weights. — 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15.

Times. — 5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 55, 60, 65, 70, 75.

Rate per minute. — 20, 25, 30, 35, 40, 45, 50, 55, 60, 65, 70, 75, 80, 85, 90, 95, 100, 105, 110, 115, 120, 125, 130.

Position No. 1. — Face the boxes; grasp the handles, with palms downward.

Movement No. 1. — Bring both handles back to shoulders, bending elbows outward. (See Fig. 13.)

Principal Muscles brought into action. — No. 1: Part of T^{10}, R^8, R^9, L^1, part of D^1, T^2, T^3, long head of T^{12}, L^1, B^1, B^4, P^{13}, F^7, F^9, F^8, S^{26}, P^2, F^{14}, F^{11}.

In this movement the same muscles on both arms and sides act together.

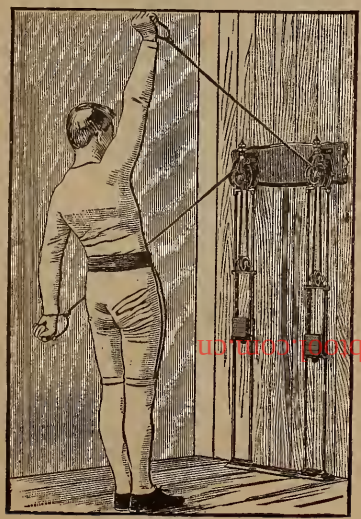

Fig. 14.

Exercises Nos. 2 and 3.

Position No. 2. — Face the boxes; turn the right handle, with palm upward, left remaining with palm downward.

Movement No. 2. — Press downward with left arm, keeping it straight, and upward with right arm, bending it as little as possible. (See Fig. 14.)

Position No. 3. — Turn the left handle with palm upward, right with palm downward.

Movement No. 3. — Press downward with right arm, and upward with the left.

Principal Muscles brought into action. — No. 2: Part of D^1, part of P^4, T^{12}, A^{10}, E^4, E^3, E^{13}, E^7, E^6, E^{12}, on right arm and side. — Part of D^1, T^2, T^3, L^1, T^{12}, A^{10}, F^7, P^2, F^9, F^8, F^{14}, F^{11}, left arm and side.

No. 3: Same muscles as in No. 2, changing arms and side.

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Fig. 15.

Exercises Nos. 4 and 5.

Weights. —

Times. —

Rate per minute. —

Position No. 4. — Stand with left side to boxes; hold the left hand with palm downward, right hand with palm inward. (See Fig. 15.)

Movement No. 4. — Bring left arm down to side, keeping it straight; carry right arm across the body, bending the elbow, with handle held perpendicular, about height of chin.

Position and Movement in No. 5 the reverse of No. 4.

Principal Muscles brought into action. — No. 4: Part of P^4, L^1, B^1, B^4, P^{13}, F^7, F^9, F^8, S^{26}, on left arm and side. — Part of D^1, part of T^{10}, R^8, R^9, L^1, T^2, T^3, long head of T^{12}, L^1, for right arm and side.

No. 5: Same muscles as in No. 4, changing arms and sides.

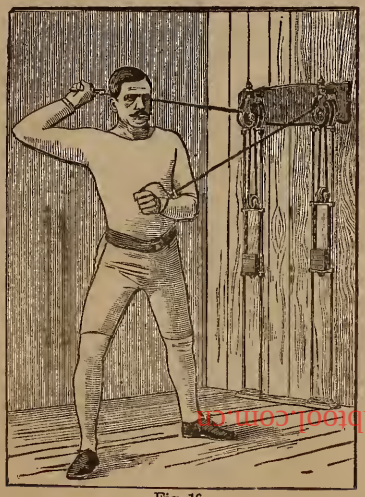

Fig. 16.

Exercises Nos. 6 and 7.

Position No. 6. — Grasp right handle with left hand, and left handle with right hand; stand with left side to boxes; right hand behind the head, palm inward; left hand waste-high, in front of body, with palm downward. (See Fig. 16.)

Movement No. 6. — Carry right arm straight out to its full extent, turning handle to horizontal position; carry the left hand diagonally downward across the body.

Position and Movement in No. 7 the reverse of No. 6.

Principal Muscles brought into action. — No. 6: T^{12}, A^{10}, F^7, P^2, F^9, F^8, F^{14}, F^{11}, for right arm and side. — Part of P^4, L^1, B^1, B^4, P^{13}, F^7, F^9, F^8, S^{26}, for left arm and side.

No. 7: Same muscles as in No. 6, changing arm and sides.

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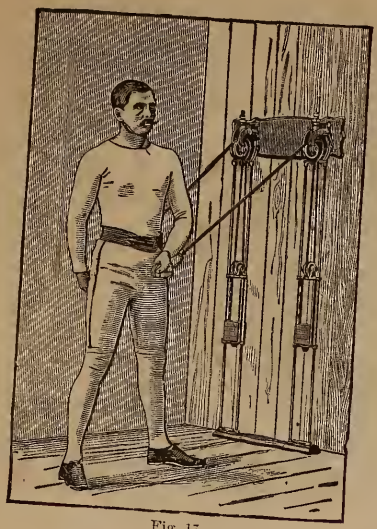

Fig. 17.

Exercise No. 8.

Weights. —

Times. —

Rate per minute. —

Position No. 8. — Stand with left side to boxes, holding the handle with right hand, palm upward, waist-high, behind the back; left hand in front of chest, with palm turned inward. (See Fig. 17.)

Movement No. 8. — Draw arm across the back, straightening the elbow as it moves; carry left hand diagonally upward across the face.

Principal Muscles brought into action. — No. 9: Part of P^4, L^1, B^1, C^3, B^4, P^{13}, F^7, F^9, F^8, S^{26}, for left arm and side. — Part of D^1, T^{12}, A^{10}, E^4, E^3, E^{13}, E^7, E^6, E^{12}, for right arm and side.

Fig. 18.

Exercise No. 9.

Weights. —

Times. —

Rate per minute. —

Position No. 9. — Stand with right side to boxes, holding the handle with left hand, palm upward, waist-high, behind the back; right hand in front of chest, with palm turned inward. (See Fig. 18.)

Movement No. 9. — Draw left arm across the back, straightening the elbow as it moves; carry right hand diagonally upward across the face.

No. 9: Same muscles as in No. 8, reversing the arms and sides.

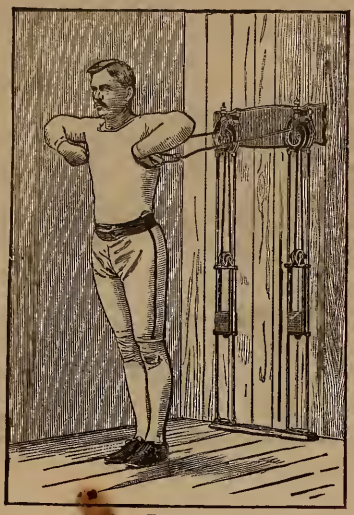

Fig. 19.

Exercise No. 10.

Weights. —

Times. —

Rate per minute. —

Position No. 10. — Stand with back to boxes, holding the hands extended behind the body, with body bending slightly forward. (See Fig. 19.)

Movement No. 10. — Bring the handles forward until they pass the body, the ropes moving under the arms, turning the palms inward, and straightening the body.

Principal Muscles brought into action.—P^4, D^1, T^{12}, A^{10}, E^4, E^3, E^{13}, E^7, E^6, E^{12}.

Simultaneously for both arms and sides.

Fig. 20.

Exercises Nos. 11 and 12.

Weights. —

Times. —

Rate per minute. —

Position No. 11. — Stand with back to boxes; right arm bent sharply back over shoulder, with palm upward; left arm extended downward and backward, with palm forward, and handle level with the hip.

Movement No. 11. — Move both hands directly forward, at the same time straightening the elbows. (See Fig. 20.)

Position and movement in No. 12 the reverse of No. 11.

Principal Muscles brought into action. — No. 11: Part of L^4, L^1, B^1, C^3, B^4, P^{13}, F^7, F^9, F^8, S^{26}, P^2, F^{14}, F^{11} for right and left arms and sides.

No. 12: Same as in No. 11 changing arms and sides.

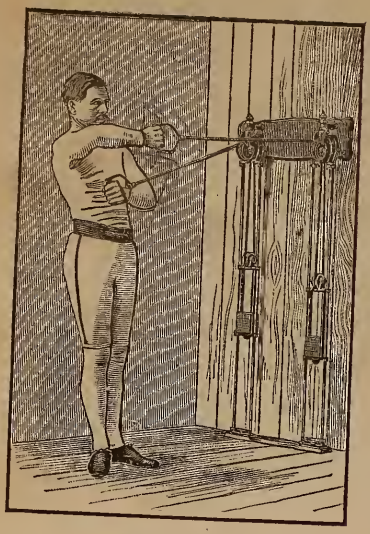

Fig. 21.

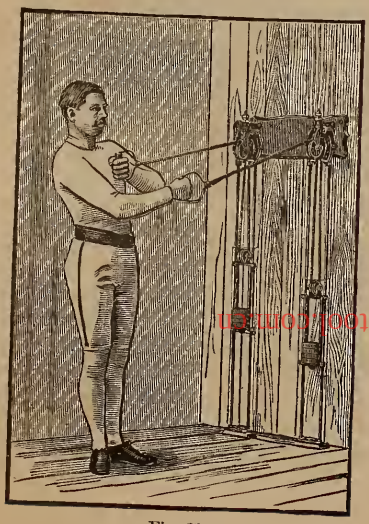

Fig. 22.

Exercises Nos. 13 and 14.

Weights. —

Times. —

Rate per minute. —

Position No. 13. — Pass the right handle over the head, at the same time turning so as to stand with left side to boxes; then transfer left handle to left hand, and right handle to right hand; hold both handles chest-high, in front of body. (See Fig. 21.)

Movement No. 13. — Draw the right hand upward and outward at some distance from the body; as the right hand returns, push the left hand across the body, the handle passing under the right arm. In the next movement the right hand moves downward, and the left hand passes over the right arm. (See Fig. 22.)

Position No. 14. — Without changing handles, stand with right side to boxes; handles vertical, chest-high, in front of the body, with palms inward.

Movement No. 14. — Draw the left hand upward and outward at some distance from the body; as the left hand returns, push the right hand across the body, the handle passing under left arm. In next movement left hand moves downward, and the right hand passes over left arm.

Principal Muscles brought into action. — No. 13: Part of T^{10}, R^8, R^9, L^1, B^1, B^4, P^{13}, F^7, F^9, F^8, S^{26} for the right arm and side.

Part of P^4, L^1, T^{12}, A^{10} for left arm and side.

No. 14: Same muscles as in No. 13, reversing the arms and sides.

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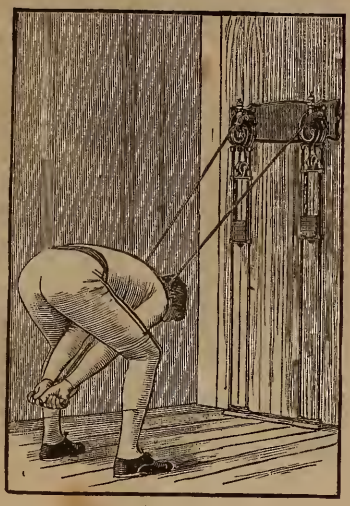

Fig. 23.

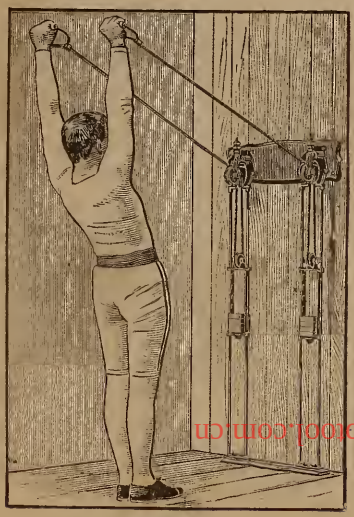

Fig. 24.

Exercise No. 15.

Weights. —

Times.

Rate per minute.

Position No. 15. — Face the boxes, with arms extended straight forward, holding the handles horizontally, with palms downward.

Movement No. 15. — Press down with handles, keeping arms straight, and bending at the hips and knees till the arms pass between the legs. (See Fig. 23.)

Return to original position, and then bring handles high above shoulders, keeping arms straight, and bending body slightly backward. (See Fig. 24.)

Principal Muscles brought into action. — R^1, P^{16}, O^1, O^2, P^{14}, P^{15}, P^4, P^5, S^{10}, T^{12}, A^{10}, I^1, T^1, P^3, A^6, A^5, in first part of movement, T^{10}, R^8, L^1, S^{11}, S^{12}, S^1, L^4, S^{14}, S^7, M^2, I^6, part of D^1, part of P^4, B^1, C^3, T^{12}, A^{10}, E^4, E^3, E^{13}, E^7, E^6, E^{12}, G^6, part of G^7, P^{17}, O^6, part of A^7, long head of B^2, S^9, S^6 in second part of movement.

NOTE. — It is not designed that the third course on the chest-weights should be used in squad or class drills, but as a means of special development for individuals exercising alone.

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THIRD COURSE ON THE CHEST-WEIGHTS.

Fig. 25.

Exercise No. 1.

Weights. —

Times. —

Rate per minute. —

Position No. 1. — Stand with back to weights, feet together, and hold the handles as in Fig. 25.

Movement No. 1. — Extend the arms directly forward and return to position, flexing the wrist as the handles approach the shoulders and straightening them as the arms are extended.

Principal Muscles brought into action. — No. 1: T^{12}, A^{10}, E^4, E^3, E^{13}, E^7, E^6, E^{12}, on both arms simultaneously.

Fig. 26.

Exercise No. 2.

Weights. —

Times. —

Rate per minute. —

Position No. 2. — Stand with back to weights and feet together; grasp the handles with thumbs up, and hold them close to the shoulder.

Movement No. 2. — Extend the left arm forward and upward, and as the left is returning to position, extend the right. (See Fig. 26.) Continue alternating left and right.

Principal Muscles brought into action. — Part of D^1, part of P^4, B^1, C^3, T^{12}, A^{10}, O^1, O^2, Q^2, L^4, S^1, S^{11}, S^{12}, L^1, on both arms and sides, alternating from right to left.

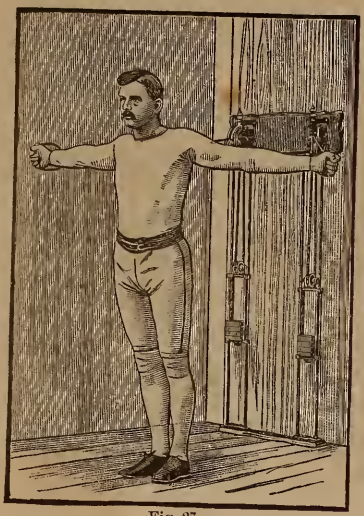

Fig. 27.

Exercise No. 3.

Weights. —

Times. —

Rate per minute. —

Position No. 3. — Stand with back to weights and feet together; grasp the handles with thumbs upward, and hold the arms extended horizontally at the sides, as in Fig. 27.

Movement No. 3. — Bring the arms forward, describing the arc of a circle, until the hands are in front of the shoulders, then let them sweep slowly backward in the same horizontal plane to position.

Principal Muscles brought into action. — No. 3: Part of D^1, part of P^4, B^1, C^3, B^4, P^{13}, F^7, F^9, F^8, S^{26}, P^2, F^{14}, F^{11}, on both arms and sides simultaneously.

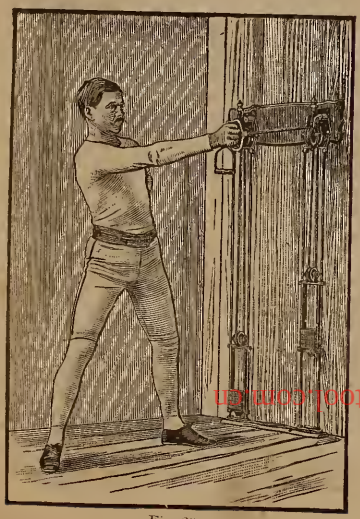

Fig. 28.

Exercises Nos. 4 and 5.

Position No. 4. — Stand with left side to the weights and feet about twenty inches apart; grasp the right handle with right hand, thumb upward, right arm extended, left hand on the left hip. (See Fig. 28.)

Movement No. 4. — Sweep the right arm horizontally backward until it is extended at the right side. Return in same horizontal plane to position and repeat, alternately flexing and extending the legs.

Reverse the position and movement for Exercise No. 5.

Principal Muscles brought into action. — No. 4: Part of D^1, T^2, T^3, part of T^{10}, R^8, R^9, L^1, T^{12}, A^{10}, E^4, E^3, E^{13}, E^7, E^6, E^{12}, O^1, O^2, Q^2, L^4, S^1, S^{11}, S^{12}, on right arm and left and right side.

No. 5: Same as in No. 4 for left arm and right and left side.

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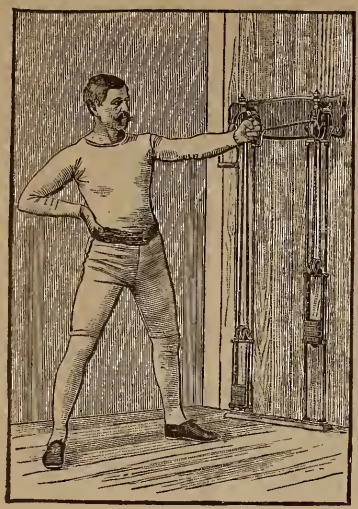

Fig. 29.

Exercises Nos. 6 and 7.

Weights. —

Times. —

Rate per minute. —

Position No. 6. — (See Fig. 29.)

Movement No. 6. — Sweep left arm horizontally forward until the left hand is in front of the right shoulder. Return the arm through the same horizontal plane to position, and repeat, alternately flexing and extending the legs.

Reverse the position and movement for Exercise No. 7.

Principal Muscles brought into action. — No. 6: Upper part of P^4, L^1, S^{10}, part of D^1, C^3, B^1, B^4, P^{13}, F^7, F^9, F^8, S^{26}, P^2, F^{14}, F^{11}, O^1, O^2, Q^2, L^4, S^1, S^{11}, S^{12}, on the left arm and left and right sides.

No. 7: Same as in No. 6, on right arm and right and left sides.

Fig. 30.

Exercises Nos. 8 and 9.

Position No. 8. — Stand facing the weights with feet together; grasp handles with thumbs inward and both arms extended horizontally forward.

Movement No. 8. — Press the right hand down to right thigh, and at the same time sweep the left arm backward horizontally until it is extended at the left side. (See Fig. 30.) Return to position; keep the arms straight at the elbows.

Reverse position and movement for Exercise No. 9.

Principal Muscles brought into action. — No. 8: Part of T^{10}, R^8, R^9, L^1, part of D^1, T^2, T^3, T^{12}, A^{10}, E^4, E^3, E^{13}, E^7, E^6, E^{12}, for left arm and side.— Part of D^1, T^2, T^3, T^{12}, L^1, A^{10}, P^5, P^2, F^7, F^9, F^8, F^{14}, F^{11}, for right arm.

No. 9: Same muscles as in No. 8, reversing arms and sides.

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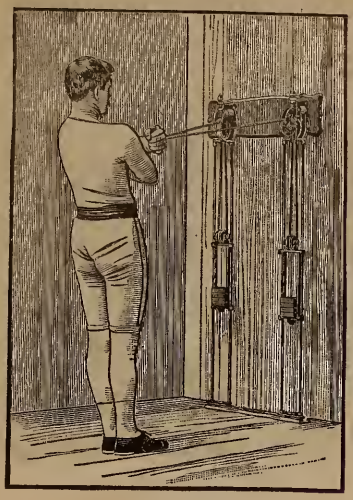

Fig. 31.

Exercise No. 10.

Weights. —
Times. —
Rate per minute. —

Position No. 10. — Stand facing the weights with feet together; grasp the handle with thumbs upward and arms extended horizontally forward.

Movement No. 10. — Bring the left handle to the right elbow (see Fig. 31), at the same time carry the right handle *under* the left forearm to the left elbow. Return to position, and bring right arm *over* left forearm to the left elbow, at the same time carry the left handle under the right forearm to left elbow. Continue alternately with left and right above.

Principal Muscles brought into action. — No. 10: Part of P^4, L^1, B^1, B^4, P^{13}, F^7, F^9, F^8, S^{26}, P^2, F^{14}, F^{11}, for both arms, acting simultaneously.

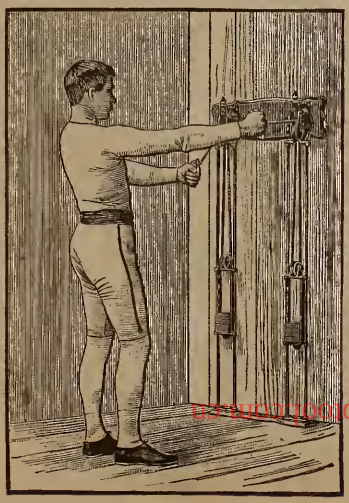

Fig. 32.

Exercise No. 11.

Weights. —
Times. —
Rate per minute. —

Position No. 11. — Stand facing weights with feet twelve inches apart; grasp the handles with thumbs upward, extending arms horizontally forward.

Movement No. 11. — Sweep both arms around to right, keeping right arm extended horizontally and flexing left arm a little below it. (See Fig. 32.) Return to position and sweep arms around to left, keep left arm extended horizontally and flex the right arm a little below it. Continue from left to right.

Principal Muscles brought into action. — No. 11: Part of D^1, T^2, T^3, part of T^{10}, R^8, R^9, L^1, T^{12}, A^{10}, E^4, E^3, E^{13}, E^7, E^6, E^{12}, O^1, O^2, O^2, L^4, S^1, S^{11}, S^{12}, B^1, C^3, B^4, P^{13}, F^7, F^9, F^8, F^{14}, F^{11}, S^{26}, P^2, on arms and sides alternately.

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Fig. 33.

Exercise No. 12.

Weights. —

Times. —

Rate per minute. —

Position No. 12. — Stand facing the weights with feet together; grasp the handles with thumbs inward and with arms horizontally forward.

Movement No. 12. — Sweep the left arm horizontally backward and at the same time elevate the right hand to a vertical position over the right shoulder. (See Fig. 33.)

Return to position, and sweep the right arm backward and elevate the left.

Continue alternately with left and right above.

Principal Muscles brought into action. — Part of T^{10}, R^{8}, R^{9}, L^{1}, P^{5}, part of D^{1}, T^{2}, T^{3}, T^{12}, A^{10}, E^{4}, E^{3}, E^{13}, E^{7}, S^{11}, S^{12}, S^{1}, L^{4}, S^{14}, S^{7} M^{2}, I^{6}, O^{1}, O^{2}, Q^{2} alternately on both arms and sides.

Fig. 34.

Exercises Nos. 13 and 14.

Positon No. 13. — Stand facing the weights with the left foot forward and the right foot thirty inches back of it.

Movement No. 13. — Press the handles down to the floor to a position on a line with the left foot (see Fig. 34). Bring the body to an erect position and carry the arms upward and backward as in Fig. 24.

Position No. 14. — Reverse of No. 13, with right foot forward.

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Movement No. 14. — Same as No. 13, carrying handles to a line in front of right foot.

Principal Muscles brought into action. — Nos. 13 and 14. Part of P^{4}, L^{1}, T^{12}, A^{10}, F^{7}, P^{2}, F^{9}, F^{8}, F^{14}, F^{11}, R^{1} P^{16}, O^{1}, O^{2}, P^{14}, P^{15}, P^{5} S^{10} on both arms and sides and on left and right legs alternately.

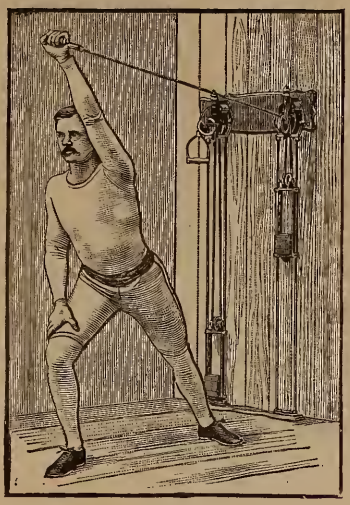

Fig. 35.

Exercises Nos. 15 and 16.

Weights. —
Times. —
Rate per minute. —

Position No. 15.—Stand with left side to weights, with feet about thirty inches apart; grasp the right handle with left-hand palm, upward arm extended, and right hand on right thigh.

Movement No. 15. — Raise the left arm to a vertical position, at the same time turn the body to the right and flex the right leg until the left arm is extended on a line with the left leg. (See Fig. 35.) Return to position and continue keeping arm straight at the elbow.

Reverse Position and Movement for Exercise No. 16.

Principal Muscles brought into action. — Part of P^4, L^1, P^5, T^{12}, A^{10}, F^7, P^2, F^8, F^{14}, F^{11}, R^1, P^{16}, O^1, O^2, P^{14}, P^{15}, S^{10} on both arms and sides alternately.

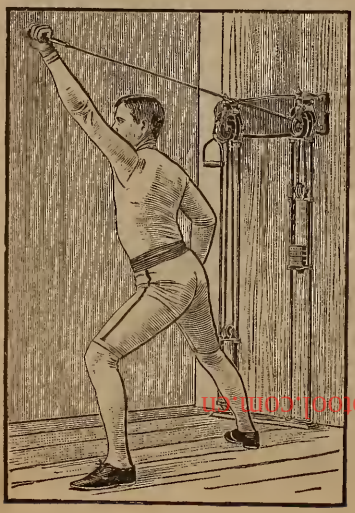

Fig. 36.

Exercises Nos. 17 and 18.

Weights. —
Times. —
Rate per minute. —

Position No. 17. — Stand with right side to weights with feet about thirty inches apart; grasp right handle with left hand, thumb downward, arm bent and handle behind head (see Fig. 9), right hand on the right hip.

Movement No. 17. — Extend the left arm upward at angle of 45° (see Fig. 36), at same time turn the body to the left and flex the left leg. Return to position and extend the arm again, alternately flexing and extending the left leg.

Reverse Position and Movement for Exercise No. 18.

Principal Muscles brought into action. — T^{12}, A^{10}, F^7, P^2, F^9, F^8, F^{14}, F^{11}, P^4, L^1, P^5, R^1, P^{16}, O^1, O^2, P^{14}, P^{15}, S^{10}, R^4, C^5, V^1, V^2 on both arms, sides and legs alternately.

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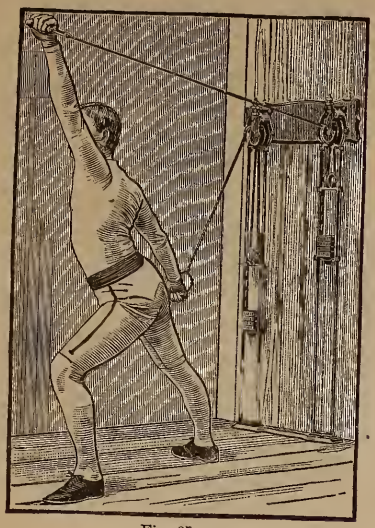

Fig. 37.

NOTE. — The fourth course on the chest weights was especially designed to afford more general exercise for the body and lower limbs, and to be used by those persons who are unfortunately deprived by circumstances of the conveniencies of a well-equipped gymnasium.

Exercises Nos. 19 and 20.

Weights. —

Times. —

Rate per minute. —

Position No. 19. — Grasp the handles as in Fig. 37 and stand with back to the weights and feet about thirty inches apart, the left foot forward.

Movement No. 19. — Throw weight forward on to the left leg keeping the right leg straight as in Fig. 37, at the same time bring both arms forward to an extended position in front of the body.

Position No. 20. — Reverse of No. 19, with right leg forward.

Movement No. 20. — Same as No. 19, bending the right leg and keeping the left straight.

Principal Muscles brought into action. — P^4, P^5, S^{10}, R^1, P^{16}, O^1, O^2, P^{15}, R^1, P^{16}, O^1, O^2, P^{14}, P^{15}, L^1. T^{12}, A^{10}, B^1, B^4, P^{13}, F^7, F^9, F^8, S^{26}, P^2, F^{14}, F^{11}, R^4, C^5, V^1, V^2 on both arms, sides and legs alternately.

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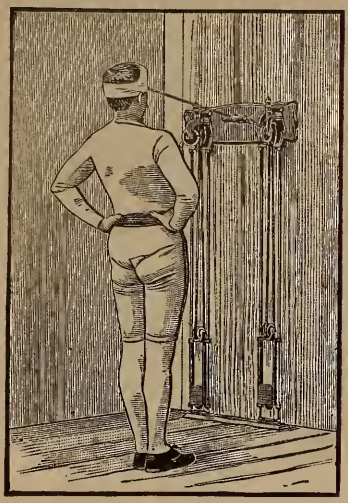

Fig. 38.

Exercises Nos. 1 and 2.

Weights. —

Times. —

Rate per minute. —

Position No. 1. — (See Fig. 38.)

Movement No. 1. — Allow the head to drop forward, pivoting at the seventh cervical vertebra, extend the chin well forward; bring the head back to place, straightening the neck.

Position No. 2. — Same as No. 1.

Movement No. 2. — Bring the head forward, bending neck and back, pivoting at the hips; now straighten the back and neck, and throw chest well forward with every movement.

Principal Muscles brought into action. — No. 1: Part of T^{10}, R^8, S^{11}, S^{17} (colli), S^{18} (colli), C^2, T^7, T^9, I^3, S^8, R^6, R^7, O^3, O^4, S^5, L^2.

No. 2: In addition to the above, L^1, S^{11}, S^{12}, S^1, L^4, S^{14}, S^7, M^2, I^6.

Fig. 39.

Exercises Nos. 3 and 4.

Weights. —

Times. —

Rate per minute. —

Position No. 3. — Stand with right side to the weights, as in Fig. 39.

Movement No. 3. — Move the body gently to the left without bending the neck. Return to position and continue the movement.

Reverse position and movement for Exercise No. 4.

Principal Muscles brought into action. — No. 3: P^{10}, S^{19}, part of T^{10}, S^{17}, S^{18}, T^7, C^2, O^1, O^2, Q^2, L^4, S^1, S^{11}, S^{12}, L^1, and other combinations on the front and back of neck and body on the left side.

No. 4: Same muscles on the right side.

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Fig. 40.

Exercises Nos. 5 and 6.

Weights. —

Times. —

Rate per minute. —

Position No. 5. — (See Fig. 40.)

Movement No. 5. — Bring the right foot down with a pawing movement until the toes nearly touch the floor, bend the knee sharply, bringing the heel towards the buttock; then extend the leg forward, and continue as above.

Reverse position and movement for Exercise No. 6.

Principal Muscles brought into action. — No. 5: G^6, part of G^7, P^{17}, O^6, part of A^7, long head of B^2, S^9, S^6, G^9, S^2, P^{11}, G^1, P^9, S^{13}, F^{10}, (foot), F^{12}, T^6, P^7, P^6, on right leg. Also the muscles used to support the weight on the left leg.

No. 6: Same muscles on the left and right legs.

Fig. 41.

Exercises Nos. 7 and 8.

Weights. —

Times. —

Rate per minute. —

Position No. 7. — Same as No. 5.

Movement No. 7. — Bring the right foot down, keeping the knee sharply bent, and extend the right leg backward, at the same time leaning forward with the body balancing on the left foot. (See Fig. 41.)

Position No. 8. — Reverse of No. 7, with left foot in stirrup.

Movement No. 8. — Same as No. 7, balancing on right leg.

Principal Muscles brought into action. — No. 7: G^6, part of G^7, P^{17}, O^6, part of A^7, long head of B^2, S^9, S^6, G^9, S^2, P^{11}, on the right leg; also muscles used to support the weight on the left leg.

No. 8: Same muscles on the left and right legs.

Fig. 42.

Exercises Nos. 9 and 10.

Weights. —
Times. —
Rate per minute. —

Position No. 9. — Place left foot in the handle and stand with back to the weights, grasping a chair, as in Fig. 42.

Movement No. 9. — Bring the left leg down to an extended position in front of the body, as in Figure. Return to position, bending the left knee sharply as the leg is carried backward.

Position No. 10. — Reverse of No. 9; right foot in stirrup.

Movement No. 10. — Same as No. 9, balancing on left leg.

Principal Muscles brought into action. — No. 9: P^{14}, I^1, T^1, P^3, A^6, A^5, R^4, C^5, V^1, V^2, T^5, E^{12}, E^8, (foot), P^8, on left leg; also the muscles used to support the weight on right.

No. 10: Same muscles on right and left leg.

Fig. 43.

Exercises Nos. 11 and 12.

Position No. 11. — Place the left foot in the stirrup and stand with back to the weights, as in Fig. 43, with the chair about six feet from the wall.

Movement No. 11. — Bring the left leg down to an extended position in front of the body, as in Fig. 42; then let the leg go as far back as possible, keeping the knee straight and bending only at the loins.

Position No. 12. — Reverse of No. 11, with right foot in the handle.

Movement No. 12. — Same as No. 11, balancing on the left foot.

Principal Muscles brought into action. — No. 11: P^{14}, I^1, T^1, P^3, A^6, A^5, and R^4, C^5, V^1, V^2, in holding the left leg straight; also the T^5, E^{12}, E^8, P^8, in holding the left foot flexed.

No. 12: Same muscles on right leg.

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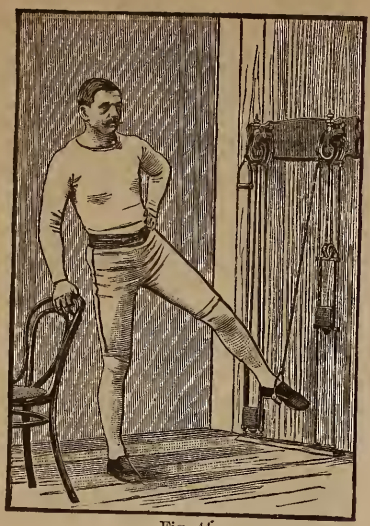

Fig. 44.

Exercises Nos. 13 and 14.

Weights. —
Times. —
Rate per minute. —

Position No. 13.—Place left foot in stirrup and stand with left side to weights, grasping a chair with the right hand as in Fig. 44.

Movement No. 13. — Bring left foot down to floor keeping the leg straight throughout the movement.

Position No. 14. — Reverse of No. 13, with right foot in the stirrup.

Movement No. 14. — Same as No. 13, balancing on left leg.

Principal Muscles brought into action. — No. 13: P^{14}, I^1, P^3, G^9, A^6, A^5, A^7, O^5, Q^1, E^{12}, F^{10}, F^{12}, T^6 on the left leg, also the muscles that support the weight on right leg.

No. 14: Same muscles on right leg, also those that support the weight on left leg.

Fig. 45.

Exercise No. 15.

Weights. — 1, 2, 3, 4, 5, 6, 7, 8, 9, 10.

Times. — 5, 10, 15, 20, 25, 30, 35, 40, 45, 50.

Rate per minute. — 5, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, 40.

Position No. 15. — Grasp handles and stand about four feet from the apparatus; bend forward at same time assuming a sitting posture as in Fig. 45.

Movement No. 15. — Turn hands palms upward, straighten legs and back and bring handles with bent arms to a position over the head as in Fig. 46.

Principal Muscles brought into action. — R^4, C^5, V^1, V^2, G^6, part of G^7, P^{17}, O^6, part of A^7, long head of B^2, S^9, S^6, T^{10}, R^8, L^1, S^{11}, S^{12}, S^1, L^4, S^{14}, S^7, M^2, I^6, part of D^1, T^2, T^3, long head of T^{12}, B^1, B^4, P^{13}, F^7, F^9, F^8, S^{26}, C^3, P^4.

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Fig. 46.

Exercise No. 16.

Weights. —

Times. —

Rate per minute. —

Position No. 16. — Grasp the handles and stand about four feet from the apparatus; bend forward with legs straight, pivoting at the hips only.

Movement No. 16.—Sweep the handles backward, keeping the arms straight, and bringing the body to an erect position with chest and abdomen well forward.

Principal Muscles brought into action. — T^{10}, R^{8}, L^{1}, S^{11}, S^{12}, S^{1}, L^{4}, S^{14}, S^{7}, M^{2}, I^{6}, G^{6}, P^{7}, P^{17}, O^{6}, part of A^{7}, long head of B^{2}, S^{9}, S^{6}, part of D^{1}, part of P^{4}, B^{1}, C^{3}, B^{4}, P^{13}, F^{7}, F^{9}, F^{8}, S^{27}.

NOTE. — In adjusting the height of the pulleys see that they are firmly fastened with the thumb-screw before any weight is put upon them.

Fig. 47.

Exercise No. 17.

Weights. — 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16.

Times. — 10, 20, 30, 40, 50, 60, 70, 80, 90, 100, 110, 120, 130, 140, 150, 160, 170, 180, 190, 200, 210, 220, 230, 240, 250, 260, 270, 280, 290, 300.

Rate per minute. — 20, 25, 30, 35, 40, 45, 50, 55, 60, 65, 70, 75, 80, 85, 90, 95, 100.

Position No. 17. — Grasp the handles and stand facing the apparatus about three feet away.

Movement No. 17. — Pull down alternately with left and right, bending the knees at each downward movement, and turning partially around as in Fig. 47.

Principal Muscles brought into action. — O^{1}, O^{2}, Q^{2}, L^{4}, S^{1}, S^{11}, S^{12}, L^{1}, part of D^{1}, T^{2}, T^{3}, T^{12}, A^{10}, E^{4}, E^{3}, E^{13}, E^{7}, E^{4}, E^{12}, R^{4}, C^{5}, V^{1}, V^{2} alternately on both arms and sides.

Fig. 48.

THE TREADLES.

Weights. — 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30.

Times. — 10, 20, 30, 40, 50, 60, 70, 80, 90, 100, 110, 120, 130, 140, 150.

Movement. — Very slow, slow, medium, fast, very fast.

Rate per minute. — 20, 30, 32, 34, 36, 38, 40, 42, 44, 46, 48, 50, 52, 54, 56, 58, 60.

Nos. 2 and 51.

1. Face the apparatus. Grasp the vertical rods shoulder-high; stand with feet twelve inches from bottom piece; place the left foot upon the treadle, allowing only the hollow of the foot to touch; lean slightly forward, and bring the treadle down on the rubber buffers, the right foot remaining in position.

1′. The same, with right foot on treadle. (See Fig. 48.)

2. Face the apparatus. Step with left foot on the treadle, then with right, bringing both treadles on buffers; grasp the horizontal rods about six inches from the vertical rods; while in this position, with body held erect, raise the left knee to a horizontal in front; then bring treadle again to the buffers.

2′. The same with right foot, alternating, and coming to rest between each movement.

3. Grasp the handles over head, hold the weight with bent arms, and work the treadles, alternating right and left.

4. Grasp the horizontal rods about twelve inches from the vertical rods; support the weight partly by the hands, and allow both knees to ascend, bending the back at the same time; then straighten both legs, and bring the treadles to buffers.

Principal Muscles brought into action.

1. G^6, part of G^7, P^{17}, O^6, part of A^7, long head of B^2, S^9, S^6, — G^1, P^9, S^{13}, F^{10}, (foot), F^{12}, T^6, P^7, P^6, on left leg.

1′. Same muscles on right leg.

2. R^4, C^5, V^1, V^2.

2′. Same muscles alternately on right and left leg.

3. R^4, C^5, V^1, V^2; also muscles of arms and back in supporting part of the weight from the handles.

4. T^{10}, R^8, L^1, S^{11}, S^{12}, S^1, L^4, S^{14}, S^7, M^2, I^6, G^6, part of G^7, P^{17}, O^6, part of A^7, long head of B^2, S^9, S^6, R^4, C^5, V^1, V^2, F^9, F^{14}, L^6, F^2, A^1.

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THE BRIDLE.

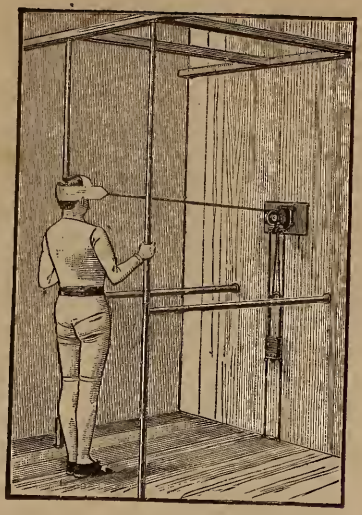

Fig. 49.

Weights. — 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12.

Times. — 5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 55, 60.

Movement. — Very slow, slow, medium, fast, very fast.

Rate per minute. — 15, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, 40, 42, 44, 46, 48, 50.

Nos. 3 and 50.

1. Face the apparatus. Place bridle on the head; grasp vertical rods shoulder-high; step back till the arms are extended, and toes are within twelve inches of the plates around foot of rods; come forward, keeping neck and body straight, rise on toes slightly; then push back to position. (See Fig. 49.)

2. Face the apparatus. Place bridle on the head; grasp the rods shoulder-high, and step back until the toes are on a line with the foot of vertical rods; lean backward till arms are extended; then come forward with the head, bending neck, upper and lower back, pivoting at the hips; now straighten the back and neck, throwing the chest well forward with every movement.

3. Face the apparatus. Place bridle on the head; step back till the body is parallel with vertical bars; grasp the bars shoulder-high; allow the neck to drop forward, pivoting at the seventh cervical vertebra, extending the chin well forward; bring head back o place, straightening the neck, etc.

4. Stand with left side to apparatus. Place bridle on head; grasp bridle-yoke with left hand; step to right till the body is just outside the line of the vertical rods, with feet twenty-four inches apart; with left leg firmly braced, lean to the left till the head passes the vertical bar, then swing to the right.

4′. The same, with right side to apparatus, swinging the head to the left.

Principal Muscles brought into action.

1. Part of T^{10}, R^8, S^{11}, S^{17}, S^{18}, C^2, T^7, T^9, I; S^8, R^6, R^7, O^3, O^4, S^5, L^2, — part of D^1, part of P^4, B^1, C^3, T^{12}, A^{10}.

2. The same muscles as in 1; also S^1, L^4, S^{14}, S^7, M^2, I^6.

3. Part of T^{10}, R^8, S^{11}, S^{17}, S^{18}, C^2, T^7, T^9, I^3, S^8, R^6, R^7, O^3, O^4, S^5, L^2.

4. P^{10}, S^{19}, part of T^{10}, S^{17}, S^{18}, T^7, C^2, R^8, S^{11}, T^9, I^3, S^8, R^6, R^7, O^3, O^4, S^5, L^2, on the right side.

4′. Same as in 4, on the left side.

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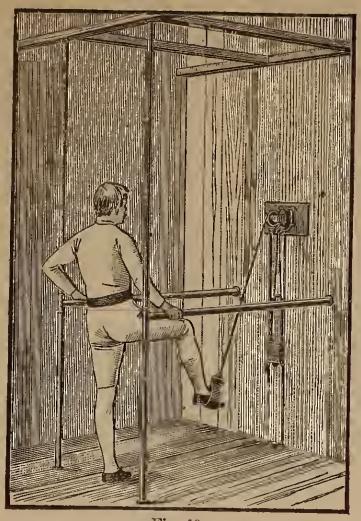

Fig. 50.

THE STIRRUP.

Weights. — 5, 6, 7, 8, 9, 10, 11, 12.

Times. — 10, 20, 30, 40, 50, 60, 70, 80, 90, 100, 110, 120, 130, 140, 150, 160, 170, 180, 190, 200.

Movement. — Very slow, slow, medium, fast, very fast.

Rate per minute. — 30, 32, 34, 36, 38, 40, 42, 44, 46, 48, 50, 52, 54, 56, 58, 60.

No. 4.

1. Step into the stall. Place left foot in the stirrup; grasp the horizontal rods six inches from the vertical rods; step back with right foot till on a line with vertical rods; with knee slightly bent, and toes pointed downward, bring the foot down in pawing movement until the toes nearly touch the floor; bend the knee sharply, bringing the heel toward the buttock; then extend the leg forward, and continue as before.

1′. The same as above, with right foot in the stirrup. (See Fig. 50.)

2. Place left foot in the stirrup, and turn left side to the apparatus. Grasp the horizontal rod with the left hand, and the vertical rod with the right hand, letting the right foot remain about twelve inches from foot of the vertical rod; while in this position, bring left foot down within ten inches of the right heel, keeping the left leg as straight as possible.

2′. The same as above, with right leg, and with right foot in stirrup.

3. Step inside the stall. Place left foot in the stirrup; grasp the horizontal rods twelve inches from the wall, and stand with right foot eighteen inches from weight-box; lean backward till arms and right leg are extended; then bring the left knee to a horizontal position in front of body; straighten left leg, and repeat the movement.

3′. The same as above, with right leg, and with right foot in stirrup.

Principal Muscles brought into action.

1. G^6, part of G^7, P^{17}, O^6, part of A^7, B^2, S^9, S^6, — G^9, S^2, P^{11}, G^1, P^9, S^{13}, F^{10}, F^{12}, T^6, P^7, P^6, on left leg; also muscles used to support the weight on the right leg.

1′. Same muscles on right leg; also muscles used to support the weight on the left leg.

2. P^{14}, I^1, P^3, G^9, A^6, A^5, A^7, O^5, Q^1, — E^{12}, F^{10}, F^{12}, T^6, on the left leg; also the muscles used to support the weight on the left leg.

2′. Same muscles on right and left legs, respectively.

3. G^6, part of G^7, P^{17}, O^6, part of A^7, long head of B^2, S^9, S^6, on left leg.

3′. Same muscles on right leg.

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Fig. 51.

Weights. — 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30.

Times. — 10, 15, 20, 25, 30, 35, 40, 45, 50, 55, 60, 65, 70, 75.

Movement. — Very slow, slow, medium, fast, very fast.

Rate per minute. — 15, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, 40, 42, 44, 46, 48, 50, 52, 54, 56, 58, 60.

Rest minutes after each movement (after 2, 4, 6, 8, 10 movements), in reclining posture, before using any other apparatus.

Nos. 5 and 49.

1. Place yourself between the bars, with back to the weight-box. Grasp the handles, with thumbs and fingers outside, about five inches from the end, with head erect, chest forward, shoulders back, and elbows extended at the sides diagonally backward; push the bars downward until the arms are extended.

In this exercise care should be taken not to let the head drop forward, or the elbows to extend too far backward. To avoid this tendency, keep the hands on the bars and slightly in front of the body.

Principal Muscles brought into action.

1. Part of D^1, part of P^4, B^1, C^3, T^{12}, A^{10}, lower part of T^{10}, L^1, P^5.

2. Place yourself between the bars, with back to weight-box. Hands in front of the body, with thumbs and fingers on the outside of bars. Push the bars downward; now allow them slowly to rise, inflating the lungs fully at the same time; while holding the breath, push the bars down vigorously, exhale, and continue the movement as described.

2. Same muscles as in 1. Also T^4, L^3, D^2, part of P^4, P^5, L^1, S^{10}, S^{19}, S^3, S^4, S^5, S^{22}, C^1, T^{11}, O^1, O^2, T^8, R^1, P^{16}, S^{12}, L^4, S^1, Q^2, S^{10}.

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SHORT INCLINED PLANE.

Fig. 52.

Weights. — 1, 2, 3, 4, 5, 6, 7, 8, 9, 10.

Times. — 25, 35, 45, 55, 65, 75, 85, 95, 105, 115, 125, 135, 145, 155, 165, 175, 185, 195, 200.

Movement. — Very slow, slow, medium, fast, very fast.

Rate per minute. — 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, 40, 42, 44, 46, 48, 50.

Rest minutes after each movement (after 2, 3, 4, 5, 6, 7, 8, 9, 10 movements), in reclining posture, before using any other apparatus.

No. 8.

Principal Muscles brought into action.

1. Take a position on the platform. Place the feet on the foot-rest, and grasp the handles; straighten the knees forcibly, and then allow the platform to return to its original position.

1. G^6, part of G^7, P^{17}, O^6, part of A^7, long head of B^2, S^9, S^6, — R^4, C^5, V^1, V^2, on both legs at the same time.

2. Position as in 1. Straighten the knees, and, as the platform returns to the bottom of the slide, raise the left leg in air, keeping the leg straight, so that the right leg alone bears the weight.

2. The same muscles as in 1, with the action intensified for right leg.

2′. Reverse of 2, left leg bearing the weight, and right leg raised in air.

2′. The same muscles as in 2 on left leg.

No. 6.

(*Lower foot-rest.*)

1. Place your feet on the foot-rest, with heels against the cleat; slide down the platform until you can grasp the handles; then extend the legs, lifting the back free from the platform, and throwing the weight of the body upon the shoulders; while in this position, let the platform slide down to the buffers; extend the legs vigorously, slide back slowly, and repeat.

1. R^4, C^5, V^1, V^2, — G^1, P^9, S^{13}, F^{10}, F^{12}, T^6, P^7, P^6, for both legs, with action intensified about the knee joint.

2. Take a sitting position on the platform, with balls of the feet placed on the cleat, with toes very near the middle of foot-rest. Slide down until you can grasp the handles; now extend the legs vigorously; allow the platform to slide within three or four inches of the buffers, and continue extending and flexing the legs.

2. Same muscles as in 1, with action intensified about the ankle joint.

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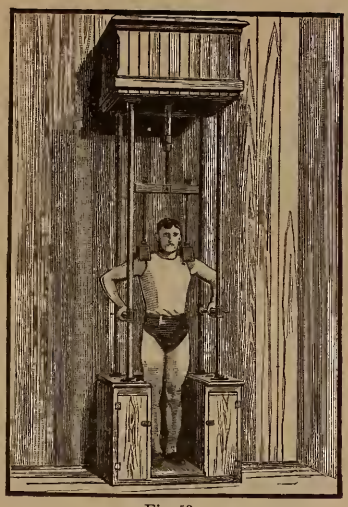

Fig. 53.

Weights.—25, 50, 75, 100, 125, 150, 175, 200.

Times.—5, 10, 15, 20, 25, 30, 35, 40, 45, 50.

Movement. — Very slow, slow, medium, fast, very fast.

Rate per minute.—2, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, 40.

Rest *minutes* after each movement (after 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 movements), in reclining posture, before using any other apparatus.

No. 7.

Principal Muscles brought into action.

1. Adjust the apparatus so that the shoulder-pads are about the height of the arm-pits; place the pads on the shoulders, standing as in Fig. 53, with arms grasping the horizontal bars, and legs slightly bent; take a full breath; raise the weight until the legs are completely extended, pressing down at the same time on the horizontal bars.

1. R^4, C^5, V^1, V^2, part of P^4, L^1, T^{12}, A^{10}, on both legs and arms at the same time; also the muscles on the back and front of the body.

2. Adjust the apparatus so that the top of the shoulder-pads are on a level with the arm-pits; place the pads on the shoulders, standing with back to the railing, knees bent outward, and body erect; grasp the vertical irons above the shoulders, with thumbs downward; take a full breath; raise the weight until the legs are completely extended; then lower it gradually, take another full breath, and continue as before.

2. R^4, C^5, V^1, V^2, part of D^1, T^{10}, L^2, R^8, R^9, R^1, P^{16}, O^1, O^2, P^{14}, P^{15}, L^1, S^{11}, S^{12}, S^1, L^4, S^{14}, S^7, M^2, I^6.

3. Adjust the apparatus so that the shoulder-pads will fall upon the top of the shoulders toward the outer edge; stand with back to the railing, with knees slightly bent; grasp the irons as before, with thumbs downward; while in this position inflate the lungs fully, and as you do so raise the shoulders as high as possible; then gradually lower the weight, at the same time gently exhaling. Care should be taken that the centre of the body be exactly in line with the centre of the machine.

3. The same muscles as in 2, with action intensified in T^{10}, L^2, R^8, R^9.

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THE CHEST DEVELOPER.

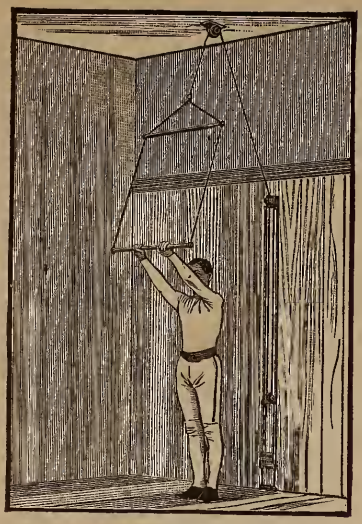

Fig. 54.

Weights. —2, 4, 6, 8, 10, 12, 14, 16, 18, 20.

Times. — 10, 15, 20, 25, 30, 35, 40, 45, 50, 55, 60, 65, 70, 75, 80, 85, 90, 95, 100.

Movement. — Very slow, slow, medium, fast, very fast.

Rate per minute. — 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, 40.

Nos. 9 and 28.

1. Face the weight-box, standing directly under the pulley. Grasp the bar at the extreme ends, and bring it down with both hands until the bar rests opposite the thighs, with arms straight at the sides.

2. Face the weight-box, as in **1**, but standing two feet (from the centre) nearer the apparatus. Grasp the bar with hands eighteen inches apart; bring down the bar, keeping the elbows stiff (see Fig. 54), until it rests opposite the thighs, with arms at sides, as before.

3. Position as in **1**. Bring the bar down by holding the arms straight, and bending the body, pivoting at the hips; then allow the bar to return to its first position; now lean backward, and bring the bar to the back of the neck.

Principal Muscles brought into action.

1. Part of P^4, part of D^1, T^2, T^3, L^1, T^{12}, A^{10}, B^1, B^4, P^{13}, F^7, F^9, F^8, S^{26}, on body and both arms simultaneously.

2. Part of P^4, P^5, S^{10}, part of D^1, T^2, T^3, long head of T^{12}, L^1, — F^7, P^2, F^9, F^8, F^{14}, F^{11}. — R^1, P^{16}, O^1, O^2, P^{14}, P^{15}.

3. Same muscles as in 2, action intensified; also B^1, B^4, P^{13}, F^7, F^9, F^8, S^{26}, part of T^{10}, R^8, L^1, S^{11}, S^{12}, S^1, L^4, S^{14}, S^7, M^2, I^6.

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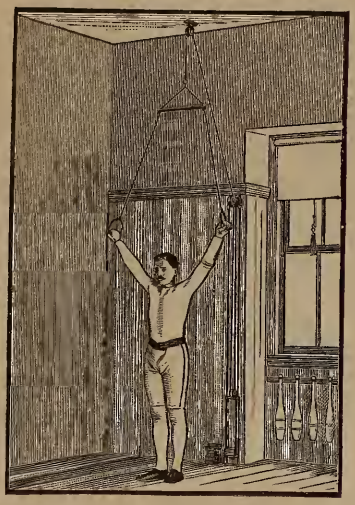

Fig. 55.

Weights. — 2, 4, 6, 8, 10, 12, 14, 16, 18, 20.

Times. — 5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 55, 60, 65, 70, 75.

Movement. — Very slow, slow, medium, fast, very fast.

Rate per minute. — 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, 40, 42, 44, 46, 48, 50.

Rest *minutes* after each movement (after, 2, 4, 6, 8, 10, 12, 14, 1C, 18, 20 movements), in reelining posture, before using any other apparatus.

Nos. 11 and 26.

Principal Muscles brought into action.

1. Take a position immediately under the pulley, facing the apparatus. Grasp the handles, and bring them to the sides, with arms extended, elbows stiff (see Fig. 55); allow handles gradually to return, keeping arms extended at the side, and elbows straight, inflating the lungs slowly, so that they shall be filled to their full capacity when the hands are over the head; then hold the breath as you bring the hands to the sides, as above described.

1. I^4, L^3, D^2, part of P^4, L^1, P^5, S^{10}, S^{19}, $S^{3, 4, 5}$, S^{22}, C^1 — T^{11}, O^1, O^2, T^8, R^1, P^{16}, S^{12}, L^4, S^1, Q^2, S^{10},—F^7, P^2, F^9, F^8, F^{14}, F^{11}.

2. Take a position under the pulley, as in 1, but a little nearer the apparatus. Bend the body forward slowly, lowering the handles with arms straight, and sweeping them backward with circular movement, until they return to their original position.

2. R^1, P^{16}, O^1, O^2, P^{14}, P^{15}, P^4, P^5, S^{10}, part of D^1, T^2, T^3, long head of T^{12}, L^1, — F^7, P^2, F^9, F^8, F^{14}, F^{11}.

3. Face the apparatus, standing three feet farther from the weight-box than in position 1. Bend the body backward from the knees; then, keeping the arms straight, extend them sidewise until they reach a horizontal plane.

3. T^{10}, R^8, L^1, S^{11}, S^{12}, S^1, L^4, S^{14}, S^7, M^2, I^6, — part of D^1, T^2, T^3, L^1, T^{12}, A^{10}—E^4, E^3, E^{13}, E^7, E^6, E^{12}.

Fig. 56.

THE TRAVELLING BAR.

Weights.—10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30.

Times.—10, 12, 15, 17, 20, 22, 25, 27, 30, 50, 75, 100, 125, 150, 175, 200.

Movement. — Very slow, slow, medium, fast, very fast.

Rate per minute.—10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, 40.

Nos. 10 and 27.

1. Face the apparatus. Grasp the bar with hands about ten inches apart, thumbs under, and wrists over (see Fig. 56); bring the bar down to the full extent of the arms; keep it as near the body as possible, with head erect, and shoulders thrown back; as the bar rises again, inflate the lungs slowly, and fill to their utmost capacity; hold the breath, and bring the bar down again.

Principal Muscles brought into action.

1. Part of P^4, L^1, P^5—I^4, L^3, D^2, S^{10}, S^{19}, $S^{3,4,5}$, S^{22}, C^1, T^{11}, O^1, O^2, T^8, R^1, P^{16}, S^{12}, L^4, S^1, Q^2, S^{10},—B^1, B^4, P^{13}, F^7, F^9, F^8, S^{26}, P^2, F^{14}, F^{11}, T^{12}, A^{10}.

2. Grasp the bar with hands eighteen inches apart, thumbs to the front, and fingers over (undergrasp); bring the bar down to a level with the neck; arms bent; allow it to return, and repeat.

2. Part of P^4, L^1, P^5,—B^1, B^4, P^{13}, F^7, F^9, F^8, S^{26}, P^2, F^{14}, F^{11}.

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Fig. 57.

Weights. — 1, 2, 3, 4, 5, 6, 7, 8, 9, 10.

Times. — 5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 55, 60, 65, 70, 75, 80, 85, 90, 95, 100.

Movement. — Very slow, slow, medium, fast, very fast.

Rate per minute. — 60, 65, 70, 75, 80, 85, 90, 95, 100, 105, 110, 115, 120, 125, 130, 135, 140.

Nos. 12 and 25.

1. Face the apparatus. Clasp the inner bar with the fingers, and the outer bar with the thumbs, the hand being above the bars (see Fig. 57); bring the bars together by pressure of the thumb and fingers only, and without exertion of the arm.

2. Face the apparatus. Grasp the inner bar with fingers underneath, and place the palm of the hand against the outer bar, thumbs underneath; then close the hand, bringing the bars together, using the muscles of the hand and forearm only, and not using the biceps.

3. Stand with the right side towards the apparatus. Place both hands under the bars, the thumb of the right hand being extended along the inner bar, and the thumb of the left hand along the outer bar; close and open the hand as before.

3′. The reverse of **3**, with left side towards the apparatus.

4. Grasp the instrument with left hand under, fingers on inner bar, and outer bar in the hollow between thumb and forefinger.

Principal Muscles brought into action.

1. O^8, F^5, F^{10}, F^9, F^{14}, L^6, F^2, A^1, on both hands simultaneously.

2, 3, 3′, and **4** the same muscles as in **1**, with action of different ones intensified.

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THE LONG INCLINED PLANE.

Fig. 58.

Weights. — 12, 10, 8, 6, 4, 2, 1.

Times. — 5, 7, 9, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, 40, 42, 44, 46, 48, 50.

Movement. — Very slow, slow, medium, fast, very fast.

Rate per minute. — 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, 40.

Rest minutes after each movement (after 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 movements), in reclining posture, before using any other apparatus.

No. 13.

	Principal Muscles brought into action.
1. Lie at full length, with back on the platform. Place the toes in the straps; grasp the bar with hands about twelve inches apart (see Fig. 58); draw the bar down until it is opposite the breast.	1. Part of D^1, P^4, B^1, C^3, L^1, on both arms and sides.
2. Position as in **1**. Bring the bar down past the face, close to the body, to full extent of the arms.	2. Same as in **1**; also T^{12}, A^{10}, F^7, P^2, F^9, F^8, F^{14}, F^{11}.
3. Position as in **1**. Grasp the bar with hands four inches apart, and sweep it down until it is opposite the thighs, keeping the arms as stiff as possible. The bar will thus perform nearly a semicircle.	3. Same as in **1** and **2**, with action intensified.
4. Position as in **1**. Bring the bar down, as in **2**, to front of thighs; then extend the bar towards the toes, keeping the arms straight, and raising the body to a sitting posture; let the platform slide down to its original position, and continue as described.	4. Same as in **1** and **2**; also R^1, P^{16}, O^1, O^2, P^{14}, P^{15}, P^5, S^{10}, I^1, T^1, P^3, A^6, A^5.
5. Position as in **1**. Grasp the bar with hands twelve inches apart; inflate the lungs to their full extent; while holding the breath, draw the bar down to a position in front of the chest from two to ten times before exhaling. Rest and repeat.	5. I^4, L^3, D^2, part of P^4, L^4, P^5, S^{10}, S^{19}, $S^{3,4,5}$, S^{22}, C^1, T^{11}, O^1, O^2, T^8, R^1, P^{16}, S^{12}, L^4, S^1, Q^2, S^{10}, — B^1, B^4, P^{13}, F^7, F^9, F^8, S^{26}, P^2, F^{14}, F^{11}, T^{12}, A^{10}.

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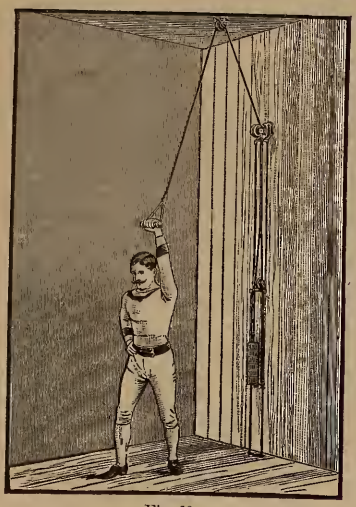

Fig. 59.

THE GIANT PULLEY.

Weights. — 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 25.

Times. — 5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 55, 60, 65, 70, 75, 80, 85, 90, 95, 100.

Movement. — Very slow, slow, medium, fast, very fast.

Rate per minute. — 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, 40, 42, 44, 46, 48, 50, 52, 54, 56, 58, 60.

Nos. 18 and 19.

1. Grasp the handle with right hand, and stand about five feet away, with right side toward the apparatus; bring the right arm down across the chest, keeping the elbow straight until you make a complete circle.

Principal Muscles brought into action.

1. Part of P^4, P^5, L^1, S^{10}, R^1, P^{16}, O^1, O^2, P^{14}, P^{15}, — T^{12}, A^{10}, F^7, P^2, F^9, F^8, F^{14}, F^{11}, on the right arm and right side.

2. The reverse of **1**, with left arm and left side to apparatus. (See Fig. 59.)

2. Same muscles as in **1**, on the left arm and side.

3. Grasp the handle with right hand, and stand with back to apparatus, just left of the centre; carry the handle down forward, keeping the arm straight, until the handle reaches the side; then bend the arm, and bring the handle to a position above the shoulder, with extended arm.

3, 4. Same muscles as in **1** and **2**, with action intensified.

4. The reverse of **3**, with left arm.

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5. Stand with right side to apparatus. Grasp the handle with the right hand, step three feet to the left, and pull handle down to shoulder with bent arm.

5. Part of D^1, T^2, T^3, L^1, long head of T^{12}, — B^1, B^4, P^{13}, F^7, F^9, F^8, S^{26}, P^2, F^{14}, F^{11}, on right arm and right side.

6. The reverse of **5**, using left hand and arm instead of right.

6. Same muscles on the left arm and left side.

Fig. 60.

THE HIGH PULLEYS.

Weights. — 2, 4, 6, 8, 10, 12, 14, 16, 18, 20.

Times. — 10, 20, 30, 40, 50, 60, 70, 80, 90, 100, 110, 120, 130, 140, 150, 160, 170, 180, 190, 200, 210, 220, 230, 240, 250, 260, 270, 280, 290, 300.

Movement. — Very slow, slow, medium, fast, very fast.

Rate per minute. — 20, 25, 30, 35, 40, 45, 50, 55, 60. 65, 70, 75, 80, 85, 90, 95, 100.

Nos. 17 and 20.

1. Face the apparatus, standing about three feet away. Grasp the handles, and pull down, alternately with right and left hands, bending the knees with each downward movement, and turning the body partially around. (See Fig. 60.)

2. Stand with back to apparatus, heels touching the foot-board. Draw handles down to the full extent of the arms, holding them in front of the body, and with back of hands upward; let them rise to the chest, elbows outward; then press downward to an extended position, and repeat.

3. Stand with back to apparatus, as in 2. Grasp handles above the head, throw the body forward, then sweep the arms forward and downward with a circular movement, keeping the elbows straight. Return to first position with bent arm movement, and continue as above.

Principal Muscles brought into action.

1. O^1, O^2, Q^2, L^4, S^1, S^{11}, S^{12}, L^1, part of D^1, T^2, T^3, T^{12}, A^{10}, — E^4, E^3, E^{13}, E^7, E^6, E^{12}, R^4, C^5, V^1, V^2, alternately on both arms and sides.

2. Part of D^1, part of P^4, B^1, C^3, T^{12}, A^{10}, lower part of T^{10}, L^1, P^5.

3. Part of P^4, P^5, S^{10}, part of D^1, T^2, T^3, long head of T^{12}, L^1, F^7, P^2, F^9, F^8, F^{14}, F^{11}, — R^1, P^{16}, O^1, O^2, P^{14}, P^{15}.

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THE LOW PULLEYS.

Fig. 61.

Weights. — 2, 4, 6, 8, 10, 12, 14, 16.

Times. — 5, 8, 10, 12, 15, 17, 20, 22, 25, 27, 30, 32, 35, 37, 40.

Movement. — Very slow, slow, medium, fast, very fast.

Rate per minute. — 5, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, 40.

Rest *minutes* after each movement (after 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 movements), in reclining posture.

1. Grasp the handles, and stand about four feet from the apparatus; bend forward, and at the same time assume a sitting posture (see Fig. 61); turn the hands palms upward, straighten the legs and back, and bring the handles, with bent arms, to a position over the shoulder (see Fig. 62).

2. Grasp the handles, and stand four feet from the apparatus; bend forward, with legs straight, pivoting at the hips only; then sweep the handles backward, keeping arms straight, and bringing the body to an erect position, with chest and abdomen well forward.

3. Grasp the handles, and stand with feet together, back to apparatus, so that the heels will just clear the stanchions; lift handles to a position above the head, with arms extended, turning the handles at the same time, so that the ropes will pass by the shoulders.

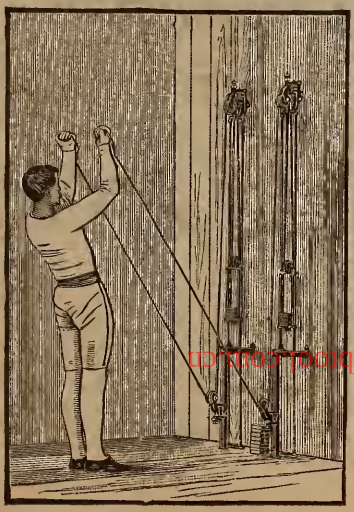

Fig. 62.

Principal Muscles brought into action.

1. T^{10}, R^8, L^1, S^{11}, S^{12}, S^1, L^4, S^{14}, S^7, M^2, I^6, G^6, P^7, P^{17}, O^6, part of A^7, long head of B^2, S^9, S^6, part of D^1, part of P^4, B^1, C^3, B^4, P^{13}, F^7, F^9, F^8, S^{26}.

2. Part of T^{10}, R^8, L^1, S^{11}, S^{12}, S^1, L^4, S^{14}, S^7, M^2, I^6, — part of D^1, T^2, T^3, long head of T^{12}; also G^6, G^7, P^{17}, O^6, A^7, long head of B^2, S^9, S^6.

3. Part of D^1, part of P^4, B^1, C^3, T^{12}, A^{10}, — R^1, P^{16}, O^1, O^2, P^{14}, P^{15}.

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THE QUARTER CIRCLE.

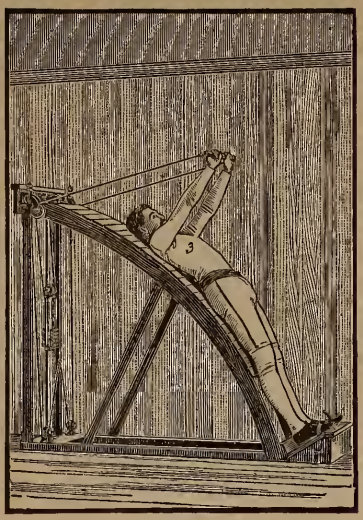

Fig. 63.

Weights. — 2, 4, 6, 8, 10, 12, 14, 16.

Times. — 5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 55, 60, 65, 75.

Movement. — Very slow, slow, medium, fast, very fast.

Rest per minute. — 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, 40.

Rest *minutes* after each movement (after 2, 3, 4, 5, 6, 7, 8, 9, 10 movements), in reclining posture, before using any other apparatus.

Nos. 29 and 30.

1. Recline with back on apparatus, and place the feet in straps. Grasp the bar with hands twelve inches apart; fill the lungs as completely as possible, hold the breath, and bring the bar, with arms held rigidly straight (see Fig. 63), to a position in front of the thighs; now exhale; take another breath as the bar goes upward, hold the breath, and bring the bar down, with arms extended as above.

2. Position as in **1**. Grasp the bar with thumbs outward, hands ten inches apart; bring bar down on the back of the neck, then come forward to an upright position and beyond.

3. Position as in **1**. With little fingers next to the knots, grasp the rope-handles attached to the bar, and bring bar to back of neck. While in this position raise the body from the circle, pivoting at the hips only.

Principal Muscles brought into action.

1. I^4, L^3, D^2, part of P^4, L^1, P^5, S^{10}, S^{19}, $S^{3,\,4,\,5}$, S^{22}, C^1, T^{11}, O^1, O^2, T^8, R^1, P^{16}, S^{12}, L^4, S^1, Q^2, S^{10}, — B^1, B^4, P^{13}, F^7, F^9, F^8, S^{26}, P^2, F^{14}, F^{11}, T^{12}, A^{10}.

2. R^1, P^{16}, O^1, O^2, P^{14}, P^{15}, P^4, P^5, S^{10}, — T^{12}, A^{10}.

3. Same muscles as in **2**, with action less intense.

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Fig. 64.

Weights. — 1, 2, 3, 4, 5, 6, 7, 8, 9, 10.

Times. — 5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 55, 60, 65, 70, 75, 80, 85, 90, 95, 100.

Movement. — Very slow, slow, medium, fast, very fast.

1. Standing with ball on the head and back to apparatus, the knees bent and feet four inches apart, grasp the handles as in Fig. 64. Straighten the legs gradually, regulating the weight taken by the head by the amount lifted by the arms.

Principal Muscles brought into action.

1. This apparatus brings into gentle action nearly all the muscles that move the head, neck, and trunk, and brings into more powerful action the muscles that extend the legs. flex the arms, and elevate the shoulders.

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Fig. 65.

Nos. 34 and 43.

1. Face the apparatus. Grasp the centre of roller with both hands, fingers over, and thumbs under; turn the roller toward you (see Fig. 65).

2. Position as in 1, with left hand over and thumb under, and right hand under with thumb over. Turn the roller toward you.

3. Position as in 1, with right hand over and thumb under, and left hand under with thumb over. Turn toward you.

4. Position as in 1, with both hands under, and thumbs over. Turn toward you.

5. Position as in 1, with both hands over, and thumbs under. Turn from you.

6. Position as in 1, with right hand under, and thumb over. Turn from you.

7. Position as in 1, with left hand under, and thumb over. Turn from you.

8. Position as in 1, with both hands under, and thumbs over. Turn from you.

THE WRIST MACHINE.

Weights. — 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12.

Times. — 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, up.

Movement. — Very slow, slow, medium, fast, very fast.

Rate per minute. — 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, 40.

Principal Muscles brought into action.

1. E^4, E^3, E^{13}, E^7, E^6, E^{12}, E^9, — O^8, F^5, F^{10}, on both arms and forearms alternately.

2. Same as in 1 for the left hand and forearm, — also F^7, P^2, F^9, F^8, F^{14}, F^{11}, L^6, F^2, A^1, — E^{10}, E^{11}, E^{13}, on the right hand and forearm.

3. Same as in 1 for right hand and forearm, and same as in 2 for left hand and forearm.

4. Same as in 1 for both hands and forearms, action intensified.

5. F^7, P^2, F^9, F^8, F^{14}, F^{11}, L^6, F^2, A^1, E^{10}, E^{11}, E^{13}, on both hands and forearms.

6. E^4, E^3, E^{13}, E^7, E^6, E^{12}, E^9, — O^8, F^5, F^{10}, for right hand and forearm. Same as in 5 for the left.

7. Same as in 6 for left hand and arm, and same as in 5 for right hand and arm.

8. Same as in 5 for both hands and forearms. Action intensified.

NOTE. — The flexors of the fingers and thumbs are exercised in all of the movements in sustaining the grasp.

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Fig. 66.

Times. — 5, 7, 10, 15, 17, 20, 22, 25, 27, 30, 40, 50, 60, 70, 80.

Movement. — Very slow, slow, medium, fast, very fast.

Rate per minute. — 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12.

Nos. 35 and 41.

1. Stand on the foot-piece, facing the apparatus. Hold the body rigidly straight, and lunge forward, grasping the bars shoulder-high, throwing out the chest, and extending the elbows at the sides (see Fig. 66); now push back to an upright position, releasing the grasp of the hands, and bringing them to the sides; lunge forward again as before.

2. Stand back to apparatus, two feet from foot-rest, with body held erect. Now fall back between the bars, and grasp them just as the shoulders pass through; pull the body back again vigorously, releasing the hands, and grasping the bars on the other side as the body passes through.

3. Stand facing the apparatus, with toes six inches from the foot-rest. Lunge forward, and grasp the bars about shoulder-high; then extend the arms forcibly, so as to bring the body to an erect position.

Principal Muscles brought into action.

1. Part of D^1, part of P^4, B^1, C^3, T^{12}, A^{10}, P^5, S^{10},—R^1, P^{16}, O^1, O^2, P^{14}, P^{15}.

2. Part of D^1, T^2, T^3, long head of T^{12}, L^1,—B^1, B^4, P^{13}, F^7, F^9, F^8, S^{26},—part of T^{10}, R^8, R^9.

3. Same muscles as in 1, with action intensified.

CONSTITUTIONAL GYMNASIUM

Fig. 67.

THE FOLDING TABLE.

Weights. — 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12.

Times. — 5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 55, 60.

Movement. — Very slow, slow, medium, fast, very fast.

Rate per minute. — 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, 40, 42, 44, 46, 48, 50.

Rest *minutes* after each movement (after 2, 3, 4, 5, 6, 7, 8, 9, 10 movements), in reclining posture, before using any other apparatus.

No. 36.

1. Recline upon the apparatus, after having adjusted it at any angle of thirty degrees. Place your feet under the foot-rest, and grasp the bar, with hands twelve inches apart; bring the bar to the thighs, with arms partially bent; allow it to return, and repeat the movement.

2. Position same as in **1**. Grasp the bar, with hands twelve inches apart, and bring it down to the thighs, with arms held rigidly straight. (See Fig. 67.)

3. Position as in **1**. Grasp the knotted ropes, with thumbs next to the bar; come forward with body to a sitting posture, bringing the bar, at the same time, to the back of the neck.

4. Adjust the apparatus to an angle of ten degrees. Place the feet under the foot-rest, and the hands behind the head; raise yourself to a sitting position, bending at the hips only.

Principal Muscles brought into action.

1. Part of D^1, part of P^4, L^1, T^{12}, A^{10}, F^7, P^2, F^9, F^8, F^{14}, F^{11}.

2. Same as in **1**; action of muscles intensified.

3. R^1, P^{16}, O^1, O^2, P^{14}, P^{15}, P^4, P^5, S^{10}, T^{12}, A^{10}, I^1, T^1, P^3, A^6, A^5, R^4.

4. R^1, P^{16}, O^1, O^2, P^{14}, P^{15}; action of same muscles less severe than in **3**.

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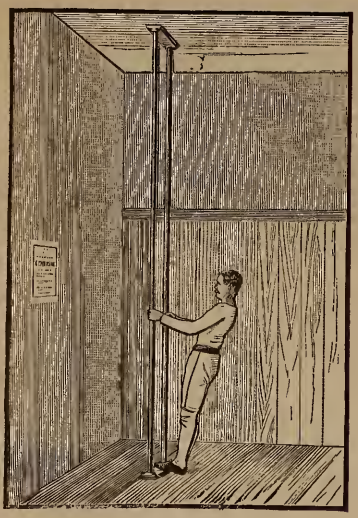

Fig. 68.

Times. — 10, 12, 15, 17, 20, 22, 25, 27, 30, 50, 75, 100, 125, 150, 175, 200.

Movement. — Very slow, slow, medium, fast, very fast.

Rate per minute. — 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, 40.

Nos. 37 and 39.

1. Stand with balls of the feet on the foot-rest, heels resting on the floor; grasp the bars shoulder-high, and raise the weight on the toes. (See Fig. 68.)

2. Stand on the foot-rest, and grasp the bars shoulder-high; lean backward till the arms are extended; then lunge forward, keeping the elbows down towards the sides. (See Fig. 69.)

Fig. 69.

3. Face the wall, with feet on the foot-rest, and grasp the bars shoulder-high; now swing to the left until the left bar is opposite the centre of the body, and so on.

Principal Muscles brought into action.

1. G^1, P^9, S^{13}, F^{10}, F^{12}, T^6, P^7, P^6, on both legs simultaneously.

2. Part of D^1, T^2, T^3, L^1, T^{12}, — B^1, B^4, P^{13}, F^7, F^9, F^8, S^{26}, — P^4, C^3. — T^{12}, A^{10}, part of T^{10}, R^8, R^9.

3. Part of D^1, T^2, T^3, L^1, T^{12}, long head of T^{10}, R^8, R^9, P^4, P^5, S^{10}, B^1, B^4, P^{13}, O^1, O^2, Q^2, L^4, S^1, S^{11}, S^{12}, on both arms and sides alternately.

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THE ADJUSTABLE LADDER PARALLELS.

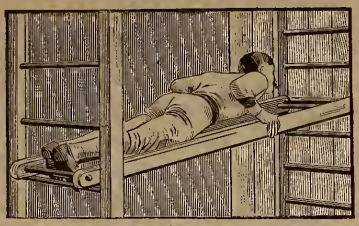

Fig. 70.

Times. — 1, 2, 3, 4, 5, 6, **7**, 8, 9, 10, 12, 14, 16, 18, 20, 22, 25.

No. 38.

1. Place the hooks of the bars over the fourth round of the ladder next to the wall, and place the other end of the bars on the third round of the ladder adjoining. Take a position between bars, facing the centre of the hall, and about a foot from the large vertical ladder. Now raise the weight to the full extent of the arms, then drop to floor; repeat this, then move the hands backward two inches, and raise the weight again, and drop to the floor; then back two more inches with hands, raise the weight as above, etc.

Principal Muscles brought into action.

1. Part of D^1, part of P^4, B^1, C^3, T^{12}, A^{10}.

2. Take position between bars, facing the centre of the hall, about three feet from large vertical ladder; raise the weight on the arms, and while in this position lift the feet, with legs straight and without a swing, till you touch the first round above the bar.

2. Same as in 1; also P^{14}, I^1, T^1, P^3, A^6, A^5.

2′. Position as in 2. Touch the second round above the bar.

2″. Position as above. Touch the third round, etc.

2′, 2″. Same as in 1 and 2; also R^1, P^{16}, O^1, O^2, P^{f5}, P^5, S^{12}.

3. Stand on bottom round of large vertical ladder with back to it; place the hands at the centre of the bars, with arms straight; then come forward with body until the shoulders are on a level with the hands; now extend the arms, and continue as before.

3, 3′, 3″. Same muscles as in 1, 2, 2′, and 2″, with action less intense.

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3′. Position as in 3. Place the feet on *second* round, and continue as above.

3″. Position as in 3. Place the feet on *third* round, and continue as above (see Fig. 70).

Fig. 71.

Weights. — 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30.

Times. — 20, 40, 60, 80, 100, 120, 140, 160, 180, 200, 220, 240, 260, 280, 300, 320, 340, 360, 380, 400.

Movement. — Very slow, slow, medium, fast, very fast.

Rate per minute. — 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, 40, 42, 44, 46, 48, 50, 52, 54, 56, 58, 60.

Rest minutes after each movement (after 2, 3, 4, 5, 6, 7, 8, 9, 10 movements), in reclining posture, before using any other apparatus.

No. 40.

1. Seat yourself in the apparatus, place the feet on the treadles, and let the elbows rest on the arms of the chair, grasping the ends with the hands; extend the right and left leg alternately. (See Fig. 71.)

2. Position as in 1. Extend both legs at the same time.

3. Position as in 1. Extend the left leg three times, then the right, and so on.

4. Position as in 1. Extend the left leg three times, allowing the leg at rest to remain in a bent position; then the right, and so on.

5. Position as in 1. Extend the left leg twice, then the right, and so on, allowing the leg at rest to remain extended.

6. Position as in 1. Slide down in the seat so that the pressure of the weight or resistance shall come upon the upper back and shoulders; now extend the right and left legs rapidly, allowing the knees to come nearly to the chest.

Principal Muscles brought into action.

1. G^6, G^7, P^{17}, O^6, A^7, long head of B^2, S^9, S^6, — R^4, C^5, V^1, V^2, on right and left legs alternately.

The same muscles are used in 2–6, the movements being varied to change the intensity of action and give greater intervals of rest to the groups of muscles used.

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THE PRONATOR AND SUPINATOR MACHINE.

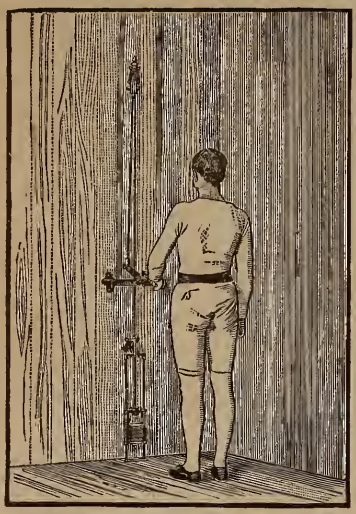

Fig. 72.

Weights. — 1, 2, 3, 4, 5, 6.

Times. — 5, 7, 10, 12, 15, 17, 20, 22, 25, 27, 30, 40, 50, 60, 70, 80.

Movement. — Very slow, slow, medium, fast, very fast.

Rate per minute. — 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12.

No. 42.

1. Face the apparatus, standing three feet away. Grasp the handle with right hand, thumbs downward, and turn slowly to the right, then back to the left, holding the arm straight.

1′. Position as in **1.** Grasp the handle with the left hand, thumb downward, and turn to the left, and back, holding the arm straight, etc. (See Fig. 72.)

Principal Muscles brought into action.

1. S^{28}, I^{3}, T^{3}, — B^{1}, S^{25}, E^{13}, P^{2}, L^{1}, T^{2}, — P^{13}, F^{7}, P^{2}, F^{9}, P^{12}, on the right arm.

1′. Same muscles on the left arm.

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Fig. 73.

Weights. — 1, 2, 3, 4, 5, 6, 7, 8, 9, 10.

Times. — 30, 40, 50, 60, 70, 80, 90, 100, 110, 120, 130, 140, 150.

Movement. — Very slow, slow, medium, fast, very fast.

No. 44.

Principal Muscles brought into action.

1. Sit in chair, and extend right leg straight, with right foot in foot-rest; connect the rope on right side by hooking into ring back of foot-rest; turn foot to left side, keeping knee straight; return to place, and continue movement.

1. T^1, part of G^7, S^2, S^3, — Q^{12}, F^{10}, F^{12}, T^6, A^4, on the right leg (inside).

2. Position as in 1. Connect rope on left side by hooking into ring back of foot-rest; turn foot to right side, keeping knee straight; return to place, and continue movement.

2. G^6, part of G^7, P^{17}, G^2, O^6, G^3, Q^1, O^5, P^{14}, I^1, A^6, A^5, A^7, B^2, — P^7, P^6, E^8, P^8 — A^4, A^1, on the right leg (outside).

3. Sit in chair, and extend left leg straight, with left foot in foot-rest (see Fig. 73); connect rope on left side by hooking into ring back of foot-rest; turn foot to right side, keeping knee straight; return to place, and continue movement.

3. Same muscles as in 1 on the left leg (inside).

4. Position as in 3. Connect rope on right side by hooking into ring back of foot-rest; turn foot to left side, knee straight; return to place, and continue movement.

4. Same muscles as in 2 on the left leg (outside).

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THE FLEXOR, FOOT, AND ANKLE MACHINE.

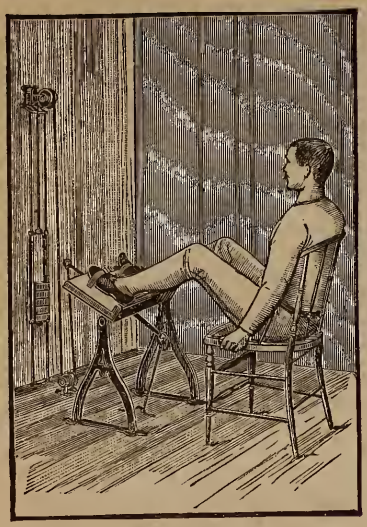

Fig. 74.

Weights. — 2, 4, 6, 8, 10, 12, 14, 15, 16, 17, 18, 19, 20.

Times. — 60, 70, 80, 90, 100, 110, 120, 130, 140, 150, 160, 170, 180, 190, 200, 210, 220, 230, 240, 250.

Rate per minute. — 30, 35, 40, 45, 50, 55, 60, 65, 70, 75, 80, 85, 90.

No. 45.

Sit in a chair about twenty inches from machine. Place the feet on the foot-rest, with toes under the straps (see Fig. 74), and knees bent at right angles; raise and lower the box-weight by flexing the feet.

Fig. 75.

Weights. — Increase the weight by rolling the balls toward the end of the projecting screw.

No. 46.

Sit in a chair about twenty-four inches from machine. Place the feet on the foot-rest, with toes under the straps, and knees slightly bent; then raise and lower the ball-weights by flexing the feet, keeping heels closely pressed against foot-rest (see Fig. 75). In using the machine do not allow the weights to be supported by the rope attachment, but keep them constantly under tension of the muscles.

Principal Muscles brought into action.

T^5, E^{12}, E^8, P^8,—E^{12}, E^2.

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Fig. 76.

Weights. — 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30.

Times. — 20, 25, 30, 35, 40, 45, 50, 55, 60, 65, 70, 75, 80, 85, 90, 95, 100.

Movement. — Very slow, slow, medium, fast, very fast.

Rate per minute. — 15, 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, 40, 42, 44, 46, 48, 50, 52, 54, 56, 58, 60.

Rest *minutes* after each movement (after 1, 4, 6, 8, 10, 12, 14, 16 movements), in reclining posture, before using any other apparatus.

No. 47.

Principal Muscles brought into action.

1. Face the apparatus, standing with feet about twenty inches apart. Grasp the vertical rod at the ends, with right hand above, and left below; while the arms are held straight, turn slowly to the right until the position of the bar is inverted.

1. Part of D^1—B^1, B^4, P^{13}, F^7, F^9, F^8, S^{26}, on left arm. Part of P^4, L^1, part of D^1, and long head of T^{12}, on right arm. O^1, O^2, Q^2, L^4, S^1, S^{11}, S^{12}, on the right side.

1′. Position as in 1. Grasp the bar with left hand above and thumbs toward the centre (see Fig. 76); turn slowly to the left, with arms straight, till bar is inverted.

1′. Same muscles on opposite arms and sides.

2. Stand facing the apparatus, with feet together. Grasp the bar, with right hand above, and left below, thumbs toward the centre, and hands six inches from the ends of the bar; lean backward, and turn with straightened arms to vertical position.

2. Same as in 1, with action of the muscles intensified.

2′. Position as in 2. Grasp the bar with left hand above, and right below, thumbs toward the centre, and hands six inches from the ends of the bar; lean backward, and turn with straightened arms to vertical position.

2′. Same as in 1 on opposite arm and side, with action of muscles intensified.

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THE ABDOMINAL STOOL AND ABDOMINAL TABLE.

Fig. 77.

Times. — 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, 40.

Movement. — Very slow, slow, medium, fast, very fast.

Rate per minute. — 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24.

Nos. 48 and 57.

1. Sit on the stool, about three feet from the wall. Place the feet on the foot-rest, with heels on the lower bar, add toes under the upper bar; place hands behind head; keep body straight from the hips up; lean backward, pivoting at the hips, until the top of head nearly touches the floor; then return to sitting posture.

1′. Position as in **1**, with hands on the hips. Lean backward until the body is in a horizontal position; then return to place.

1″. Position same as in **1**, with hands on edge of stool. Lean backward until the body is at an angle of forty-five degrees (see Fig. 77); then return to vertical position.

Fig. 78.

Principal Muscles brought into action.

1. R^1, P^{16}, O^1, O^2, P^{14}, P^{15}, I^1, T^1, P^3, A^6, A^5, — T^5, E^{12}, E^8, P^8, E^2, on body and both legs.

1′, 1″. Same as in **1**, with action less intense.

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Fig. 79.

Weights. — 2, 4, 6, 8, 10, 12.

Times. — 10, 15, 20, 25, 30, 35, 40, 45, 50, 55, 60, 65, 70, 75.

Movement. — Very slow, slow, medium, fast, very fast.

Rate per minute. — 15, 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, 40, 42, 44, 46, 48, 50.

No. 53.

Principal Muscles brought into action.

1. Place the left foot in the shoe (see Fig. 79). Grasp the bars, and step as far back as possible without raising the weight attached to shoe, and allowing both legs to remain straight; now bring the left leg back eighteen inches to the rear of the right, keeping both legs straight throughout the movement.

1. G^6, G^7, P^{17}, O^6, A^7, B^2, S^9, S^6, G^9, S^2, P^{11}, — T^5, E^{12}, E^8, P^8, E^2, on left leg.

1′. The reverse of **1**, using right leg instead of left.

1′. Same as in **1**, on right leg.

2. Place the left foot in shoe. Swing the left leg back eighteen inches to the rear of right, bending the left leg, and straightening the right, every time the weight is raised.

2. Same as in **1**, with action of S^9, B^2, S^6, G^9, S^2, P^{11}, intensified.

2′. The reverse of **2**, using right foot in shoe instead of the left.

2. Same muscles as in **2**, on right leg.

NOTE. — In all the movements the leg supporting the weight of the body is bearing the strain of the muscular exertion of the leg moving the weight.

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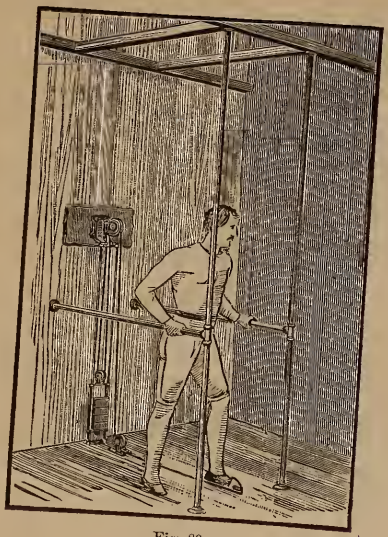

Fig. 80.

THE EXTENSOR SHOES.

Weights. — 2, 4, 6, 8, 10, 12.

Times. — 10, 15, 20, 25, 30, 35, 40, 45, 50, 55, 60, 65, 70, 75.

Movement. — Very slow, slow, medium, fast, very fast.

Rate per minute. — 15, 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, 40, 42, 44, 46, 48, 50.

No. 54.

1. Stand with back to apparatus. Place the left foot in shoe, and step as far forward as possible without raising the weight; then swing the left foot forward (see Fig. 80) twelve inches in front of the right foot, keeping both legs rigidly straight.

1′. Reverse of 1, using right foot in shoe instead of left.

2. Position as in 1. Movement the same, but with bended knees; left foot in the shoe.

2′. Position as in 1′. Movement the same, but with bended knees; right foot in the shoe.

Principal Muscles brought into action.

1. P^{14}, I^1, T^1, P^3, A^6, A^5, R^4, C^5, V^1, V^2, — T^5, E^{12}, E^8, P^8, E^2, on left leg.

1′. Same as on right leg.

2. Same as in 1, with action of R^4, C^5, V^1, V^2 intensified on left leg.

2′. Same muscles as in 2, right leg.

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Fig. 81.

Weights. — 5, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30.

Times. — 10, 20, 30, 40, 50, 60, 70, 80, 90, 100, 110, 120, 130, 140, 150, 160, 170, 180, 190, 200.

Movement. — Very slow, slow, medium, fast, very fast.

Rate per minute. — 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, 40, 42, 44, 46, 48.

Rest *minutes* after each movement (after 3, 5, 8, 10, 13, 15, 18, 20, 22, 25, 27, 30 movements), in reclining posture, before using any other apparatus.

No. 55.

1. Sit on the sliding-seat, with toes in straps. Slide well forward, and grasp the handle well toward the end (see Fig. 81); throw back head and shoulders until handle nearly touches legs; straighten knees, and bring handle, with straight arms, over the knees; then, with bent arms, bring handle nearly to pit of stomach, keeping the body, after first throwing back the head and shoulders, a little back of perpendicular.

Principal Muscles brought into action.

1. T^{10}, R^8, L^1, S^{11}, S^{12}, S^1, L^4, S^{14}, S^7, M^2, I^6, — R^9, part of D^1, T^2, T^3, long head of T^{12}, — B^1, B^4, P^{13}, F^7, F^9, F^8, S^{26}, R^4, C^5, V^1, V^2, — G^6, G^7, P^{17}, O^6, part of A^7, long head of B^2, S^9, S^6.

2. Sit on the sliding-seat, with toes in straps. Slide forward, and grasp handle, and pull it nearly to pit of stomach; then keep legs comparatively straight; lean well forward until handle passes toes; then bring handle back, with straight arms, to pit of stomach, leaning backward until the body is nearly horizontal.

2. Same as in 1, except those of the legs.

3. Sit on sliding-seat, with toes in straps, hands on hips. Lean backward at an angle of forty-five degrees; then come to perpendicular. After a little practice, lean back till head touches floor, with hands clasped behind neck.

3. R^1, P^{16}, O^1, O^2, P^{14}, P^{15}, — I^1, T^1, P^3, A^6, A^5, — T^5, E^{12}, E^8, P^8.

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THE PADDLING MACHINE (High Attachment).

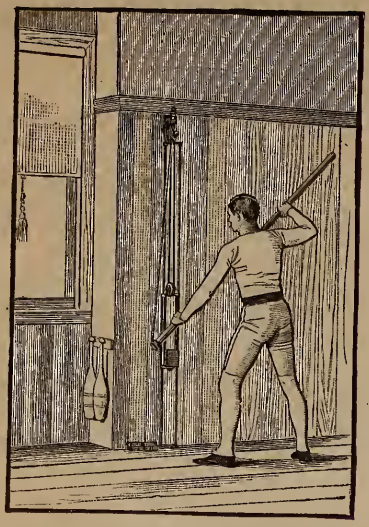

Fig. 82.

Weights.—2, 4, 6, 8, 10, 12, 14, 16, 18, 20.

Times.—10, 20, 30, 40, 50, 60, 70, 80, 90, 100.

Movement. — Very slow, slow, medium, fast, very fast.

No. 56.

1. Grasp the handle ten inches from the rope end with the left hand, and the other end of the handle with the right hand; stand about thirty inches from the weights, facing the apparatus; hold the body firm, bending the knees slightly; sweep the handle round to the left (see Fig. 82), turning the body at the same time.

Principal Muscles brought into action.

1. Posterior part of D^1, T^2, T^3, T^{12}, L^1, A^{10}, B^1, B^4, P^{13}, F^7, F^9, F^8, S^{26} on left arm, and anterior part of D^1, P^4, B^1, C^3, T^{12}, A^{10} on the right arm. O^1 on the right side, and O^2, Q^2, L^4, S^1, S^{11}, S^{12}, and L^1 mostly on the left side.

1′. The reverse of 1, with right hand next to the rope end of the handle, and the left hand near the other end; sweep the handle round to the right.

1′. Same muscles as in 1, mostly on the right arm and side.

2. Grasp the handle with left hand, ten inches from the rope, and the other end with the right hand; stand with the back to the apparatus, about two feet from the rods; turn to the right by extending the left arm and flexing the right arm.

2. Anterior part of D^1, P^4, B^1, C^3, T^{12}, A^{10}, on the left arm, and posterior part of D^1, T^2, T^3, long head of T^{12}, L^1, B^1, B^4, P^{13}, F^7, F^9, F^8, S^{26}, on the right arm. O^1 on the left side and O^2, Q^2, L^4, S^1, S^{11}, S^{12}, L^1, mostly on the right side.

2′. The reverse of 2, with right hand grasping the rope end of the handle; turn to the left, extending the right arm and flexing the left arm.

2′. Same muscles as in 2, mostly on the right arm and side.

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THE PADDLING MACHINE (Low Attachment).

Fig. 83.

Weights. — 2, 4, 6, 8, 10, 12, 14, 16, 18, 20.

Times. — 10, 20, 30, 40, 50, 60, 70, 80, 90, 100.

Movement. — Very slow, slow, medium, fast, very fast.

No. 57.

1. Grasp the handle, thumbs upward, with hands about thirty-six inches apart, and right hand above the left; stand facing the apparatus, with left foot about eighteen inches in advance of the right, as in Fig. 83; swing the handle backward to the left as far as possible without changing the position of the feet; swing back to centre and repeat.

2. Reverse the position as described in 1; swing the handle to the right, then back to the centre, and repeat.

Principal Muscles brought into action.

1. Part of D^1, T^2, T^3, T^{12}, L^1, B^1, B^4, P^{13}, F^7, F^9, F^8, S^{26}, P^4, A^{10}, — O^1, O^2, L^4, S^1, S^{11}, S^{12}, mostly on the left side, and extensors of left leg and foot.

2. Same muscles as in 1, mostly on the right side, and extensors of the right leg and foot.

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THE SCULLING MACHINE.

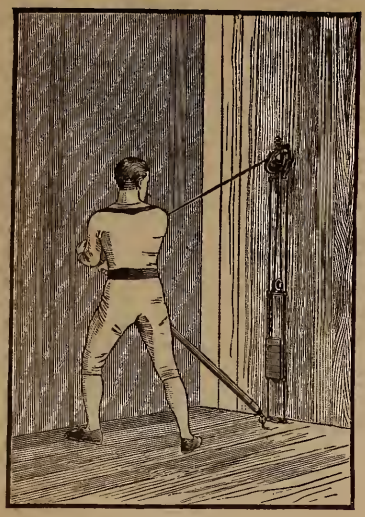

Fig. 84.

Weights. — 6, 8, 10, 12, 14, 16, 18, 20, 22, 24.

Times. — 10, 20, 30, 40, 50, 60, 70, 80, 90, 100.

Movement. — Very slow, slow, medium, fast, very fast.

No. 58.

1. Grasp the handle, thumbs upward, with left hand above the right; stand facing the apparatus, about thirty inches from the weights, with feet twenty inches apart; swing the handle to the left (see Fig. 84) as far as possible without changing the position of the feet; swing back to centre and repeat.

2. The same movement as described in 1, to the right.

3. Alternate from left to right.

Principal Muscles brought into action.

1. O^1, O^2, L^4, S^1, S^{11}, S^{12}, L^1, part of D^1, part of P^4, B^1, C^3, T^2, T^3, long head of T^{12}, mostly on the left side.

2. Same as in 1, mostly on the right side.

3. The same muscles as in 1 acting alternately on the left and right sides, also the muscles that extend the thighs and legs.

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LIST OF MUSCLES.

A.

1 Abductor minimi digiti.
2 Abductor indicis.
3 Abductor pollicis (haud).
4 " " (foot).
5 Adductor brevis.
6 Adductor longus.
7 Adductor magnus.
8 Adductor pollicis (hand).
9 " " (foot).
10 Anconeus.

B.

1 Biceps (arm).
2 Biceps femoris (leg).
3 Biventor cervicis.
4 Brachialis anticus.

C.

1 Cervicalis ascendens.
2 Complexus.
3 Coraco-brachialis.
4 Crico-thyroid.
5 Crureus.

D.

1 Deltoid.
2 Diaphragm.
3 Digastric.

E.

1 Erector spinae.
2 Extensor brevis digitorum.
3 Extensor carpi radialis brevior.
4 Extensor longior.
5 Extensor ulnaris.
6 Extensor digitorum communis.
7 Extensor indicis.
8 Extensor longus digitorum.
9 Extensor minimi digiti.
10 Extensor ossis metacarpi pollicis.
11 Extensor primi internodii pollicis.
12 Extensor proprius pollicis.
13 Extensor secundi internodii pollicis.

F.

1 Flexor accessorius.
2 Flexor minimi digiti.
3 " " " (foot).
4 Flexor brevis digitorum.
5 Flexor brevis pollicis.
6 " " " (foot).
7 Flexor carpi radialis.
8 Flexor carpi ulnaris.
9 Flexor digitorum sublimis.
10 Flexor longus digitorum.
11 Flexor longus pollicis.
12 " " " (foot).
13 Flexor ossis metacarpi pollicis.
14 Flexor profundus digitorum.

G.

1 Gastrocnemius.
2 Gemellus superior.
3 Gemellus inferior.
4 Genio-hyo-glossus.
5 Genio-hyoid.
6 Gluteus maximus.
7 Gluteus medius.
8 Gluteus minimus.
9 Gracilis (leg).
10 " (hand).

I.

1 Iliacus.
2 Infracostal.
3 Infraspinatus.
4 Intercostal.
5 Interspinales.
6 Intertransversales.

L.

1 Latissimus dorsi.
2 Levator scapulae.
3 Levatores costarum.
4 Longissimus dorsi.
5 Longus colli.
6 Lumbricales (hand).
7 " (foot).

M.

1 Masseter.
2 Multifidus spinae.
3 Musculus accessorius ad sacro lumbalem.
4 Mylo-hyoid.

O.

1 Obliquus abdominis externus.
2 Obliquus abdominis internus.
3 Obliquus capitis superior.
4 Obliquus capitis inferior.
5 Obturator externus.
6 Obturator internus.
7 Omo hyoid.
8 Opponens minimi digiti.
9 Opponens pollicis.

P.

1 Palmaris brevis.
2 Palmaris longus.
3 Pectineus.
4 Pectoralis major.
5 Pectoralis minor.
6 Peroneus brevis.
7 Peroneus longus.
8 Peroneus tertius.
9 Plantaris.
10 Platysma myoides.
11 Popliteus.
12 Pronator quadratus.
13 Pronator radii teres.
14 Psoas magnus.
15 Psoas parvus.
16 Pyramidalis abdominis.
17 Pyriformis.

Q.

1 Quadratus femoris.
2 Quadratus lumborum.
3 Quadriceps extensor cruris.

R.

1 Rectus abdominis.
2 Rectus capitus anticus major.
3 Rectus capitus anticus minor.
4 Rectus femoris.
5 Rectus lateralis.
6 Rectus posticus major.
7 Rectus posticus minor.
8 Rhomboideus major.
9 Rhomboideus minor.
10 Rotatores spinae.

S.

1 Sacro lumbalis.
2 Sartorius.
3 Scalenus anticus.
4 Scalenus medius.
5 Scalenus posticus.
6 Semimembranosus.
7 Semispinalis dorsi.
8 Semispinalis colli.
9 Semitendinosus.
10 Serratus magnus.
11 Serratus posticus superior.
12 Serratus posticus inferior.
13 Soleus.
14 Spinalis dorsi.
15 Spinalis colli.
16 Splenius.
17 Splenius capitis.
18 Splenius colli.
19 Sterno cleido mastoid.
20 Sterno-hyoid.
21 Sterno-thyroid.
22 Subclavius.
23 Subcruens.
24 Subscapularis.
25 Supinator brevis.
26 Supinator longus.
27 Supraspinalis.
28 Supraspinatus.

T.

1 Tensor vaginae femoris.
2 Teres major.
3 Teres minor.
4 Thyro hyoid.
5 Tibialis anticus.
6 Tibialis posticus.
7 Trachelo mastoid.
8 Transversalis abdominis.
9 Transversalis colli.
10 Trapezius.
11 Triangularis sterni.
12 Triceps.

V.

1 Vastus externus.
2 Vastus internus.

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