THE HUMAN FIGURE IN MOTION
THE
HUMAN FIGURE
IN MOTION . . .

An Electro-Photographic Investigation
of Consecutive Phases of Muscular
Actions . . . . . .

BY
EADWEARD MUYBRIDGE

(THIRD IMPRESSION)

LONDON: CHAPMAN & HALL, LTD.

1907

Commenced 1872.
Completed 1885

H. C. C. Hansen
Kjøbenhavn.
INTRODUCTORY.

In the "Transactions of the Royal Institution of Great Britain," of date March 13, 1882, is printed an epitome of a lecture, given by the author of the present work, on the Science of Animal Locomotion in its relation to Design in Art, which is thus alluded to in an article by the late George A. Sala, published in the *Illustrated London News*, on the 18th of the same month—

"On Monday last, in the theatre of the Royal Institution, a select and representative audience assembled to witness a series of most interesting demonstrations of animal locomotion, given by Mr. Muybridge . . . who exhibited a large number of photographs [illustrating consecutive phases in the motion] of the horse, walking, ambling, galloping, and leaping . . . By the aid of an astonishing apparatus called a zoöpraxiscope, which the lecturer described as an improvement on the old zoetrope . . . the animals suddenly became mobile and beautiful, and walked, cantered, ambled, galloped, and leaped over hurdles in the field of vision in a perfectly natural and life-like manner. . . .

"After the horses, dogs, oxen, wild bulls, and deer, were shown under analogous conditions of varied movement, and finally man appeared (in instantaneous photography) on the screen, and walked, ran, leaped and turned back-somersaults to admiration . . .

"On the following Thursday Mr. Muybridge repeated his demonstrations at the Royal Academy of Arts."

The transparent photographs used during these lectures were some of the results of an investigation commenced by the author at Sacramento, California, in May, 1872, and continued, with numerous periods of intermission, at Palo Alto, in the same State, until 1879.

The zoöpraxiscope was devised by the author, on the principle initiated in the early part of the nineteenth century by the Belgian physicist Plateau—for the purpose of demonstrating the persistency of vision—and is briefly described in an essay by the late Professor Richard A. Proctor, "Photographs of a Galloping Horse," printed in the *Gentleman's Magazine* for December, 1881. A detailed description of the apparatus is given in a recent work by the author, "Animals in Motion" (Chapman & Hall, Limited, 1898). It will, therefore, be unnecessary
in this place, to repeat what is there said in regard to its construction. It may, however, as a matter of record, be admissible to say that, as photographic analyses of changes incidental to motion of any kind commenced with this investigation by the author, so was the zoöpraxiscope the first instrument ever constructed or devised for demonstrating, by synthetical reconstruction, movements originally photographed from life, and for many years it was the only apparatus in use for that purpose. In the progress of physical science and mechanical construction it has, as might naturally be supposed, had to relinquish to its younger rivals its former unique position; but it was not until 1893, or more than thirteen years after it was first used, that any improvement in its construction or in its effects on the screen were made public. The improvements in the modern instruments are due to the invention of celluloid, as a substitute for glass, for receiving and exhibiting the photographic images.

At the present day, when the many and important chemical discoveries and new appliances enable any youth of ordinary intelligence, by the expenditure of a few shillings and a little attention to printed instructions, to become an amateur photographer, it is not easy to realize the difficulties which had to be surmounted—even so late as twenty years ago—in the production of a satisfactory photograph of a rapidly moving object, which, the writer of the essay in the Gentleman's Magazine before mentioned, states he "was assured by one of the ablest English photographers was absolutely outside the bounds of possibility;" it may not be out of place, therefore, to reprint a few paragraphs on the subject, written by the editor of Knowledge (London), which appeared in that journal April 14, 1882.

"A few years ago the news of the successful photographing of a galloping horse was received with incredulity. . . . That a horse rushing along at the rate of a mile in one and two-thirds of a minute [more than seventeen yards in a second], and moving its limbs forward in part of each stride with nearly twice that velocity, should be seized by photographic art so as to show every limb well and clearly delineated, would have seemed wonderful indeed to the early professors of that art. Still more amazing is it to find ten or twelve distinct pictures taken during a single stride, the comparison of which, inter se, enable the most rapid of all equine movements to be analyzed as though the horse could be made to go through all the motions of the swiftest gallop at a funeral pace. Then, by combining them in a much-improved kind of zoötrope—the zoöpraxiscope—the horse can be made to go through the action as perfectly as though he were actually galloping before the eyes of the audience. . . . This has been done for the horse, and other animals, athletes, gymnasts, and even for birds.

"Not only the characteristic movements of the different actions, but even those slight and scarcely definable peculiarities which distinguish the movements of one athlete from another in performing the same feat, of one horse from another in moving at the same gait, and so forth, are perfectly recognizable in the combination of pictures which, separately seen, simply startle us by the new light which they throw on the real nature of these rapid movements."

In confirmation of those "slight and scarcely definable peculiarities" recognized by the editor of Knowledge in the synthetic realizations of the zoöpraxiscope, the author will not readily forget the complete refutation of an assertion made by him the first time the apparatus was put into practical operation. The anecdote may not be without
INTRODUCTORY.

interest, especially to the constructors of the many different instruments which, at the present day, have taken the place of their prototype.

Upon the completion of a series of twenty-four consecutive phases, illustrating a single stride of a noted horse from the stables of Governor (afterwards Senator) Stanford, that gentleman, one evening in the autumn of 1879, invited a few friends to witness, by projection with the oxy-hydrogen light and the zoöpraxiscope, the primitive synthetical reproduction of an animal’s movement. “There, Governor,” said the author, as he put the apparatus in motion, “you have a representation of Hawthorn galloping at a one forty-two gait,” that horse being one of several with which he had experimented. After a few seconds’ attention, his host exclaimed, “I think you must make a mistake in the name of the animal; that is certainly not the gait of Hawthorn, but that of Anderson,” another horse on the Palo Alto ranch. The author disputed this correction, and reasserted the accuracy of the entry in his record-book. The Governor was equally positive of its error. Upon reference, the next day, to the trainer, the author was informed, very much to his surprise, that the horse sent to him for that particular experiment (without the knowledge of its owner), was Anderson; and at the moment he felt more disappointed at the inaccuracy of his registry than gratified with the perfect manner in which the zoöpraxiscope had performed its duties.

In 1878 the author published, under the general title of “The Horse in Motion,” some of the results of his labours in a few sheets of photographs, each one of which illustrated several consecutive phases of a horse while trotting, galloping, and so forth, which were duly deposited, the same year, in the Library of Congress at Washington. Some of these photographs quickly found their way to various parts of the world, and were commented upon by numerous journals of the day. References to a few early reviews of these demonstrations may be found in the Appendix.

The publications of 1878 were followed, in 1881, by a quarto volume of some two hundred pages of photographs, illustrating various movements by horses, dogs, and other animals, and feats of the gymnasium and the field by some Californian athletes.

The favour with which these demonstrations were received convinced the author that a more comprehensive investigation, carried out in a more exacting and systematic manner than was at that time possible at Palo Alto, and with the advantages offered by the then newly discovered dry-plate process, would result in throwing much additional light on the hitherto little known but important problem of animal movements. This new enterprise—if conducted on the contemplated scale—promised to involve such a large expenditure, that some little time elapsed before the necessary arrangements for its execution could be made.

The author was, however, fortunate enough to obtain the co-operation of the University of Pennsylvania, then under the able administration of the late Dr. William Pepper, and was instructed by the trustees of that
institutions to continue his researches under its auspices. The work was recommenced in the summer of 1884, and completed in the autumn of the following year.

The system adopted and the apparatus employed differed in no material respect from that used in California, which, having been fully described in "Animals in Motion," it will here be necessary to say, that by means of three batteries of cameras electrically operated by a motor-clock, twenty-four successive photographic exposures could be made in a quarter of a second of time; and twelve successive exposures, simultaneously made from each of three different points of view could be completed in the one-fifth of a second. The time-intervals between each consecutive exposure of a series were recorded by a chronograph, in one-thousandths of a second, and are, with a few exceptions, reprinted under each series of illustrations.

The results of this investigation—consisting of 781 photo-mezzotint engravings, with examples of more than twenty thousand acts of motion by animals, birds, and human beings—were, in 1887, published in eleven folio volumes, under the title of "Animal Locomotion." Copies of the work were secured by the principal libraries and institutions of science and of art in Europe and America, where they may be consulted by those interested in the subject. Selections of the engravings were also issued in portfolios, and some hundreds of such selections were subscribed for their individual use by artists, scientists, and others on both sides of the Atlantic. In the Appendix may be seen a few facsimile autographs, selected—not without difficulty—from the subscription list of the author, who avails himself of this opportunity to express his sincere thanks to the many distinguished men who thus endorsed the value of his labours.

It being so universally recognized that a study of the precise functions of the limbs, whether of man or of the lower animals, as made known by photography, is of great importance to the physiologist, and to the natural scientist generally; and that a knowledge of the successive appearances which those limbs assume while executing any specific movement is of absolute necessity to the artist, that he may obtain a correct impression of that movement as a whole, and be thus enabled to give a satisfactory and truthful interpretation of it;—it has been decided to republish a number of the most generally useful seriatiums in a more convenient and popular manner than was adopted in the publication of the original work, in the hope of thus more widely disseminating a knowledge of the facts revealed by the author's researches.

With this object in view, a number of movements of horses and other quadrupeds and birds have, as previously stated, been already republished with the title of "Animals in Motion." The present volume, as its title implies, is devoted exclusively to the human figure.

With regard to the models, the greater number of men were students or graduates of the University of Pennsylvania, each one of whom had a well-earned record in the particular feat selected for illustration. Model 46 was the professor of physical culture; 37, the champion runner, and a good jumper; 69, the best all-round cricketer.
and 30 was equally noted in the game of base-ball. 52,
64, 65, 66, and 67 were instructors at the Fencing and
Sparring Club; and 22 was a well-known pugilist. The
mechanics were experts in their particular trades, and
the labourers were accustomed to the work they are
represented doing.

Of the women, 5, 7, 8, 9, 10, and 13 were artists' models, and 12 was a première danseuse from one of the
Philadelphian theatres.

In addition to the engravings which illustrate suc-
cessive phases of a continuous or of a completed action, it
was thought desirable, in consideration of the small
dimensions of the figures, to select some of the phases and
re-engrave them the same size as that in which they were
originally published. For this selection, and for the
omission of many phases necessary to properly illustrate
the continuity of an action, the author disclaims all
responsibility.

In his examination of the contents of this volume
the critical observer will do well to remember that the
negatives from which the photo-mezzotints are copied were
made more than fifteen years ago; they are reproduced
without the slightest attempt being made to improve them;
and are presented with all their faults, precisely as taken
in the camera.

It cannot be too forcibly impressed on the mind of the
student, that the photographed phases of motion in either
of the volumes, are not intended for use as a substitute
for personal observation. Their value consists, not as
individual photographs made at particular instants in the
performance of some muscular act—which any one with a
hand camera could do equally as well—but as seriatim
phases, demonstrating the various changes which take
place in the disposition of the limbs and body during the
evolution of some act of motion from its inception to its
completion. Studied in this manner, the author is not
without hope that the artist will realize a just appreciation
of the movement itself, and be enabled to give expres-
sion to it in an acceptable and at the same time truthful
manner.
CATALOGUE OF ILLUSTRATIONS.

The consecutive phases of nearly all the serial illustrations of movement were synchronously photographed from each of two or from three points of view. Wherever convenient, the foreshortened phases are placed immediately under the corresponding phases of the lateral series. In some of the seriates, two lines of figures are required for the laterals, and one line only for the foreshortenings; in this event the corresponding phases can be readily ascertained by counting the figures.

In all the seriates the sequence of phases is indicated by an arrow.

The classification of the figures into laterals, front-foreshortenings, and rear-foreshortenings, is, in some of the seriates, purely arbitrary. These designations are usually given to the first phase from each of the respective points of view.

The intervals of time between the successive phases—when the chronograph was used—are recorded, under each series, in thousandths of a second. If it is required to ascertain the time in which the complete movement, or any portion of a movement, was effected, it will be merely necessary to multiply the number of thousandths of a second by the number of intervals. For nearly all purposes, however, the calculation of intervals in hundredths, or perhaps even tenths, of a second may be found sufficiently accurate.

As a general rule, the points of view of each lateral series were at an elevation of about one-half the height of the model while standing on the ground. In seriates 1 and 4, the lateral points of view were on a level with the platform on which the model was walking, and so also with the larger figures of the same action as series 1. The points of view of the foreshortened series were—when at an angle of 90° to the laterals—of varying heights of a vertical line; either ascending or descending 3 inches for each successive exposure.
THE HUMAN FIGURE IN MOTION.

The points of view from other angles were usually on one horizontal line, and about the level of the lateral serials.

The lines on the background were 5 centimetres, or about 2 inches, apart, with broader lines 50 centimetres, or about 20 inches, apart. The usual distance of the model from the background was, for the laterals, about 75 centimetres (30 inches); the distance of the model from the lateral camera usually approximated 15 metres, or nearly 50 feet.

**MEN (NUDE OR SLIGHTLY DRAPEP).**

<table>
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<tr>
<th>Series</th>
<th>Model</th>
<th>Action</th>
<th>Number of Figures</th>
<th>Lateral.</th>
<th>Foreshortenings</th>
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<td>7</td>
<td>14</td>
<td>17</td>
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<tr>
<td>2</td>
<td>47</td>
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<td>3</td>
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<td>4</td>
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<td>&quot; up an incline</td>
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<td>12</td>
<td>36</td>
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<tr>
<td>6</td>
<td>46</td>
<td>&quot; up stairs</td>
<td>11</td>
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<td>11</td>
<td>33</td>
<td>27</td>
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<tr>
<td>7</td>
<td>46</td>
<td>&quot; down stairs</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>36</td>
<td>29</td>
</tr>
<tr>
<td>8</td>
<td>46</td>
<td>&quot; and turning round</td>
<td>12</td>
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<td>36</td>
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<td>10</td>
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<td>&quot; a half-mile gait</td>
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<td>11</td>
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<td>&quot; full speed</td>
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<td>12</td>
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<td>&quot; and picking up a ball</td>
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<td>14</td>
<td>40</td>
<td>&quot; standing, high</td>
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<td>—</td>
<td>12</td>
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<td>15</td>
<td>37</td>
<td>&quot; straight, high</td>
<td>12</td>
<td>—</td>
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<td>16</td>
<td>37</td>
<td>&quot; running straight, high</td>
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<td>—</td>
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<td>17</td>
<td>37</td>
<td>&quot; running, twist</td>
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### Catalogue of Illustrations

#### Women (Nude)

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<td>7</td>
<td>&quot; turning and ascending stairs</td>
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<td>1 and 8</td>
<td>A shock to the nerves</td>
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#### Women (Diaphanous Garments)

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<td>53</td>
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<td>Walking, and flinging a fan</td>
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<td>Stooping, and putting on a shawl</td>
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<td>57</td>
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<td>Turning, and raising hands</td>
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<td>Sitting down on a chair</td>
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<td>Turning round (semi-recumbent)</td>
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<td>A high step and a jump</td>
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<td>Getting on and off a table</td>
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#### Women (Half-clad)

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<td>Lat.</td>
<td>Fore.</td>
<td>Rear.</td>
<td>Total</td>
<td>Page.</td>
</tr>
<tr>
<td>53</td>
<td>12</td>
<td>Running with skipping-rope</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>36</td>
<td>121</td>
</tr>
<tr>
<td>54</td>
<td>12</td>
<td>Jumping from step-stones</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>30</td>
<td>123</td>
</tr>
<tr>
<td>55</td>
<td>12</td>
<td>Ricochetting on one foot</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>24</td>
<td>125</td>
</tr>
<tr>
<td>56</td>
<td>12</td>
<td>Sitting down on the ground</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>30</td>
<td>127</td>
</tr>
</tbody>
</table>
THE HUMAN FIGURE IN MOTION.

WOMEN (DRAPE).  

<table>
<thead>
<tr>
<th>Series</th>
<th>Model</th>
<th>Action</th>
<th>Number of Figures</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>72</td>
<td>7</td>
<td>Carrying a basket on head, and turning ...</td>
<td>12 12 12</td>
<td>36</td>
</tr>
<tr>
<td>73</td>
<td>7</td>
<td>Emptying a basin of water</td>
<td>10 10 10</td>
<td>30</td>
</tr>
<tr>
<td>74</td>
<td>7</td>
<td>Lifting and carrying a basket ...</td>
<td>9 9 9</td>
<td>27</td>
</tr>
<tr>
<td>75</td>
<td>5</td>
<td>Walking and stooping ...</td>
<td>12 12 -</td>
<td>24</td>
</tr>
<tr>
<td>76</td>
<td>5</td>
<td>Adjusting train, and turning ...</td>
<td>12 - 12</td>
<td>24</td>
</tr>
<tr>
<td>77</td>
<td>15</td>
<td>Down stairs, a lamp in hand ...</td>
<td>12 - -</td>
<td>12</td>
</tr>
<tr>
<td>78</td>
<td>15</td>
<td>Lawn-tennis ...</td>
<td>8 8 8</td>
<td>24</td>
</tr>
</tbody>
</table>

CHILDREN.

<table>
<thead>
<tr>
<th>Series</th>
<th>Model</th>
<th>Action</th>
<th>Number of Figures</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>83</td>
<td>70</td>
<td>Crawling on the ground</td>
<td>12 12 12</td>
<td>36</td>
</tr>
<tr>
<td>84</td>
<td>72</td>
<td>Walking ...</td>
<td>11 -</td>
<td>11</td>
</tr>
<tr>
<td>85</td>
<td>70</td>
<td>Running ...</td>
<td>12 -</td>
<td>12</td>
</tr>
<tr>
<td>86</td>
<td>70</td>
<td>Crawling up stairs ...</td>
<td>8 -</td>
<td>8</td>
</tr>
<tr>
<td>87</td>
<td>70</td>
<td>Attempting to walk up stairs ...</td>
<td>12 - 12</td>
<td>24</td>
</tr>
</tbody>
</table>

Total figures in series, 2337.

WOMEN AND CHILDREN.

<table>
<thead>
<tr>
<th>Class of Model</th>
<th>Action</th>
<th>Number of Figures</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>79 12 and 70</td>
<td>Child greeting a stranger</td>
<td>24 - -</td>
<td>24 173</td>
</tr>
<tr>
<td>80 12 and 70</td>
<td>Child being lifted from the ground</td>
<td>24 24 24</td>
<td>72 175</td>
</tr>
<tr>
<td>81 12 and 70</td>
<td>Child being placed on the ground</td>
<td>18 18 18</td>
<td>54 177</td>
</tr>
<tr>
<td>82 12 and 70</td>
<td>Running ...</td>
<td>16 16 16</td>
<td>48 179</td>
</tr>
</tbody>
</table>

MISCELLANEOUS FIGURES.

(Reproduced on the same scale as those in the original work.)

<table>
<thead>
<tr>
<th>Class of Model</th>
<th>Action</th>
<th>Number of Figures</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Men (nude or slightly draped)</td>
<td>Walking ...</td>
<td>9 193</td>
<td></td>
</tr>
<tr>
<td>&quot; &quot;</td>
<td>carrying boulder on shoulder</td>
<td>12 195</td>
<td></td>
</tr>
<tr>
<td>&quot; &quot;</td>
<td>carrying weights in hand</td>
<td>11 197</td>
<td></td>
</tr>
<tr>
<td>&quot; &quot;</td>
<td>under various conditions</td>
<td>12 199</td>
<td></td>
</tr>
<tr>
<td>&quot; &quot;</td>
<td>Running ...</td>
<td>8 201</td>
<td></td>
</tr>
<tr>
<td>&quot; &quot;</td>
<td>Jumping ...</td>
<td>11 203</td>
<td></td>
</tr>
<tr>
<td>&quot; &quot;</td>
<td>&quot; &quot;</td>
<td>9 207</td>
<td></td>
</tr>
</tbody>
</table>
# Catalogue of Illustrations

<table>
<thead>
<tr>
<th>Class of Model</th>
<th>Action</th>
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<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Men (nude or slightly draped)</td>
<td>Cricket</td>
<td>10</td>
<td>209</td>
</tr>
<tr>
<td></td>
<td>Heaving boulders</td>
<td>8</td>
<td>211</td>
</tr>
<tr>
<td></td>
<td>Baseball, football</td>
<td>7</td>
<td>213</td>
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<tr>
<td></td>
<td>Wrestling</td>
<td>14</td>
<td>215</td>
</tr>
<tr>
<td></td>
<td>Fencing, running, and so forth</td>
<td>12</td>
<td>217</td>
</tr>
<tr>
<td></td>
<td>Striking a blow, and boxing</td>
<td>13</td>
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<tr>
<td></td>
<td>Boxing</td>
<td>10</td>
<td>221</td>
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<tr>
<td></td>
<td>Blacksmithing</td>
<td>8</td>
<td>223</td>
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<tr>
<td></td>
<td>etc.</td>
<td>7</td>
<td>225</td>
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<tr>
<td>Women (nude)</td>
<td>Walking under various conditions</td>
<td>11</td>
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</tr>
<tr>
<td></td>
<td>etc.</td>
<td>7</td>
<td>229</td>
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<tr>
<td></td>
<td>Turning round and ascending stairs</td>
<td>9</td>
<td>231</td>
</tr>
<tr>
<td></td>
<td>and ascending stairs with weights in hand</td>
<td>9</td>
<td>233</td>
</tr>
<tr>
<td></td>
<td>Stoopinmg, and so forth</td>
<td>11</td>
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</tr>
<tr>
<td></td>
<td>Throwing</td>
<td>10</td>
<td>237</td>
</tr>
<tr>
<td></td>
<td>Various movements</td>
<td>8</td>
<td>239</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>241</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Class of Model</th>
<th>Action</th>
<th>Number of Figures</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Women (semi-draped)</td>
<td>With skipping-rope</td>
<td>10</td>
<td>243</td>
</tr>
<tr>
<td></td>
<td>Jumping, and so forth</td>
<td>10</td>
<td>245</td>
</tr>
<tr>
<td></td>
<td>Various actions</td>
<td>12</td>
<td>247</td>
</tr>
<tr>
<td></td>
<td>(diaphanous costume)</td>
<td>8</td>
<td>249</td>
</tr>
<tr>
<td></td>
<td>Stooping, descending stairs, etc.</td>
<td>8</td>
<td>251</td>
</tr>
<tr>
<td></td>
<td>Dancing</td>
<td>8</td>
<td>253</td>
</tr>
<tr>
<td></td>
<td>Miscellaneous actions</td>
<td>7</td>
<td>255</td>
</tr>
<tr>
<td>(draped)</td>
<td>Lawn-tennis, etc.</td>
<td>10</td>
<td>257</td>
</tr>
<tr>
<td></td>
<td>Turning round, stooping, etc.</td>
<td>11</td>
<td>259</td>
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<tr>
<td>Woman and child</td>
<td>Lifting child from the ground</td>
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<tr>
<td>Children</td>
<td>Various actions</td>
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</tr>
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<td></td>
<td>Crawling on the ground</td>
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</tr>
<tr>
<td></td>
<td>Ascending stairs</td>
<td>10</td>
<td>267</td>
</tr>
</tbody>
</table>

Total figures on original scale, 384.
ATHLETE. WALKING.

Photographed synchronously from two points of view.

Model 46.

Time-intervals: 0.03 second.

For a similar movement, with larger figures from the original work, see pages 193 and 219.
ATHLETE. WALKING.

PHOTOGRAPHED SYNCHRONOUSLY FROM TWO POINTS OF VIEW.

Model 46.

Time-intervals: \( \frac{1}{60} \) second.

For some phases of a similar movement, with larger figures from the original work, see pages 193 and 219.
ATHLETE. CARRYING SEVENTY-FIVE POUND BOULDER.

PHOTOGRAPHED SYNCHRONOUSLY FROM THREE POINTS OF VIEW.

Model 46.

Time-intervals: 0.075 second.

For some of these phases, from the original work, see page 195.
ATHLETE. WALKING, WITH FIFTY-POUND WEIGHT IN ONE HAND.

PHOTOGRAPHED SYNCHRONOUSLY FROM TWO POINTS OF VIEW.

Model 46.

Time-intervals: 0.099 second.

For some of these phases, from the original work, see page 197.
THE HUMAN FIGURE IN MOTION.

ATHLETE. ASCENDING AN INCLINE.

PHOTOGRAPHED SYNCHRONOUSLY FROM THREE POINTS OF VIEW.

Model 36.

Time-intervals: 168 second.

For some of these phases, from the original work, see page 199.
ATHLETE. ASCENDING A STAIRWAY.

Photographed synchronously from Three Points of View.

Time-intervals: 1/125 second.

For some of these phases, from the original work, see page 199.
ATHLETE. DESCENDING STAIRWAY.

Photographed synchronously from three points of view.

Time-intervals: 0.092 second.

Model 36.

For a phase of this series, from the original work, see page 199.
SOLDIER.  ON GUARD.

PHOTOGRAPIED SYNCHRONOUSLY FROM THREE POINTS OF VIEW.

Model 60.

Time-intervals: 161 second.
ATHLETE. STARTING ON A RACE.

Photographed synchronously from Two Points of View.

Model 37.

Time-intervals: 0'93 second.

For some of these phases, from the original work, see page 201.
ATHLETE. RUNNING.

Photographed synchronously from Two Points of View.

Model 37.

Time-intervals: 0.042 second.

For some similar phases, from the original work, see page 201.
ATHLETE. RUNNING.

Photographed synchronously from Two Points of View.

Time-intervals: 0.57 second.

Model 55.

For one of these phases, from the original work, see page 219.
ATHLETE. RUNNING AND PICKING UP A BALL.

Photographed synchronously from Two Points of View.

Model 26.

Time-intervals: '075 second.
ATHLETE. STANDING BROAD JUMP.

PHOTOGRAPHED SYNCHRONOUSLY FROM TWO POINTS OF VIEW.

Time-intervals: 1.56 second.

For some of these phases, from the original work, see page 203.
ATHLETE. STANDING HIGH JUMP.

PHOTOGRAPHED SYNCHRONOUSLY FROM TWO POINTS OF VIEW.

Model 40.

Time-intervals: '139 second.

For some of these phases, from the original work, see page 205.
ATHLETE. A STRAIGHT HIGH JUMP.

PHOTOGRAPHED SYNCHRONOUSLY FROM TWO POINTS OF VIEW.

Model 37.

Time-intervals: .063 second.

For similar phases, from the original work, see page 205.
ATHLETE. A RUNNING, STRAIGHT HIGH JUMP.

PHOTOGRAPHED SYNCHRONOUSLY FROM TWO POINTS OF VIEW.

Model 37.

Time-intervals: .087 second.

For similar phases, from the original work, see page 205.
ATHLETE. A RUNNING, TWIST HIGH JUMP.

PHOTOGRAPHED SYNCHRONOUSLY FROM TWO POINTS OF VIEW.

Model 37.

Time-intervals: '160 second.

For some of these phases, from the original work, see page 205.
BOYS. PLAYING AT "LEAP-FROG."

PHOTOGRAPHED SYNCHRONOUSLY FROM TWO POINTS OF VIEW.

Models 27 and 28.  
Time-intervals: 1.09 second.

For some of these phases, from the original work, see page 207.
THE HUMAN FIGURE IN MOTION.

ATHLETE. TURNING A BACK SOMERSAULT.

Photographed synchronously from two points of view.

Model 33.
ATHLETE. CATCHING AT A BALL: "ERROR."

Photographed synchronously from Two Points of View.

Model 30.

Time-intervals: 1/108 second.

For a phase of this series, from the original work, see page 227.
ATHLETE. CATCHING AND THROWING AT BASE-BALL.

Photographed synchronously from Two Points of View.

Model 30.

Time-intervals: .201 second.
ATHLETE. BOWLING AT CRICKET.

PHOTOGRAPHED SYNCHRONOUSLY FROM TWO POINTS OF VIEW.

Model 69.

For some of these phases, from the original work, see page 209.
ATHLETE. OVER-ARM BOWLING AT CRICKET.

Photographed synchronously from two points of view.

Model 69.

For some of these phases, from the original work, see page 209.
ATHLETE. HEAVING A 20-POUND ROCK.

PHOTOGRAPHED SYNCHRONOUSLY FROM TWO POINTS OF VIEW.

Time-intervals: .145 second.

Model 46.

For phases of a similar action, from the original work, see page 211.
ATHLETE. HEAVING 75-POUND ROCK.

Photographed synchronously from Three Points of View.

Time-intervals: .489 second.

Model 52.

For some of these phases, from the original work, see page 211.
ATHLETE. BATTING AT BASE-BALL.

PHOTOGRAPHED SYNCHRONOUSLY FROM TWO POINTS OF VIEW.

Model 30.

Time-intervals: 0.085 second.

For some of these phases, from the original work, see page 213.
ATHLETE. BATTLING AT CRICKET.

Photographed synchronously from Two Points of View.

Model 69.

For some of these phases, from the original work, see page 209.
ATHLETE. BATTLING AT CRICKET.

Photographed synchronously from Two Points of View.

Model 69.
ATHLETE. ROWING.

Photographed synchronously from Three Points of View.

Model 68.
ATHLETES. WRESTLING.

Models 46 and 68.

For some of these phases, from the original work, see pages 215 and 217.
ATHLETES. FENCING.

Models 66 and 67.

For some of these phases, from the original work, see page 219.
PUGILIST. STRIKING A BLOW.

Model 22.

Time-intervals: 1/12 second.

For some of these phases, from the original work, see page 221.
THE HUMAN FIGURE IN MOTION.

Copyright, 1887, by Eadweard Muybridge.

PUGILISTS. BOXING.

Models 64 and 65.
THE HUMAN FIGURE IN MOTION.

PUGILISTS. BOXING.

Photographed synchronously from Two Points of View.

Models 64 and 65.
THE HUMAN FIGURE IN MOTION.

PUGILISTS. BOXING.

Photographed synchronously from Two Points of View.

Models 52 and 53.

Time-intervals: 1 1/5 second.

For some phases of boxing by these pugilists, from the original work, see pages 221 and 223.
THE HUMAN FIGURE IN MOTION.

PUGILISTS. BOXING.

Photographed synchronously from Two Points of View.

Models 52 and 53. Time-intervals '163 second.

For some phases of boxing by these pugilists, from the original work, see pages 221 and 223.
THE HUMAN FIGURE IN MOTION.

BLACKSMITHS. HAMMERING AT AN ANVIL.

Models 59 and 61.

Time-intervals: 133 second.

For some of these phases, from the original work, see pages 225 and 227.
LABOURER WITH LONG-HANDED SHOVEL.

PHOTOGRAPHED SYNCHRONOUSLY FROM THREE POINTS OF VIEW.

Model 41.

Time-intervals: '334 second.
WOMAN. WALKING.

PHOTOGRAPHED SYNCHRONOUSLY FROM TWO POINTS OF VIEW.

Model 6.

Time-intervals : \(0.94\) second.

For some of these phases, from the original work, see page 231.
WOMAN. CROSSING ON "STEP-STONES."

Photographed synchronously from Three Points of View.

Time-intervals: 1/18 second.

For some of these phases, from the original work, see page 231.
WOMAN. TURNING, AND ASCENDING STAIRWAY.

PHOTOGRAPHED SYNCHRONOUSLY FROM TWO POINTS OF VIEW.

Model 7.

Time-intervals: .284 second.

For some of these phases, from the original work, see page 233.
THE HUMAN FIGURE IN MOTION.

WOMAN. WITH A BUCKET OF WATER IN ONE HAND, ASCENDING STAIRS.

Photographed synchronously from three points of view.

Model 7.

Time-intervals: 325 second.

For some of these phases, from the original work, see page 235.
WOMAN. WITH A BUCKET OF WATER IN EACH HAND, ASCENDING STAIRS.

Photographed synchronously from Three Points of View.

Model 4.

Time-intervals: 266 second.

For some of these phases, from the original work, see page 235.
WOMAN. DESCENDING AN INCLINE.

Photographed synchronously from two points of view.

Model 7.

Time-intervals: 0.90 second.

For some of these phases, from the original work, see page 229.
WOMAN. DESCENDING A STAIRWAY.

Photographed synchronously from Three Points of View.

Model 13.

Time-intervals: 1/10 second.
WOMAN. KICKING.

Photographed synchronously from Three Points of View.

Model 13.

Time-intervals: '169 second.
WOMAN. REMOVING MANTLE.

PHOTOGRAPHED SYNCHRONOUSLY FROM THREE POINTS OF VIEW.

Model 13.

Time-intervals: .274 second.

For a phase of this series, from the original work, see page 231.
WOMAN. TAKING WATER-JAR FROM ANOTHER WOMAN.

Photographed synchronously from three points of view.

Models 9 and 10.

Time-intervals: 1/60 second.
WOMAN. FEEDING A DOG.

Photographed synchronously from Three Points of View.

Model S.

Time-intervals: '22 second.
WOMAN. POURING A BASIN OF WATER OVER HER HEAD.

Photographed synchronously from Three Points of View.

Model S.

Time-intervals: 1/244 second.

For some of these phases, from the original work, see page 241.
WOMAN. A SHOCK TO THE NERVOUS SYSTEM.

Photographed synchronously from Three Points of View.

Models 1 and 8.

Time-intervals: .437 second.

For a phase of this series, from the original work, see page 241.
VARIOUS INDEPENDENT ACTS OF MOTION.

Photographed synchronously from three points of view.

Model 7.
WOMAN. USING SKIPPING-ROPE.

Photographed synchronously from Three Points of View.

Model 12.

Time-intervals: 1/104 second.

For some of these phases, from the original work, see page 213.
WOMAN. JUMPING ON "STEP-STONES."

PHOTOGRAPHED SYNCHRONOUSLY FROM THREE POINTS OF VIEW.

Model 12.

Time-intervals: .119 second.

For some of these phases, from the original work, see page 245.
WOMAN. RICOCHETTING ON ONE FOOT.

Photographed synchronously from Three Points of View.

Model 12.

Time-intervals: 1/141 second.

For some of these phases, from the original work, see page 245.
WOMAN. SITTING DOWN ON THE GROUND.

PHOTOGRAPHED SYNCHRONOUSLY FROM THREE POINTS OF VIEW.

Model 12.

Time-intervals: '231 second.

For some of these phases, from the original work, see page 249.
WOMAN. RISING FROM SITTING ON THE GROUND.

PHOTOGRAPHED SYNCHRONOUSLY FROM THREE POINTS OF VIEW.

Model 12.

Time-intervals: 0.31 second.
WOMAN. TURNING AROUND AND ASCENDING STAIRWAY.

Photographed synchronously from Three Points of View.

Model 12.

Time-intervals: .046 second.

For some of these phases, from the original work, see page 247.
WOMAN. WALKING, AND FLIRTING A FAN.

Photographed synchronously from Three Points of View.

Model 8.

Time-intervals: '115 second.

For some of these phases, from the original work, see page 259.
THE HUMAN FIGURE IN MOTION.

WOMAN. RUNNING.

Photographed synchronously from two points of view.

Model 7.

Time-intervals: 1/100 second.

For a phase of this series, from the original work, see page 247.
WOMAN. THROWING A SHAWL AROUND HER SHOULDERS.

PHOTOGRAPHED SYNCHRONOUSLY FROM THREE POINTS OF VIEW.

Model S.

Time-intervals: 271 second.

For some of these phases, from the original work, see page 251.
DANCING-GIRL. A PIROUETTE.

Photographed synchronously with Series 63 and 64.

Model 12.

Time-intervals: 2.77 second.

For some of these phases, from the original work, see pages 253 and 255.
DANCING GIRL. A PIROUETTE.

Photographed synchronously with Series 62 and 64.

Model 12.

Time-intervals: \( \frac{1}{277} \) second.

For some of these phases, from the original work, see pages 253 and 255.
DANCING-GIRL. A PIROUETTE.

PHOTOGRAPHED SYNCHRONOUSLY WITH SERIES 62 AND 63.

Model 12.

Time-intervals: 277 second.

For some of these phases, from the original work, see pages 253 and 255.
WOMAN. RAISING HANDS AND TURNING AROUND.

Photographed synchronously from Three Points of View.

Model 12.

Time-intervals: \( \frac{1}{228} \) second.

For a phase of this series, from the original work, see page 257.
WOMAN. ASCENDING A STAIRWAY.

Photographed synchronously from Three Points of View.

Model S.

Time-intervals: '161 second.

For a phase of this series, from the original work, see page 259.
WOMAN. DESCENDING A STAIRWAY, AND TURNING AROUND.

PHOTOGRAPHED SYNCHRONOUSLY FROM THREE POINTS OF VIEW.

Model S.

Time-intervals: ~181 second.

For some phases of this action, from the original work, see page 251.
WOMAN. SITTING DOWN AND FLIRTING A FAN.

PHOTOGRAPHED SYNCRONOUSLY FROM THREE POINTS OF VIEW.

Model 12.

Time-intervals: 1/241 second.

For some of these phases, from the original work, see page 257.
WOMAN. TURNING AROUND ON THE GROUND.

Photographed synchronously from Three Points of View.

Model 7.

Time-intervals: irregular.
WOMAN. MAKING A HIGH-STEP, AND JUMPING.

PHOTOGRAPHED SYNCHRONOUSLY FROM THREE POINTS OF VIEW.

Model 12.

Time-intervals: '290 second.

For some of these phases, from the original work, see page 249.
WOMAN. ASCENDING AND DESCENDING FROM A TABLE.

Photographed synchronously from Three Points of View.

Time-intervals: irregular.

Model 7.

For a phase of this series, from the original work, see page 259.
WOMAN. WITH A BASKET ON HER HEAD, TURNING AROUND.

Photographed synchronously from Three Points of View.

Time-intervals: '219 second.

For some of these phases, from the original work, see page 261.
WOMAN. EMPTYING A BASIN OF WATER.

Photographed synchronously from Three Points of View.

Model 7.

Time-intervals: 0.059 second.

For a phase of this series, from the original work, see page 257.
WOMAN. LIFTING A BUSHEL BASKET.

Photographed synchronously from Three Points of View.

Model 7.

Time-intervals: 200 second.

For a phase of this series, from the original work, see page 257.
THE HUMAN FIGURE IN MOTION.

WOMAN. STOOPING TO PICK UP A HANDKERCHIEF.

Photographed synchronously from Two Points of View.

Model 5.

Time-intervals: .345 second.

For some of these phases, from the original work, see page 263.
THE HUMAN FIGURE IN MOTION.

WOMAN. ADJUSTING TRAIN AND TURNING AROUND.

Photographed synchronously from two points of view.

Model 5.

Time-intervals: 1.65 second.
WOMAN. DESCENDING A STAIRWAY.

Model 15.
WOMAN. PLAYING AT LAWN-TENNIS.

Photographed synchronously from Three Points of View.

Time-intervals: '152 second.

For some phases of a similar action, from the original work, see page 261.
CHILD. GREETING A STRANGER.

Models 12 and 70.

Time-intervals: 291 second.

For some of these phases, from the original work, see page 267.
WOMAN. LIFTING AND CARRYING CHILD.

Photographed synchronously from Three Points of View.

Models 12 and 70.

Time-intervals: 0.31 second.

For some of these phases, from the original work, see page 263.
WOMAN. PLACING CHILD ON THE GROUND.

PHOTOGRAPHED SYNCHRONOUSLY FROM THREE POINTS OF VIEW.

Models 12 and 70.

Time-intervals: 290 second.
WOMAN AND CHILD.  RUNNING.

PHOTOGRAPHED SYNCHRONOUSLY FROM THREE POINTS OF VIEW.

Models 12 and 70.

Time-intervals: .093 second.
CHIL D. CRAWLING ON THE GROUND.

PHOTOGRAPHED SYNCHRONOUSLY FROM THREE POINTS OF VIEW.

Model 70.

Time-intervals: '169 second.

For some of these phases, from the original work, see page 269.
THE HUMAN FIGURE IN MOTION.

CHILD. WALKING.

Photographed synchronously from two points of view.

Model 72.

Time-intervals: 0.067 second.
CHILD. RUNNING.

Model 70.

Time-intervals: 0.97 second.

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CHILD. CRAWLING UPSTAIRS.

Photographed synchronously from Two Points of View.

Model 70.

Time-intervals: '206 second.

For some of these phases, from the original work, see page 271.
CHILD. ATTEMPTING TO WALK UPSTAIRS.

PHOTOGRAPHED SYNCHRONOUSLY FROM TWO POINTS OF VIEW.

Model 70.

Time-intervals: 1/61 second.

For some of these phases, from the original work, see page 271.
MISCELLANEOUS PHASES

OF

THE HUMAN FIGURE IN MOTION

SELECTED FROM VARIOUS SERIATES; AND REPRODUCED ON THE SAME SCALE AS ORIGINALLY PUBLISHED IN "ANIMAL Locomotion"

1887
SOME PHASES IN THE WALK OF AN ATHLETE.

Model 46.

ORDINARY SPEED.

See Series 1.

Time-intervals: 1/200 second.

SOME PHASES IN THE WALK OF AN ATHLETE.

Model 46.

RAPID SPEED.

See Series 2.
THE HUMAN FIGURE IN MOTION.

"SOME PHASES IN THE WALK OF AN ATHLETE. CARRYING A 75-POUND BOULDER.

Model 46.

See Series 3.
SOME PHASES IN THE WALK OF AN ATHLETE.

CARRYING A 50-POUND DUMB-BELL.

Model 46.

See Series 4.

SOME PHASES IN THE WALK OF AN ATHLETE.

CARRYING Buckets FILLED WITH WATER.

Model 46.
SOME PHASES IN THE WALK OF AN ATHLETE. CARRYING A 75-POUND BOULDER.

Model 46.

WALKING, UNDER VARIOUS CONDITIONS.

Model 36.

See Plates 5, 6, and 7.
THE HUMAN FIGURE IN MOTION.

SOME PHASES OF STARTING FOR A RACE.

Model 37.

See Series 9.

SOME PHASES OF RUNNING A RACE.

Model 37.

See Series 10.
SOME PHASES OF A STANDING LONG-JUMP.

Model 37.

SOME PHASES OF A STANDING HIGH-JUMP.
See Series 14.

Model 40.

SOME PHASES OF RUNNING HIGH-JUMPS.
See Series 15, 16, and 17.

Model 37.
SOME PHASES OF RUNNING AND JUMPING.

Models 27, 28, 37, 47, 97.
CRICKET.

Model 69.

See Serieses 22, 23, and 27.
HEAVING A 75-POUND BOULDER.
Model 52.

HEAVING A 20-POUND BOULDER.
Model 35.
PHASES IN BATTING AT BASEBALL.


PHASES AT FOOTBALL.
Some phases in a wrestling match.

Models 46 and 68.

See Series 30.
SOME PHASES IN A WRESTLING MATCH.

Models 46 and 68.

See Series 30.
PHASES OF MOTION, SELECTED FROM VARIOUS SERIATES.

Models 37, 46, 55, 66, 67, 99, and 104.
THE HUMAN FIGURE IN MOTION.

SOME PHASES OF A PUGILIST STRIKING A BLOW.

Model 22.

See Series 32.

SOME PHASES OF A BOXING MATCH.

Models 52 and 53.
SOME PHASES OF A BOXING MATCH.

Models 52 and 53.
BLACKSMITHS AT WORK.
IN PHASE 2 THE SLEDGE-HAMMER HAS REBOUNDED.
Models 59 and 61.
See Series 37.
BLACKSMITHS AT WORK.

IN PHASE 12 THE SLEDGE-HAMMER IS DESCENDING.

See Series 37.

Models 59 and 61.

BASEBALL (LOW BALL).
Model 30.

Model 98.

BASEBALL (ERROR).
Model 30.
THE HUMAN FIGURE IN MOTION.

WALKING, UNDER VARIOUS CONDITIONS.

Models 1, 7, and 8.
VARIABLES ACTS OF MOTION.

Models 1, 6, 7, 8, and 13.
Model 7.
SOME PHASES OCCURRING IN THE ACT OF STOOPING.
THE HUMAN FIGURE IN MOTION.

VARIOUS ACTS OF THROWING.

Models 7 and 8.
Various acts of motion.

Models 1 and 8.

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SELECTED PHASES FROM SERIES 54.

Model 12.

SELECTED PHASES FROM SERIES 55.

Model 12.
THE HUMAN FIGURE IN MOTION.

VARIOUS PHASES OF MOVEMENT.

Motions 7 and 12.
SELECTIONS FROM SERIATES 62, 63, AND 64.

EACH SELECTED PHASE IS ILLUSTRATED FROM ONE, TWO, OR THREE POINTS OF VIEW.

Model 12.
SELECTIONS FROM SERIATES 62, 63, AND 64.

EACH SELECTED PHASE IS ILLUSTRATED FROM ONE, TWO, OR THREE POINTS OF VIEW.

Model 12.
THE HUMAN FIGURE IN MOTION.

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MISCELLANEOUS ACTS OF MOTION.

Models 4, 7, 12, and 15.
VARIOUS PHASES OF MOVEMENT.

Models 7, 8, and 15.
SOME PHASES OCCURRING IN LAWN TENNIS.

VARIOUS PHASES OF MOVEMENT.
SOME PHASES OCCURRING IN THE ACT OF TURNING AROUND.

SELECTED PHASES FROM SERIES 75.
SELECTED PHASES FROM SERIES 80.

Models 12 and 70.
SELECTED PHASES FROM SERIES 79.

PHASES OCCURRING IN THE ACT OF LIFTING A DOLL BY A CHILD.

Model 70.
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