THE TACHOCYCLE.

For a full-grown man or woman to roll a hoop would seem very puerile, and yet a glance at the accompanying reproductions of photographs taken at Dieppe last summer might make a person think that the sport therein represented, which is now much in favor, and which, although less primitive than hoop rolling, is just as useful for restoring one's impaired health, was carrying him back to the days of his childhood. It is a question of an apparatus designed, through the pull that it exerts in moving forward, to increase the speed of a person walking or running a foot race. It consists essentially of two wheels of any sort of material utilizable for the purpose, and to which any desired dimensions may be given. These wheels revolve freely around an axle that serves as a support, and upon which a person bears through the intermedium of handles. In the apparatus shown in Fig. 3, the axle is straight and is provided with two handles, but in Fig. 4 it is cranked so as to permit of the foot resting upon it. The wheels, too, might be made fast to the axle and the handles be rendered loose upon the latter. The inventor even proposes to add small intermediate wheels, if need be, to give more stability to the entire system. As may be seen, the mechanism is not very complicated. In this respect, the apparatus seems to have a great advantage over ordinary cycling machines, which are so quick to deteriorate; and, although the speed at which it carries a person along is not so great as that of such machines, it nevertheless seems as if its utility were greater, from a hygienic standpoint, since walking or foot racing will always remain the kind of locomotion best adapted to our physical nature, without speaking of the accidents that are less to be feared with this apparatus, which one can let go of at any moment, if occasion requires it. Figs. 1 and 2 are some models of the apparatus put in service last summer at Dieppe, where the bathers gave them a most favorable reception.

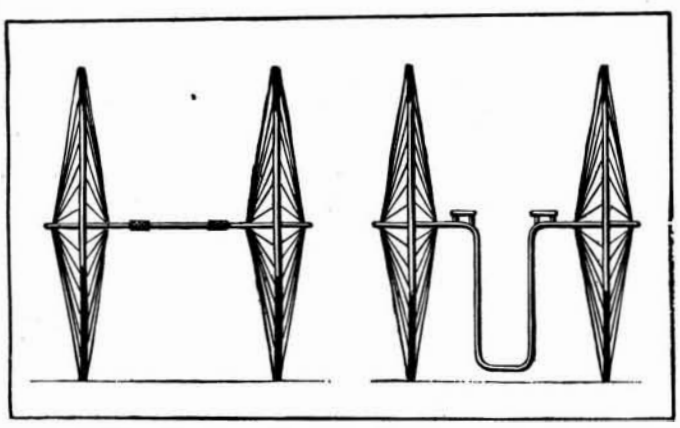


Fig. 3.—Tachocycle with a Straight Axle.

Fig. 4.—The same with a Cranked Axle to serve as a Foot Rest.

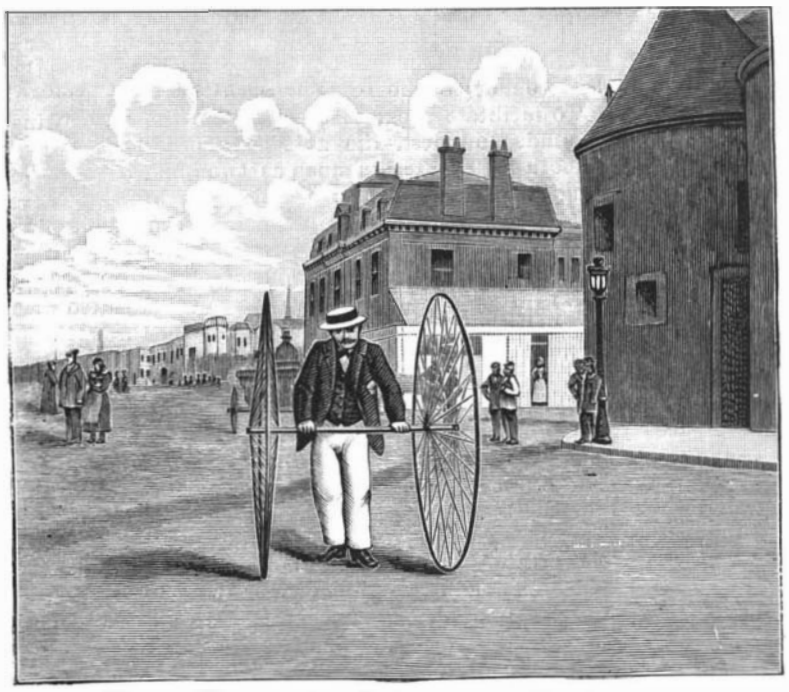


Fig. 1. THE TACHOCYCLE ON THE BEACH AT DIEPPE.

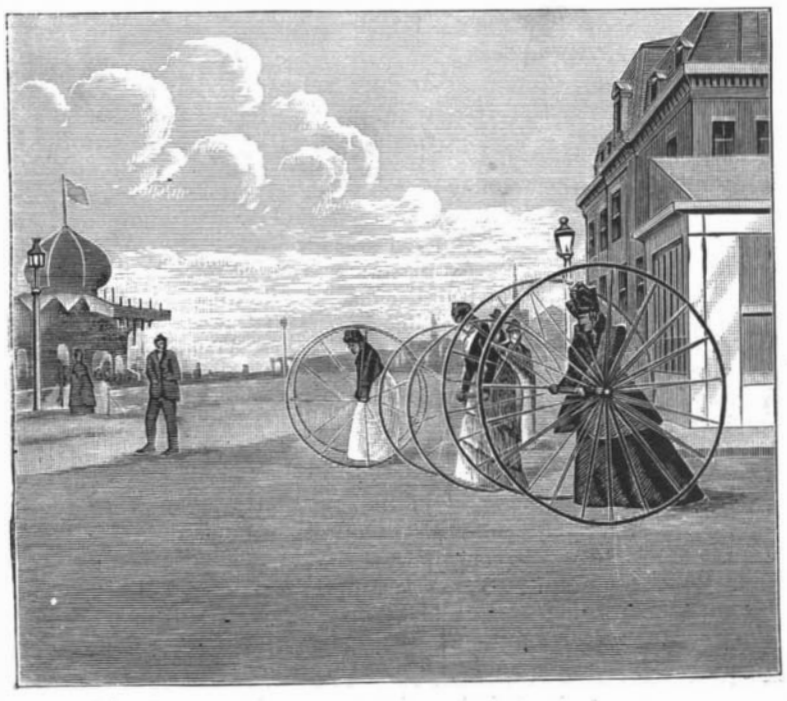


Fig. 2.—THE TACHOCYCLE ON THE BEACH AT DIEPPE.

HINTS ON COLORING LANTERN SLIDES.

BY GEO. M. HOPKINS.

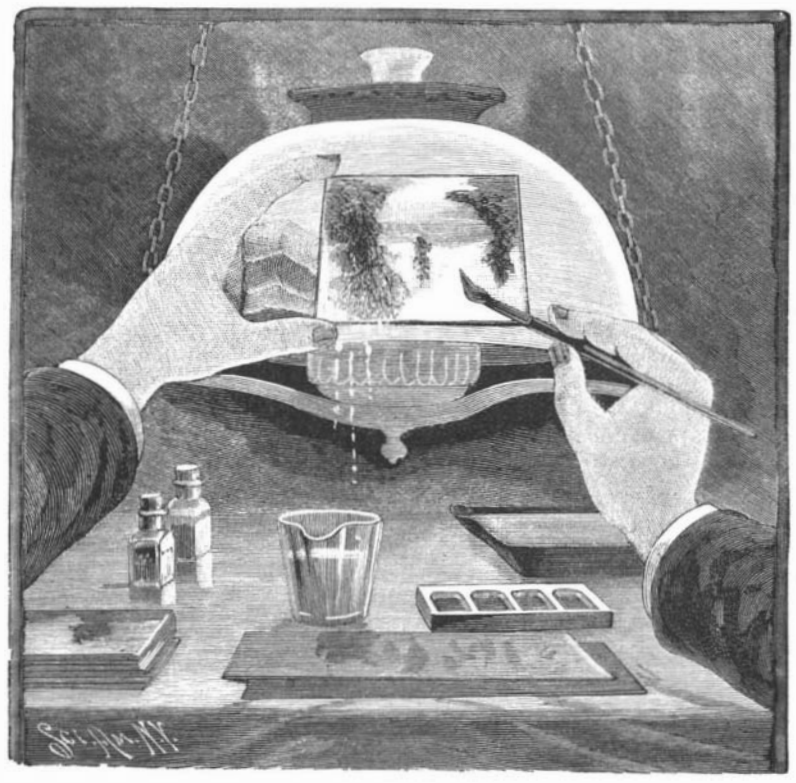
It frequently happens that one who is practiced in the art of coloring lantern slides desires to color a rare or valuable slide when the remotest chance of injury to the slide cannot be taken. In such cases the color must be applied either to the back or outer surface of the plate or to a plate that will answer the purpose of a cover glass. The latter method is certainly to be preferred, as it involves no risk whatever, and at the same time affords an opportunity of trying different color effects on the same picture; such, for example, as spring, summer and autumn tints in landscapes, and different combinations of color in architectural views, interiors or figures.

The plate used for receiving the color is an old unused gelatin lantern slide plate, from the film of which the silver has been removed by hypo; or a gelatin plate from which a discarded view has been removed from the film by means of a reducing solution; the plate in either case being washed long enough to remove all hypo.

The film on the unused plate will need toughening by soaking it for two or three minutes in a solution of alum of the strength commonly used for preventing frilling, the plate being afterward thoroughly washed. This plate takes color better than one which has been subjected to the reducing process. A plate may also be prepared by flowing a solution of gelatin over a clean cover glass, allowing it to dry, and then treating it to an alum bath and subsequent washing.

The slide to be colored, which is, of course, unmounted, is placed with its glass side against the glass side of the transparent film-bearing plate, which is dry, and the transparent film is wet all over by means of a very soft brush carrying clean water. Some caution is required to prevent the film side of the slide from becoming wet. A small quantity of water absorbed between the contacting glass surfaces is an advantage, as it binds the plates together and prevents them from moving easily one on the other.

The coloring is done upon the transparent film, following the outlines and every feature of the picture as closely as possible. It will, of course, be impossible to follow every leaf and blade of grass, or every twig and flower, with perfect accuracy, on account of two thicknesses of glass intervening between the color film and the picture film, yet the results secured by this method are astonishing. The writer has colored slides in this way which were not distinguishable, even by experts, from slides colored on the picture-bearing film. The following description of a method of coloring prints on gelatin-coated lantern slide plates is taken from the writer's article in the SCIENTIFIC AMERICAN of March 11, 1893, it being applicable in the present case:



LANTERN SLIDE COLORING.

The first operation in coloring is to go over the entire surface of the film while it is wet with a thin wash of warm color, which may be either yellow or pink, depending upon the subject. This kills the chalky whiteness of the high lights, and gives the entire picture a warm and desirable tone, even though the wash is not sufficiently strong to be detected when the picture is thrown upon the screen.

The colors used for this purpose are transparent aniline colors prepared for coloring photographs. They are labeled brown, blue, violet, flesh, orange, green, and so on. The ordinary aniline dyes may be used instead of the prepared colors, as they are practically the same. The manipulation of the colors is the same as in water color painting. The film is kept wet continually from the beginning to the end of the operation, but after the broad washes of the first warm tint and the final sky color, the water lying on the surface of the film is allowed to dry off, leaving the film still swelled and wet, but without the surface water.

The prepared colors can rarely be applied to the slide without being reduced with water. Sometimes the best effects are produced by mixing different colors before applying them, while in other cases the effects are secured by separate washes of different colors, superposed. Each wash of color sinks into the film and is not removed by a subsequent wash.

Although an easel or support something like a retouching frame may be useful, the writer prefers to hold the slide in the hand, as shown in the engraving. The wet plate is held in a slightly inclined position in front of a lamp provided with a plain opal or ground glass shade. The writer prefers artificial light for coloring, as the pictures are to be shown generally by artificial light, which is yellow. If the pictures are designed for projection by sunlight, it is undoubtedly better to color them in daylight.

The first wash is preferably put on while the slide is held in an inverted position, and while it is still flowing the blue is added for the sky, at first very light near the horizon, increasing in intensity toward the top of the slide. After this wash is set and superfluous water has evaporated, the water accumulating along the lower edge of the plate is removed with the fingers, and the slide is turned right side up, when the extreme distance, whether it be mountain or foliage, is covered with a light wash of blue, and this wash is brought well down toward the foreground. If the blue appears cold, it can be toned down by a very light wash of yellow or red. Trees in the middle distance can now be gone over with a light wash of orange or orange with a little of the flesh color or pink added. When near the foreground a very light wash of green is applied to the foliage, but the raw green of the color set cannot be used for this; it must be modified by the addition of orange or of brown. If when applied the green appears too cold, it may be toned down by a light wash of brown, of orange or flesh color. It is desirable to produce variety in the foliage.

Rocks in the distance are washed with blue and the color is subsequently modified by washes of red or brown. Trunks of distant trees and some rocks may be left nearly the original color of the photo., but near rocks and tree trunks may be tinted with brown, blue,

or warm green, and subsequently modified by washes of green, red, brown, yellow, or orange.

It is useless to trace the smaller branches of trees and shrubs, and it is rarely necessary to deal with single leaves or blossoms; when this must be done a jeweler's eye glass is required, and fine, small brushes are used, great care being taken to keep within the outline of the object being colored. In all this work, the artist does well to remember that the coloring is to stand the test of great magnification and strong light.

The plate is apt to dry out in some places while the coloring is going on at other places. As coloring cannot be successfully done on a dry surface, it is important to wet the surface before proceeding. This is done by applying water with a soft camel's hair brush. After the surface water has disappeared the coloring may proceed.

It is obviously impossible to mention every modification of color that may be produced by mixtures and washes. This is something to be acquired by practice. The writer uses very few colors, rarely more than the following: Blue, green, brown, orange, flesh, rose, and yellow. The last is a strong color which must be applied with caution. Green and blue are also strong colors which can never be applied without the admixture of a warm color, or a subsequent wash of the same. Brown in different strengths has a large application. It is useful in toning down bright greens, for rocks, tree trunks, earth, etc. A wash of blue over the brown produces a different but useful gray.

The principal points to be observed are to keep the plate always wet, to use light washes, to modify color by subsequent washes, and in working up details to preserve the outlines.

After the coloring is completed, the glasses are separated, the colored film is allowed to dry, when it is placed over the picture, the two films being in contact, and a binding strip is attached to the edges in the usual way. The mat in this case is pasted on the outside of the cover.

When it is desired to color a wet plate or collodion film slide with liquid colors, the collodion film is coated with a thin transparent film of gelatin, which is allowed to dry, when it is immersed for a few minutes in a solution of alum, to toughen it. It is then washed, and while still wet, the broad washes of color are applied.

Something has been said about the permanence of the liquid colors used on the slides. The writer has many slides colored in this manner two or three years since, which have not changed perceptibly. Without doubt continual exposure to sunlight would affect them, but it would also change any other colors used for this purpose. In a prolonged test in sunlight of all the liquid colors used on slides, it was found that the greens after a time turn yellow. Brown becomes somewhat darker. The reds and yellow remained unchanged. Blue faded slightly. But this is a test more severe than colored lantern slides would ever be subjected to. The writer believes they would retain their color indefinitely.

A Substitute for the Buffalo Robe.

The disappearance of the buffalo has led to a useful invention and a new industry. The American Buffalo Robe Company, 1 to 7 Howell Street, Buffalo, N. Y., is manufacturing the Saskatchewan Buffalo Robe, which is such an excellent imitation of the original that they can hardly be told apart except on close examination.

This robe is the invention of Mr. A. M. Newlands, of Galt, Canada, who has had 30 years' experience as a woolen manufacturer, and he foresaw, along in the seventies, when the buffalo disappeared, never to return, that a substitute must be had for its valuable skin.

The Saskatchewan is made on a patented machine. A back as strong as leather, with a covering of hair and wool, made in one piece (no seams to rip), and lined with a scarlet or black lambskin, and an intermediate lining of rubber sheeting, which makes it impervious to rain and wind.

Doctors, liverymen and farmers, who have tested these robes for four years in Canada, pronounce them equal in all respects to the old buffalo, which, for a century or more, did such good service when wear and warmth were a necessity.

At the World's Fair, Chicago, these robes, also coats made from the same material, were on exhibition. They attracted much attention, and received the highest award and a diploma.

The Boynton Bicycle Railroad.

An exhibition was given of the Boynton bicycle railroad between Hagerman Station and the Great South Bay, at Bellport, L. I., on the 16th of February, which was witnessed by twenty-seven members of the Massachusetts Legislature, including the members of the Senate Transit Committee, the Senate Committee on Street Railways and the House Committee on Transit. In addition to the above there were about one hundred prominent railroad men from different parts of the United States, as well as a large press representation. They were entertained by Mr. Dunton, a nephew of Austin Corbin, who is president of the company, and by Mr. Boynton, the inventor. The system was illustrated in the SCIENTIFIC AMERICAN of February 17, 1894. The road is two miles long, but in that short distance a speed of over fifty miles an hour was obtained. Mr. Boynton explained the details to those present, and Mr. Dunton delivered an address, pointing out the commercial features.

Air and Life.

All living creatures breathe, and the air is as necessary to them as water, food, and a certain amount of heat. From the chemical point of view the air is composed of different elements. It is not at all a simple body, as was supposed up to the end of the last century, but a mixture of gaseous bodies, capable of being isolated and analyzed. Among these elements three preponderate in quantity and physiological importance. These are oxygen, azote, and carbonic acid. Oxygen and azote constitute the greatest part of the air—the essential part. The most important of the accessory elements is carbonic acid, being found in the air in the proportion of four or five parts to every ten thousand parts, varying according to locality. There are, besides, other bodies which enter into the composition of the atmosphere, as ammonia, azotic acid (found in rain water), and ozone, an oxygen condensed in some way under the influence of atmospheric electricity. These, however, exist only in very small quantities.

Every one knows that without oxygen there would be no life, either of plants or animals. Paul Bert, however, has found by experiment a fact which, at first sight, seems very strange. This is, that oxygen, this gas, vital above all others, is a violent poison, for the plant as for the animal, for the cellule as for the complete organism; and, if found in the air in certain proportions, immediately becomes an instrument of death. This is one of the most curious of recent discoveries. No oxygen, no life; too much oxygen, equally no life. We now pass to azote. If an animal or plant is placed in this atmosphere, death takes place without delay. It is not that azote is a poison, but it is inert, useless, and incombustible. Its respiratory role is valueless, and its only function seems to be that of tempering the action of the oxygen.

We come now to carbonic acid. This, as we know, is a very noxious element; injurious to animals and to plants, it appears as a gas injurious above all others. Nevertheless, it is one of the essential bases of life. If it disappears from the air, vegetation is immediately destroyed, and in its absence but a few days would elapse before all that breathes would disappear from our globe. In certain cases, however, the atmosphere itself is an instrument of death, containing, as it does, the different microbes. Some of these are inoffensive, but many are deadly. Spread through the air by persons afflicted with tuberculosis, varioloid, scarlatina, diphtheria, every species of microbian disease, they travel far and wide, scattering death in their train.

Thus we see that the atmosphere brings life and death at once. Each of its elements is indispensable to life and each of them is an agent of death, according to conditions and proportions. The one which seems to be most vivifying can become a formidable poison; the most useless, the most noxious even, is shown by analysis to be an essential base of life. And the conclusion is, that if any one of these should disappear, the earth would immediately become a naked and barren globe, deprived of all life. Looking at this still further, another fact is revealed to us. It is that, according to the very happy expression of J. B. Dumas, all living creatures are only condensed air. Vegetables exist only by virtue of the air, animals by means of the vegetables. The elements of vegetable life are those of the air, and animals live on the vegetables. The connection is narrow, intimate, direct. Man is condensed air. And as this air, during the centuries that man has existed, has incessantly traversed through bodies of our ancestors, being part of them for a time, and then again disengaged, our body is actually made up of the same elements as that of our ancestors. The substance is the same. And that substance, which is also that of the vegetables of the past, circulates ceaselessly through space. To-day or to-morrow, flower or fruit, it will incorporate itself, here, in the slow growth of a mollusk; there, in the brain of a Descartes, a Pascal, a Joan of Arc, a Shakespeare. It never stops; its cycle, of which no human eye has seen the beginning, and of which none will be able to observe the end, seems infinite; passing alternately from life to death. Old as the world, and in spite of that, eternally young, it would appear (if it had consciousness) to have exhausted all that life contains of joy and of sorrow, and to have known all the emotions, the most noble as the most vile.

That air which so sweetly blows in our face to-day is all past existence; it is a myriad of existences, those of our ancestors, those also of the dead for whom we mourn; to-day it becomes a part of us, and to-morrow it will pursue its journey, metamorphosing itself without cessation; passing from one organism to the other, without choice, without distinction, until the day when, our planet dying, all this substance will re-enter into the frozen earth, a gigantic tomb which will revolve silent and desolate, through the unfathomable depths of the universe. And after? Science remains dumb. In that book of nature which opens to us and in which we plunge with avidity, in order to decipher the future, two pages are wanting, those which would most interest us: the first and the last.—*Public Opinion, from Revue des Deux Mondes.*

Industrious Texas Ants.

Last summer, I believe it was, writes a contributor to the Galveston *News*, while lying in the shade of a large pecan tree, I noticed a small family of aphides on the leaf of a cotton stalk, and was not a little surprised a moment later on seeing a large red ant with black head and long legs emerge from the under side of the leaf. I soon recognized him as one of the well known pastoral ants (*Hypoclines*), industrially the lowest of the ant family, and who lead a lonely life, like the old Syriac shepherds tending their pygmy cows. On the same leaf I noticed a fellow herder, who was tending a still smaller flock. Both went about from time to time, and gently stroking with their antennæ the tube-like protuberances on the abdomen, induced a slight flow of sweet liquor, the honey dew of the apir. These crystal beads of honey they dexterously licked off before they fell on the leaf, and quickly hurried away to repeat the same operation on another aphide.

The sagacity of the shepherd ant is only rivaled by that of the farmer ant, also a native of far Western Texas. These remarkable insects, according to some writers, plant each year a crop of ant rice, a cereal seemingly originated by some farmer agriculturist in bygone ages, and when the crop is ripe they gather it into subterranean granaries, always reserving a store for planting.

Somewhat resembling in occupation the farmer ant, Texas can boast of many colonies of the umbrella or leaf-cutting ant, so common and destructive in Mexico and Central America. In the latter countries they are quite destructive, often destroying large trees, and their depredations have to be guarded against by means of woolen fillets wound about the trunks of the trees. Many notions, wholly without foundation, seem to be current concerning these strange little pests. Their method of operation, so far as I have observed in Fort Bend County, is to strip only the smaller trees and shrubs. The leaves are not cut into disk-shaped pieces, as commonly supposed, but in any form that suits the artistic fancy of the ant.

To facilitate progress to and from the leaf-cutting grounds and nest, the ants construct clear, broad, smooth roads, often as much as two hundred yards in length and from six to eight inches broad. These roads display considerable engineering skill, abounding in curves, grades, and even tunnels. The leaf-cutters seem to be the most industrious of all the ant family; big, little, old, and young seeming to be animated with an almost insane desire to do his share of the work.

Nothing could be more amusing than to see a little fellow, not more than the fourth of an inch long, hurrying madly along with a huge leaf dexterously held in his mandibles. The nest of the umbrella ant is a very poor affair, and bears about the same relation to the neat tunnels of the farmer ant that the hovel of the squatter does to the substantial home of the prosperous farmer. Any rude hole or hollow log serves the leaf gatherer as a store room, where he puts away his hot bed to hatch out the eggs deposited by the female. The leaf-cutter is thus the original inventor of the incubator, although his rights have never been recognized by letters patent.

In New Mexico and Northern Mexico is to be found the honey ant, sold as confections by the Mexicans, which are eaten something like grapes. Unlike the bee, the ant is unable to secrete wax or otherwise make a suitable receptacle for his gathered honey, but in the face of these difficulties he has solved the problem completely. Certain members, very patriotic ones, doubtless, are selected who act as honey jars or workers. These martyrs stay at home and bravely swallow the gathered honey until their gradually extending abdomens will hold no more, and as they hang suspended like so many golden drops from the sides of the tunnel, they have the appearance, though not the sentiments, of bloated capitalists profiting in idleness by the labors of their fellow beings.

The life of the honey keeper is no sinecure. His duties are arduous and require the greatest care. When the honey season is over he it is who feeds the idle hands, regurgitating a drop of honey whenever a check on the larder is presented, the latter consisting of certain well defined strokes on the head and body by the hungry ant. Some malignant investigators, whose whole desire seems to be to fasten on these exemplary little animals the vices of men, claim that there is to be found a parasitic bug in the nests of the honey ant which, at the solicitation of thirsty members, yields an alcoholic liquor something similar to beer. The methods of the formic topers are said to be similar to those of the enlightened Caucasian, consisting in certain winks and expressive crookings of the elbows.