

STEREOSCOPY

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PERPETUAL MOTION

OUR national Patent Office refuses to grant patents upon perpetual motion devices because such devices are opposed to fundamental physical law and hence inoperative. The advisability of such action is unquestionable, but one wonders why it is not extended to all devices which are contrary to fundamental law.

We have before us a recently granted patent upon a device for obtaining monocular stereoscopic effects! The thing is impossible! We do not mean that because it has not been done before that it would appear to be impossible; what we mean is that it is absolutely, unquestionably impossible. It is in direct contradiction to all fact. Stereoscopy is the mental interpretation of a *difference*, and you cannot have a difference where only one thing exists. You could hardly speak of the difference between an apple for example. You must have the difference between two or more apples, or between an apple and some other object.

Perhaps more than in any other field, people leap into inventions in stereoscopy without having troubled to familiarize themselves with the most elementary principles of the field.

This of course is not important within itself. We mention the case simply to show that today there is no scientific field so little known and so little understood as that of stereoscopy. Unfortunately the stereographer can do but one of two things. He can blindly, although carefully, follow the rules, or he can take the trouble to learn the fundamentals of the work.

Such absurdities as the patent mentioned are made possible because so few people, including many scientists, actually working in the field, have the faintest conception of what stereoscopy really is. There is an almost universal confusion between stereoscopy and the illusion of relief.

ILLUSION OF RELIEF

There are many well-known and highly effective devices whereby a picture is given an illusion of depth and relief. The most familiar (and the one upon which the patent mentioned is based) is that of viewing a picture through a lens system. This gives to the picture a very striking appearance of being in several planes, that is of having depth, *but this is not stereoscopy*.

Stereoscopy is not founded upon an illusion of any kind. The depth observed is just as actual, just as real, as that seen when the original object is viewed. Because the little understood neuropsychological reactions involved in stereoscopic perception are not generally understood, one argues that in seeing an actual object the depth observed is real, while in viewing a photographic print, the depth appearance must be an illusion because the print cannot have real depth. The argument is faultless. It only fails because *it is based upon wholly false premises*.

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STEREOSCOPIC SYNTHESIS

Physiologists specializing in the field of human vision are agreed that we do not actually see anything in relief. That statement is somewhat ambiguous, so let us put it another way. We see objects with each eye individually, and the image which we perceive is the image of the real object, but because it is seen with but one eye it is not seen stereoscopically.

However, when two images which exhibit the necessary differences are transmitted simultaneously by the two eyes, those two actual images are, by a mental process as yet too little understood, fused to create, *not* a combination image containing the elements of both originals, but a totally new creation which has characteristics of its own lacking in both originals, and which excludes many individual characteristics found in the two originals.

The stereoscopic image is utterly and completely synthetic, a visual image without factual counterpart in the physical world, having its whole being from creation to perception within the mind. (We are speaking of direct vision, not of viewing a stereogram.)

Then you ask, if this image is wholly mental, why do we "see" the object out in space? The answer is one which is at first difficult to accept as it seems to include both primitive concepts and black magic. However, it is accepted in the field of physiological optics that this synthetic image is visually projected into space to that position determined by the specific characteristics of the two plane images, so that this image occupies the same spatial position occupied by the real object. Of course there is no projected light beam or any other physical carrier, so the term may be confusing at first, but it seems to be the only theory which satisfies existing fact. If you are interested you will find this "projection" fully discussed in almost any modern text of physiological optics.

Therefore, we must amend a previous statement. It would be more true to say that all stereoscopic vision, including our everyday vision, is an illusion. However the important point is that the illusory relief of the monocular optical system is unnatural, while stereoscopy in every step follows strictly the normal course of visual stimulation and perception.

STEREOSCOPY IS SPECIFIC

To come to a more commonplace point of view, the illusory relief is not specific. The background appears to be distant, the foreground appears to be near, but there is no object in the picture so definitely oriented that you can estimate its distance.

Stereoscopy is just as specific as actual vision. When examining a stereogram you can estimate the distance of any object in the field just as accurately as you could judge the distance of the real object. Those who have a defective sense of distance will make the same errors when judging the stereogram as when judging the distance of the real object. And finally, the stereogram contains all the necessary elements to enable the distance of any object portrayed to be measured with instruments just as accurately as if the real distance were measured.

MONOCULAR STEREOSCOPY AN IMPOSSIBLE CONTRADICTION

Monocular stereoscopy is analogous to a two-legged quadruped, to dry water, or hot snow. It is quite in the same category as black luminosity (and note, we do not say "black light"). In short, the two words "monocular" and "stereoscopic" are antithetical. So it would appear that the Patent Office has after all granted a patent which is precisely in the class of perpetual motion.

STEREOSCOPIC REALISM

We wish to add a few words to a statement recently made in this column. The statement was made that the acceptable stereogram exhibited no visible base or support, that the images were seen in full natural distance and in full life size, with no paper, no mount, no glass or celluloid support apparent. We have received several inquiries asking for information about this new system and how it is accomplished.

There is no new system, nothing new. The foregoing is an accurate description of the appearance of any and of every good stereogram made according to rules and viewed under correct conditions. It is the stereoscopic appearance familiar to every amateur working in the field and it is the appearance which has given to stereoscopy the reputation of being the most perfect reproduction process known to man.

As we have so often said in this column, the stereoscopic image is an *exact* duplicate of the original image. In the viewer you see exactly what you would see when looking at the real thing.

We live in an age of overworked adjectives, so when you are told that something is perfect, splendid, gorgeous, colossal, you gather the impression that it is possibly somewhat good. When you are told that the stereoscopic image is an exact duplicate of the real thing, you therefore expect it to show some resemblance to the original. In this instance, however, the words are to be taken exactly at face value. When viewing a well-made stereogram in a good viewer, *you see exactly what you would see if you were to look at the actual scene*. If you do not, something is decidedly wrong either in the taking or the viewing of the picture.

There are a few factors which have a bearing upon this result. (a) The viewer must be matched to the camera. (b) The pupillary base of the camera must be accurate. (This explains why the so-called "stereoscopic" aerial views are so rarely satisfactory.) (c) The positive must be made upon a transparent base so that it is a transparency rather than a paper print. (d) The viewer must be of the cabinet type so that the view is seen as at the end of a dark tunnel. (e) The viewer should have achromatic lenses and be equipped with focusing and interpupillary adjustments.

It must be admitted that paper prints viewed in an open viewer do not give the effect simply because extraneous objects are seen around the edges of the stereogram. Inasmuch as reason will not permit the Washington Monument and the wall of our study to occupy the same space at the same time, we permit this reasoning to interfere with, not the illusion, but the normal processes of visual perception.

INTERPUPILLARY

It has often been said that no stereoscopic process can be exact because the interpupillary distances among individuals vary so widely, while that of the camera is fixed. This criticism arises from another misconception of the character of stereoscopy.

In the first place many stereo cameras do have an adjustable base which has no value unless the variability is considerable. The important point is that the adjustment of the viewer lenses to the interpupillary of the spectator automatically corrects the viewing factors for that individual.

The whole art and science of stereoscopy lies in the fact that the stereogram is a faithful reproduction of the original scene, reproduced without any personal or individual bias, so that it truly replaces the original as a source of visual

stimulus. When this stereogram is viewed by any individual, the scene is reproduced as that individual would see the original, and any and all differences which would be perceived by several individuals looking at the original will likewise be perceived by the same group looking at the stereogram! This includes the so-called "focusing" upon objects at various distances from the spectator, and changing this "focus" for these various objects.

Only when you realize that the stereogram is a complete, and a faithful reproduction of the original, containing every element of visual stimulation contained in the original, can you truly begin to appreciate stereo. Only then can you appreciate the true value of the finest available stereo equipment.

NEWS NOTES

MULTISCOPE FOR USE WITH AERIAL PHOTOGRAPHY

The following is excerpted from a Northeastern Engineering Inc. circular describing the latest model of the Multiscope.

This new instrument incorporates improvements which are a direct result of two years of field work with the earlier models. Many photogrammetrists and foresters who have operated this new instrument believe it is the last word in an instrument which incorporates a high speed stereoscopic plotter; a compensating stereoscopic plotter; a mirror stereoscope; and a camera lucida.

Although the instrument is the same size as on previous models, namely 60" long, 30" high and 22" wide and has a gross shipping weight of 200 pounds, it incorporates many valuable new features. You will note particularly the Plexiglas flight line indicators, the individual spot lights with dimming control on each of the photograph tables as well as on the map table; and the removable photo table supports. In addition to these there are mechanical refinements which add to the accuracy and ease of operation of the instrument.

Mustiscopes are now in use by famous universities, a number of photogrammetrists and consultants in the United States, Canada, Mexico and Greece, and many timber, power companies and industrials in the U. S. and Canada. Also a number of Government Agencies including: States of Wisconsin, Minnesota, Connecticut, Pennsylvania; the Province of Ontario and the Australian Government; and the United States Forest Service.

TWO NEW PHOTOCOPY PAPERS ADDED TO KODAGRAPH LINE

Two new papers for photocopying have been added to the Kodagraph line of photographic materials for engineering and office reproduction.

A new ledger-duplitized contact paper, coated on both sides of the sheet, has been announced by the Eastman Kodak Company, together with a new Kodagraph Projection Paper on standard weight stock. Hitherto Kodagraph Projection Paper has been available only in extra thin and in ledger weights.

The new Kodagraph Contact Paper, Ledger Duplitized, permits prints to be made on both sides of the paper and is extremely useful for bound records, contracts, catalogues, and similar documents.