

"METEMPSYCHOSIS."*

"Metempsychosis" is the name of an illusion which was the joint invention of Messrs. Walker and Pepper, of London. It was devised by the former gentleman, and the latter assisted in perfecting it. It is probably the most mystifying of any of the optical tricks. It has of late years been shown in America, by Kellar, under the title of the "Blue Room." The first effect produced upon the spectator after witnessing the illusion is that he has been dreaming, or seeing ghosts or spirits, for it seems utterly impossible for man to accomplish the wonders produced by it.

Our first engraving shows the stage set as an artist's studio. Through the center of the rear drop scene is

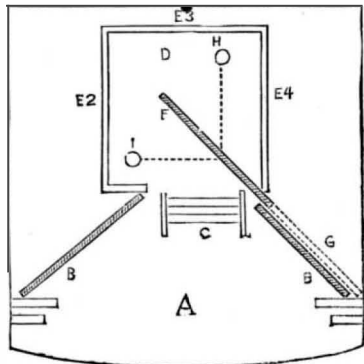


FIG. 2.

seen a small chamber in which is a suit of armor standing upright. The floor of this apartment is raised above the level of the stage and is approached by a short flight of steps. When the curtain is raised a servant makes his appearance and begins to dust and clean the apartments. He finally comes to the suit of armor, taking it apart, cleans and dusts it, and finally reassembles it. No sooner is the suit of armor perfectly articulated than the soulless mailed figure deals the servant a blow. The domestic, with a cry of fear, drops his duster, flies down the steps into the large room, the suit of armor pursuing him, wrestling with him, and kicking him all over the stage. When the suit of armor considers that it has punished the servant sufficiently, it returns to its original position in the small chamber just as the master of the house enters, brought there by the noise and cries of the servant, from whom he demands an explanation of the commotion. Upon being told, he derides the servant's fear, and, to prove that he was mistaken, takes the suit of armor apart, throwing it piece by piece upon the floor. This is only one of the countless effects which can be produced by this interesting illusion.

The working of the illusion will be understood by reference to the diagram, Fig. 2. At A we have the proscenium opening; B B are two flats of scenery which close in the scene from the front wings to the steps, C, which in their turn lead up to the small chamber, D, at the back, in which all the changes occur. The walls of the chamber are lettered E¹, E², E³, E⁴. F is a large mirror extending from floor to ceiling, and capable of being wheeled back and forth on a truck or carriage. When this mirror is withdrawn, as seen at the dotted lines, G, the spectators see through the opening of the chamber to the rear wall. The suit of armor is marked H. Now, if the mirror be pushed across the chamber, both the armor, H, and the rear wall disappear, and the walls of the chamber at E¹ and E² are reflected so that they appear to be the walls E³ and E⁴. There is another suit of armor at I. It is placed so that, when it is reflected in the mirror, it will occupy the exact position of the other suit of armor, H. When the mirror is shoved forward and hides the suit of armor,

H, an actor dressed in a similar suit enters behind the glass by a secret door, removes the dummy armor, and assumes the same place himself. All this time the suit of armor at I is reflected in the mirror, so that a suit of armor is always visible. The mirror is now drawn back, and the suit of armor which the actor wears is seen. When the servant now dusts the armor, it suddenly seems to become endowed with life and chases

him around the room; and when it again mounts the steps in the smaller room, the mirror is shoved forward, the actor making his escape in time to place the first suit of armor where it formerly stood. Now the mirror is again drawn out, revealing the sides of the room, E³ and E⁴, and, of course, exposing the suit of armor, H. If the walls, E¹ and E², and the armor, I, are correctly placed as regards reflection, he can pass the mirror to and fro at will, without any change being detected, as the reflection takes the place of the reality, and we suppose we are looking at the real object.

As the edge of the mirror passes the suit of armor a hard line is to be seen, a distinct vertical line, which would seem to wipe out the object as it passes. To avoid this, the inventors hit upon a novel and purely ingenious expedient. They etched vertical lines in the silver back of the glass at the end which first passes across the field of view, beginning with thick silvered spaces close together, and tapering, with the lines farther apart as shown in our diagram, Fig. 3. It can thus be seen that the reflected article gradually appears instead of coming suddenly into view, and when the mirror is moved away the real article gradually appears.

In order that the edges of the glass may be better disguised as it moves forward or backward, the edge is cut or ground into steps, as shown in Fig. 4.

By the apparatus described above, many changes can be made, as a living man appearing in a previously empty chair, flowers growing on an empty bush, a change of a man into a woman, a painted picture into a living one, etc. In some effects a table is employed, to all appearances the common square kitchen table. A person is seen sitting at the table, which is empty; suddenly there appears before him a large dish of oranges or a meal. This is arranged by providing the table with a slot which runs diagonally from corner to corner. This allows the glass to travel through it, and thus shuts off one-half of the table. Articles are placed on the table, behind the glass, which is now withdrawn, leaving them to be seen upon the table. The slot in the top of the table is covered with sheet rubber or other material.

Simple Test for Noxious Gases in the Air of Mines.

For detecting deleterious reducing gases such as carbonic oxide, methane, etc., in the air of mines, A. Mermet finds a dilute solution of potassium permanganate, containing a little nitric acid, highly efficient, the effect of these gases being to decolorize the permanganate solution. The reaction goes on more rapidly when the solution also contains silver nitrate, one part of carbonic oxide per 500 to 5,000 parts of air decolorizing the liquid in from one to twenty-four hours. The reagent is prepared as follows: Silver ni-

1 cubic centimeter of the permanganate solution, and 1 cubic centimeter of pure nitric acid are mixed and made up to 50 cubic centimeters with distilled water freed from organic matter. The reagent must be used immediately. To collect a sample of air from the gallery of a mine, a flask is filled with pure distilled water and emptied in the gallery, the air entering the flask by displacement. When the air is dusty the flask should be fitted with a paraffined cork with two tubes, one for the outflow of the water and the other filled with cotton wool to filter the ingoing air. The bottle must then be closed by a glass stopper, since the organic matter in cork would decolorize the reagent and spoil the test. A second flask being filled with normal air,

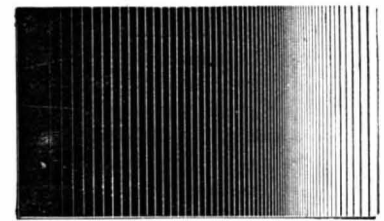


Fig. 3.

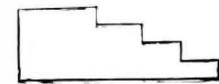


Fig. 4.

some of the reagent is poured into both and they are then placed side by side on a sheet of white paper. After some time the impure air will decolorize the liquid, whereas that in the flask of normal air will retain its original rose color. This decoloration is more rapidly effected in proportion as the quantity of reducing gases is greater. The actual nature of the impurity can then be ascertained by ordinary methods, but sulphur, if present, reveals itself during the initial reaction by combining with the silver salt to form sulphide, which turns the reagent brown.—Colliery Guardian.

Dust and the Clearness of the Air.

The effect of atmospheric dust in altering the visibility of distant mountains is discussed by Herr Schultheiss in a recent number of the Meteorologische Zeitschrift. Science (April 16) condenses his results as follows: Observations on the visibility of the Alps have been made for twenty years past at Höchenschwand, a station in the southern Black Forest, at an altitude of 1,000 meters (3,280 feet) and commanding, under favorable conditions, an extended view of the Alps as far as Mont Blanc. Three degrees of visibility are noted,

designated respectively as 0, 1, and 2, the latter figure denoting the greatest clearness of view. A careful study of the records and of the weather conditions prevailing at the times of observation reveals the fact that the visibility is best under anticyclonic conditions (the presence of an area of high barometer). . . . There is a descending movement of the atmosphere, and as the upper strata are cleaner and purer than the lower, this process results in causing greater clearness of the air and hence a higher degree of visibility. Ninety per cent of all the cases in which the view of the distant Alps was clear are found to be associated with such . . . conditions. Cleaning the air by means of rain seems to be the controlling factor in the majority of the other 10 per cent of cases. Naturally, as anticyclones are more frequent and longer lived over central Europe in winter, the visibility is greater in winter and less in summer. There is a common belief, here as well as in Europe, that very clear days, which give very good



Fig. 1.—"METEMPSYCHOSIS."

trate solution: Two or three grammes of silver nitrate crystals dissolved in 1 liter of water. Potassium permanganate solution: 1 liter of distilled water boiled with a few drops of pure nitric acid (free from hydrochloric acid), a little permanganate solution being added until the liquid becomes rose colored, in order to destroy any organic matter which may have found its way into the water, as dust, etc. When cold 1 gramme of potassium permanganate crystals is dissolved in the water and 50 cubic centimeters of nitric acid added to it. For use 20 cubic centimeters of the silver nitrate solution,

views of distant mountains, are most likely to be followed by rain. Schultheiss has investigated this question in the case of the Alps as seen from Höchenschwand, and finds that a very clear view is seldom closely followed by rain. He also finds that the dust in the atmosphere at 1,000 meters is very fine and does not include large quantities of coarser smoke particles, as it does at lower levels.

THE Chilean government telegraph lines now comprise about 7,500 miles.

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Bathing: Its Relation to Diseases of the Respiratory Tract.

Chronic catarrhal disease of the nose, throat, bronchi or lung is rarely, if ever, the outcome of one attack of acute inflammation, properly cured. No; we get a history in these cases of repeated inflammation, with careless or neglected treatment, each a little more severe than its predecessor and none quite cured before its successor had appeared, gradual extension of the trouble, pathological changes, lesions forming, until finally the disease is chronic, inveterate, and a long course of treatment, operations and a change of climate are necessary to restore the mucous membrane to as nearly as possible its former normal standard. I believe that in the majority of these cases the renewed colds, the exacerbations which render catarrhal diseases so prevalent and so intractable, are due, not so much to the variations in climate as to the imprudences people commit, knowing these changes are liable. The three most prolific favoring causes of respiratory disease are injudicious clothing, superheated homes and hot bathing, local or general. The last (being my text) I am emphatic about, because I find in people who look forward to winter with dread as a season of misery—a succession of colds, sore throats, or coughs from fall to spring—when I abolish the hot bath and substitute the cold, that they promptly become less susceptible; colds become less frequent or cease altogether and my treatment for any existing chronic trouble shows an efficacy in marked contrast to what it had been accomplishing.

In speaking of cold bathing I do not necessarily mean the full cold bath, for it takes a person of strong reactive powers to take a cold morning plunge in winter with benefit, although robust people and some not so hearty seem to thrive upon their use. I do not think, however, that they are generally to be recommended.

My special reference is to the bathing of the face, neck, and chest, night and morning, with cold water. The addition of a handful of salt to the bowl of water greatly enhances the effect and should not be omitted. A washcloth of Turkish toweling should be used, as a sponge gives no friction. The water should be hydrant cold. The face, neck and chest should be briskly but thoroughly bathed and then dried by active friction with a Turkish towel and the bather dress rapidly or retire, as the case may be.

The very activity of the proceeding is in itself healthy exercise, which would doubtless not be taken were it not for this incentive. The circulation is stimulated, deep respiration is induced, the arm, back and chest

muscles are developed, the skin is left tingling with a healthy glow, but not the warm, soft, perspiring, susceptible redness of the hot bath.

We are creatures of custom. The stoker can stand the terrific heat of the engine room because he is used to it. The policeman grows hale and hearty pacing the cold streets, because he is so constantly exposed. So it is in this matter of cold bathing. The face, neck and chest become accustomed to cold and dampness by a safe method—the daily cold, salt bath. The skin is thereby stimulated and hardened by a system, so to speak, of daily exposure, so that the sudden contact with lowered temperature, draught or storm does not shock it; hence no chill, and "colds" are avoided.

The surface soon becomes inured to cold and the perambulating shiverer, the man who invariably sneezed when he stepped from the street car, to whom the frequent nip of whisky seemed a preventive necessity; the man who went cringing along the streets in winter with his head so buried in his overcoat that his best friends could not recognize him out of doors, now discards his muffler, turns down his coat collar, holds his head erect and exposes his face and neck to the blast, buoyed up by the crisp air, instead of shrinking from it as before—now fairly reveling in the nipping breezes that play against his throat and sting his nostrils.

He ceases to be the perennial prey of the laryngologist and the wilds of New Mexico shall know him not.—H. Worthington Paige, New York, in the Southern California Practitioner.

The Psychogenesis of Fear.

Fear is a psychological condition which has received comparatively scant attention at the hands of psychologists, common as are its manifestations and obscure as is its mechanism, says the Medical Press. Transcendental philosophers regard fear as the automatic stimulus for a reflex co-ordination of movements intended to protect the organism against impending injury, but the moment we begin seriously to scrutinize the outward and visible effects of this condition it becomes painfully apparent that, far from aiding escape from danger, it is often per se the direct and immediate cause of disaster. Angelo Mosso, in his very fascinating treatise on this subject, reiterates Haller's view, that the phenomena of fear common to all animals are not conducive to the preservation of the timid, but rather to their destruction, it being part of the law of nature, as understood by him, that animals de-

stined to be the prey of others should not be able to defend themselves easily.

Without committing ourselves to this somewhat brutal hypothesis, it is a matter of common observation that fear renders the individual more vulnerable to attack, and, for the time being, subordinates the will to the influence of conflicting and often incomprehensible emotions. It is suggested that the kneeling attitude universally adopted in prayer is to be ascribed to the physiologic fact that strong emotions cause a sudden trembling of the legs and oblige us to sink to the ground. Darwin, in his "Expression of the Emotions," attributed a preponderating importance to the will as the cause of expression; but, as the author remarks, what many call free will is only a fatal necessity, an indissoluble chain of causes and effects, of physical and mechanical actions; of automatic and unconscious reactions, in the living machine. Hence, in studying the expressions of fear we must look to the reflex nervous apparatus, which alone can explain the explosive suddenness of the phenomena of acute fear. Physiologists recognize that stimuli accumulate in the spinal cord, when becomes slowly charged like a Leyden jar, until suddenly discharged by a contact or by some very slight impression. When we have something in the throat which tickles us, the slight and at first scarcely perceptible irritation by and becomes intolerable, and in the functions of reproduction the repetition of slight stimuli produces greater and more and more uncontrollable reflex movements.

Such an explosion seems out of all proportion to the momentary and trivial cause, but this is because we overlook the fact that the force has been accumulating until, to borrow an expression from physics, its tension is greater than the pressure of the will. It is, he observes, the quantity, not the quality, of the stimulus which determines the intensity of the expressions. Prof. Mosso suggests that nature has been unable to find a substance for brain and spinal cord which should be extremely sensitive and yet should never, under the influence of strong stimuli, exceed in its reaction those physiologic limits which are best adapted to the preservation of the animal. Be this as it may, fear may be described as a chaotic explosion of emotions due to an irregular, and therefore imperfect, supply of blood to the brain. Every action is preceded, every thought is accompanied, by vasomotor dilatation of the vessels in the brain, the distribution of the area of vascularization being determined either by the controlling area of consciousness or by the percussive influence of some external stimulus.

RECENTLY PATENTED INVENTIONS.

Railway Appliances.

AIR BRAKE ALARM COCK.—Adam McIntosh, Albany, N. Y. This improvement comprises a three-way cock in the signal pipe and an auxiliary cock opening and closing in unison with the opening and closing of the signal pipe cock, the auxiliary cock being connected with the alarm and with the signal pipe. The device is of simple construction, and the arrangement is such that the train pipe nozzle cock and the cock for the signal pipe cannot be closed without giving an alarm to the engineer and the conductor of the train.

RAILWAY GAGE BAR.—Peter Olson, Field, Canada. An adjustable tie rod is provided by this invention for connecting the rails of a track, the length of the rod being adjustable to accommodate it to the different gages used on curves. It comprises two bars having hooks adapted to engage the outer edge of the rail base, means for drawing the bars inward, while other bars slide upon the first ones and engage with the inner edges of the rail base. With this device the tendency of the rails to spread on curves may be quickly and easily corrected, and without drawing the spikes from the ties, the rails being drawn together by driving a wedge.

RAILWAY SIGNALING.—Georges De Bengy Puyvallee and Joseph Ambrose Meunier, Paris, France. An arrangement for notifying and recording way signals on locomotives has been devised by these inventors, which comprises the placing of the signals along the line and on the locomotives into mechanical relations with each other, to warn the drivers when the line is blocked, and at the same time keeping a record of such notifications. The invention also enables trains to place the line signals into a position giving notice that the line is blocked, to protect their passage from the rear, and to release the signals after passing a sufficient distance.

Bicycles, Etc.

BICYCLE CHANGE GEAR.—Bernt T. Nedland and Christian Fredrickson, Westby, Wis. This is a device applicable to any form of bicycles, a beveled gear having concentric rings of beveled teeth being attached to the crank axle, while a shaft with beveled pinions may be connected or disconnected therewith by means of a pivoted lever having segment arms composed of concentric and eccentric surfaces. The shifting device is controlled by a single lever, and it is impossible to have more than one of the pinions in engagement with the gear wheel at the same time, the change being quickly made from one speed to another.

BICYCLE HANDLE BAR AND TOOL HANDLE.—Karle H. Granger, South Weymouth, Mass. A flexible or yielding hand grip is afforded by this invention, whereby the vibratory movement of the handle bar or handle will not affect the hands, the grip surface consisting of a series of inflatable members preferably placed

in spiral arrangement. The handle section is wrapped around by tubing at whose inner end is a valve, by which the tube may be inflated with air, water, or any material which will render the coils elastic. The improvement is also applicable to bicycle pedals, foot cushions, and for many other uses.

Mechanical.

CRUSHING AND GRINDING MILL.—William H. Coward, Erith, England. This mill has a grinding or rubbing action as well as a crushing action, the roller and drum being caused to revolve at different surface speeds, means being provided to enable their relative surface speeds and the distance between their acting surfaces to be varied to suit the material operated on. Improved means are also provided for conveying the material to and repeatedly passing it beneath the crushing roll, to increase the area of the gage plate when the crushed ore is to be concentrated, and to insure the return to the drum of the grosser particles which may be carried off with the blast when the gage plate is not used.

SAW SET.—Henry Neidhardt, Brooklyn, N. Y. This device comprises a standard which supports an anvil, a pressure lever being pivoted in the standard and a setting dog which is operated by the pressure lever. A holding lever is also pivoted in the standard and a lever engaging with the holding lever, there being a yielding connection between the latter lever and the pressure lever. The device may be operated with comparatively little power or pressure to quickly and accurately set the teeth of a saw.

TOOL HOLDER.—John M. Richardson, Daingerfield, Texas. This is a device in which any form of tool, especially hatchets, garden tools, etc., may be quickly and conveniently placed and firmly held against turning or moving in any direction. The holder has a slotted socket in which a shank is arranged to enter, the shank having lugs for engagement with the walls of the slot in the socket, a key being shaped to fit the slot. A clip, which may be integral with the key, prevents the latter from leaving the socket.

Agricultural.

PLOW.—Richard H. Purnell, Rosedale, Miss. To facilitate setting the plow blade at different angles by tilting it on its connection with the standard, the plow is made, according to this invention, with a short depending rear bar (adapted for adjustable connection with a foot or sole piece, pivoted at its front end to the lower end of the standard, the rear end of the sole piece having an upturned portion. The sole piece extends for a considerable distance on a straight line back from the blade, and the latter may be of the sweep form or mouldboard form, or in the form of a share, shovel, sweep or scraper.

Miscellaneous.

PIANO ACTION.—Julius H. Block, Moscow, Russia. This action has a gravity damper and

a gravity arm normally holding the damper on the strings, the hammer on its forward stroke releasing the damper and permitting it to move by its own weight out of engagement with the strings. No springs of any kind are necessary, the entire arrangement being so balanced that the slightest touch of the key will actuate the hammer and damper, so that great lightness of touch is readily acquired by the performer. The improvement is adapted for use with both square and upright pianos, and is designed to greatly increase the power and volume of tone of the instrument.

SASH HOLDER.—Theodore Martin, Wallaceburg, Canada. This device can be readily attached to a window frame to securely hold either the upper or lower sash as desired, and to form a lock to prevent the sash being opened. It consists of a cramping cam lever with projecting lug, surrounded by a rubber ring on its binding end, while a retaining plate lies parallel to the lever on the outside of the rubber ring. The retaining plate has at its rear edge a laterally projecting lug extending inwardly toward the lever and in rear of and crimping and pinching the rubber ring on its rear side, whereby it is more firmly held and prevented from slipping in its seat.

SCUTTLE COVER.—William L. Springer, Chicago, Ill. A cover hinged on the skylight casing, according to this invention, has stays for connecting it with the casing, each stay being formed with two links pivotally connected with each other and with the cover and the casing, the links being arranged to fold when the cover is closed and to hold the cover in a nearly vertical position when the links are extended. The device is strong and simple, and permits the ready opening of the cover to its full extent to form a convenient passage from within to the roof of a building.

BEDSTEAD.—Augustus E. Strang, Salem, Oregon. An iron bedstead with tubular side rails and angle iron end rails, according to this invention, is made very durable when the parts are assembled, while it may be readily taken down for transportation. The side and end rails are joined to the posts by novel clamping devices which make the bedstead when set up a very rigid and strong structure.

Designs.

SUSPENDER END.—William Bloomberg, New York City. The clip forming part of this suspender end is supported by two united straps or tapes connected with the body portion of the loop.

SKIRT HOLDER.—Robert M. Steindler, New York City. This design provides an elastic bicycle skirt holder of neat appearance and ready application.

GAME BOARD.—Roswell A. Dandaraw and George E. Gordon, Rensselaer, N. Y. This board is made with a central raised barrier resembling a bar, and a series of shorter barriers crossing the main barrier, forming a group of pockets open upon one side.

PARCEL CARRIER.—John P. Smith, New Haven, Conn. This is a device designed for use in

connection with bicycles, and consists of a central loop and return lateral arms terminating in hooks.

NOTE.—Copies of any of the above patents will be furnished by Munn & Co. for 10 cents each. Please send name of the patentee, title of invention, and date of this paper.

NEW BOOKS, ETC.

MAXIMUM STRESSES IN FRAMED BRIDGES. By William Cain. New York: D. Van Nostrand Company. 1897. Pp. 23. Price 50 cents.

The matter which forms the basis of the present book appeared originally in the Van Nostrand Magazine of 1878, and was largely concerned with the comparison of weights of bridges and their most economical depths. These subjects have now been practically solved by bridge engineers and the result has been the elimination of many types of bridge trusses once popular and the retention of certain leading forms that have proved most economical and otherwise desirable. The present edition of this work confines itself to the discussion of the types most used at present, and the aim has been to aid the student, in presenting the subject in a simple, clear, and at the same time thorough manner. It will doubtless prove of interest to all bridge engineers.

A NEW WORK ON MECHANICAL DRAWING. In 24 parts. By J. G. A. Meyer. Arnold Publishing Company. Price 50 cents.

The fifth and sixth parts of this interesting work on the general principles of machine design are at hand, continuing the illustrated rules and computations for strength and form of general machinery, and with a practical lesson in steam engine design in each number.

THE ENGINEER'S SKETCH BOOK OF MECHANICAL MOVEMENTS, DEVICES, APPLIANCES, CONTRIVANCES AND DETAILS EMPLOYED IN THE DESIGN AND CONSTRUCTION OF MACHINERY FOR EVERY PURPOSE. By Thomas Walter Barber, Engineer. Third edition, considerably enlarged, with 2603 illustrations, Descriptive Notes and Memoranda. London: E. & F. N. Spon, Limited. New York: Spon & Chamberlain. 1897. Pp. 335. Price \$4.

This book cannot but prove of great value to every engineer and inventor. Every successful engineer is a born inventor; indeed, the daily work of an engineer in practice largely consists in scheming and devising from previous experience new and improved processes, methods and details for accomplishing them and for simplifying and cheapening the old forms of machinery and the work they produced. In the work of designing machinery, the draughtsman has to rely mainly on his memory for inspiration, and for lack of an idea has frequently to wade through numerous volumes to find a detail or movement to effect a particular purpose. His labors, as well as