TWENTIETH CENTURY MAGIC

AND THE CONSTRUCTION OF MODERN MAGICAL APPARATUS : : : : WITH THE INTRODUCTION OF NEW EXPERIMENTS : : : : : : MECHANICAL CHEMICAL, ELECTRICAL

A TREATISE ON THE CONSTRUCTION AND INTRODUCTION OF SCIENTIFIC MAGICAL APPARATUS

BY

NEVIL MONROE HOPKINS

AUTHOR OF

"Model Engines and Small Boats"
and Various Technical Monographs

One Hundred Illustrations

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PREFACE.

WHILE the author has not attempted to produce a complete work on magical methods, it has been his aim to introduce new magical experiments, together with working notes for the construction of the necessary apparatus. As a number of very able conjurers have prepared works embracing tricks with cards and experiments dependent upon sleight-of-hand, the present little book is designed primarily to furnish additional field for the amateur conjurer to operate in, as well as constructive occupation if he has a mechanical turn of mind. Most of the pieces of apparatus, when completed, will be found of flexible character, serving for varied magical effects and meeting numerous magical requirements. Some of the work is very easy and some is admittedly more difficult. The author has attempted to be as explicit as possible in every detail, at the risk of being unnecessarily exact to those familiar with mechanical principles and the use of tools, and trusts that the more detailed explanations will be pardoned, which are intended for those comparatively without experience in the character of the work presented.

N. M. H.

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TWENTIETH CENTURY MAGIC.

CHAPTER I.

THE MAGICIAN'S STAGE AND TABLES.

The Design and Equipment of a Magical Stage.

Chief among the varied paraphernalia associated with the demonstration of modern magical effects upon which the brilliancy and control of many pieces of the most effective apparatus depend, are the modern magician's stage and tables, with their secret cords and pulleys, electric wires, and trap-doors. As the success of the tricks introduced in this little volume, together with many of the ingenious experiments described in other magical works, is dependent on a properly designed stage with its accessories for control and effectiveness, the writer first takes up the subject of small-stage design and equipment. There are many ingenious magical experiments which only appear to their maximum advantage when performed in a drawing-room on a small platform, their introduction on a large stage in a theatre or hall detracting from their brilliancy and effectiveness because they are not of a demonstrative or showy character, and cannot be seen and appreciated from all parts of a large audience. With a correctly proportioned and well-equipped magical stage of comparatively small dimensions, many of the finest tricks can be exhibited to their best advantage, the large optical illusions and more elaborate cabinet tricks of course excepted. A properly proportioned and well-

equipped stage has more to do with the success attained by the magical art than the closest observer in the audience suspects. The very height of the platform above the floor level causes small traps in the magician's table top to be invisible, not to mention the available wires and cords, and the possibility of getting rid of and exchanging objects it affords. It constitutes a retreating place where a curious member of the audience cannot follow unless invited, and allows of the use of a curtain, which may be dropped "between the acts," should it prove necessary to arrange some piece of apparatus screened from the gaze of the curious.

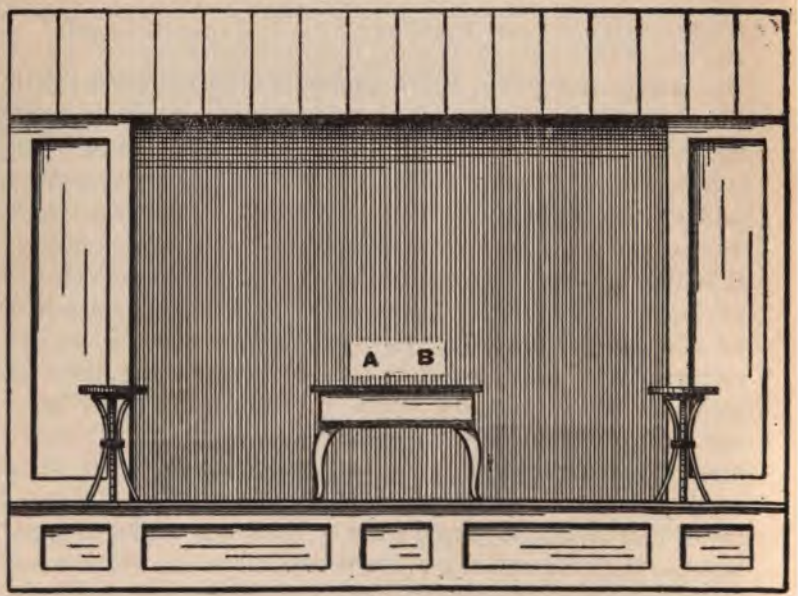


FIG. 1.

The experiments introduced in the following chapters are intended for drawing-room entertainments, the stage and equipment herein described and illustrated being designed primarily to meet their needs, although applicable to numer-

ous other magical requirements. It is assumed at the outset that the reader is somewhat familiar with carpentering and the general use of tools, or else has the assistance of one endowed with mechanical and constructive ability. Fig. 1 illustrates the appearance of a small magical stage from the seats of the audience. The height of this stage, regardless of the breadth and depth, must be at least two feet, in order that the spectators shall not see the top of the magician's table, A B, when seated. The height of conjurers' tables is usually between two feet six inches and three feet three inches. No exact figures can very well be given for a drawing-room stage, as the size of the room and the available space for the audience must necessarily govern the width, and possibly the depth and total height. The background should be of dark material, and all light should come from the front.

The distance of the first row of chairs in the audience from the front of the platform is another very important point, the reason for which will be made clear by referring to Fig. 2. The magician's table is shown at A B, the first row of chairs being located at C. This "bald-headed" row must be placed at least six feet from the edge of the platform, and must be arranged by trial in order to prevent the chute at the back of the table A B being seen, which is fully described in connection with the first table illustrated, intended for our use. It will be found necessary to adjust the table on the stage in addition to arranging the audience, if a secret chute is to be used. The stage is easily constructed according to the plans given in Fig. 2, which allow room for an assistant under the flooring, should this be desired. The little plan at D shows the flooring partially in place, and allows of the use of a trap running the entire depth of the platform. The platform, together with the framing, must be substantially nailed or screwed together, with enough wooden braces to insure rigidity, a shaky, yielding stage being almost worse

than none at all. All upright wooden construction is dependent on diagonal, crossed wooden or iron braces or "ties," stiffening the entire work as soon as nailed in place. For our small stage wooden braces will be the easiest to apply, meeting all requirements. The crossed braces in Fig. 2 "tie" the construction from moving backward or forward. A similar set, not shown in the illustration, is provided at the back to prevent the construction from moving sideways. Use plenty of timber and put up no hurried and careless construction, for a wabble and a crash during a spirit manifestation would not enhance its effect, to say nothing of the danger and delay.

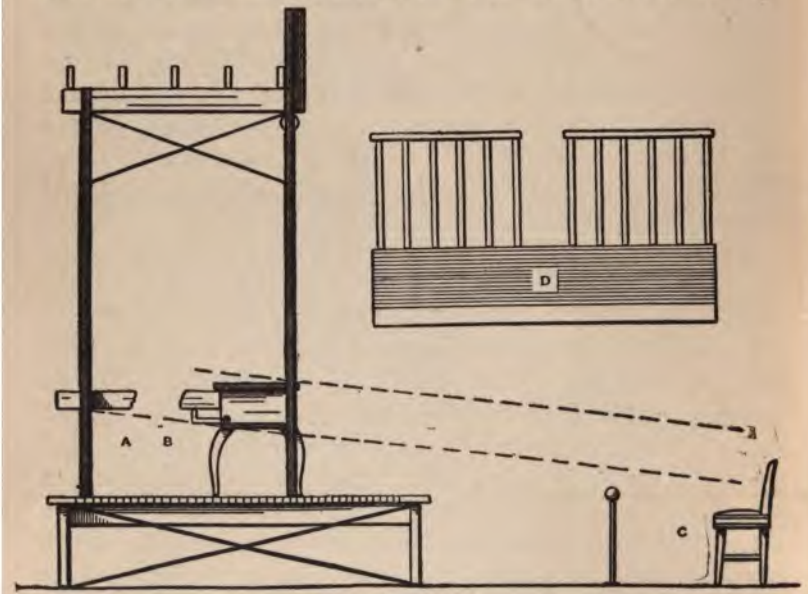


FIG. 2.

If the table is to be used with the secret chute or carrier, not only the height of the stage in relation to the audience *must be considered*, but the relation of the "width of the

audience" to the width of the table and stage, as illustrated in Fig. 3. Here a plan of the stage is shown with the flooring taken up along the trap, and the conjurer's table in place with the secret chute. The small auxiliary tables are represented at A and B. In Fig. 2 the visual lines from the seats of the

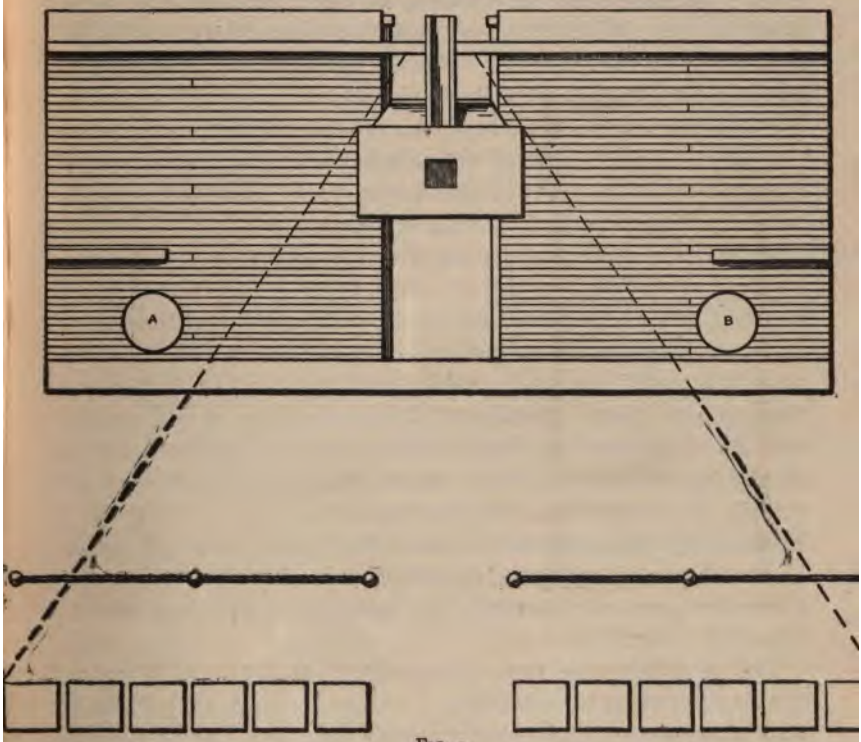


FIG. 3.

audience are shown, the secret chute being shielded from view because of the height adjustment, and in Fig. 3 the lateral lines of vision are interrupted as shown, because of the width adjustment. It seems hardly necessary to say that the arrangement of the seats of the onlookers and the

"scheme" of the stage should be as guarded a secret as the most effective trick. Of course a light hand-rail must regulate the "width of the audience," if the room or hall is too wide for the stage, in addition to one running across the front to prevent those in the first row from approaching too close. This front rail must be broken, as illustrated in Fig. 3, to allow of the conjurer's coming forward to borrow articles and have them returned. Not knowing what "trappings" exist on the stage, one will simply be led to believe that the presence of the rails is simply for finish and effect, the question of restricted angle of vision not presenting itself. The distance from the back of the platform to the magic table must be determined by trial, viewing the table's location from all the chairs in the auditorium until the table is placed in such a way as to make its chute entirely invisible. The nearer the table is placed to the back of the stage the better, so far as protection of the secret chute is concerned. Room should be left between the table and the back to allow of the magician to pass behind, as the secret chute is detachable and may be drawn out behind the scenes and replaced again at any time without fear of detection. It will be seen how readily any suspicions of secret communication are dispelled by walking and operating behind the table, when the chute is secretly and temporarily displaced. This chute, however short, cannot be used in a hall where a gallery exists, unless it is shut off.

Before taking up the equipment of this stage, in order that it shall meet the needs of the more elaborate mechanical and electrical tricks, one or two suggestions as to the distribution of the chairs in the back of the first row may be of value to those unfamiliar with the arrangement of seats for an entertainment of this character. In placing the seats for an audience it may be remembered in general that the seats should be as compactly placed as possible, *considering* convenience and comfort. It would be a good

rule to restrict the width of the front row or two to the width of the actual stage platform, allowing the rows behind to increase in width by a chair on either end of a given row. In this manner the width of the auditorium at the back will be quite accommodating, the seats in the rear still being within the "cone" of visual lines. This will be understood by referring again to Fig. 3. This is a general suggestion only, however, for no rule can be given to take the place of trial and experimentation in specific cases, for all possible conditions are not easily embraced in one or two rules, no matter how wide their scope may be. A light ornamental curtain hanging from the hand rail will not only serve as a finishing ornament, but will prevent those seated in front from seeing the chute, should they stoop down.

We will now equip the stage with means for secret electrical communication, and for conveniently obtaining secret electric power, heat, and light. With a good supply of electricity secretly on hand, convenient to the magician's table, the performer is able to summon the most mysterious assistance of incalculable value. As electric lighting is coming more and more into vogue, the writer gives full directions for using an electric lighting current, without risk or danger of any kind. Chapter V. contains this information, illustrated with diagrams of connections, together with descriptions of apparatus, including the proper wires and fuses and their installation. It may be desirable to equip the stage with gas-pipes and possibly with temporary water-pipes, in addition to the electrical wires, mechanical wires, and cords. As the stage is to be covered with a carpeting of dark material, anything of moderate thickness, in the form of a temporary wire or cord, may be laid directly on the flooring, and be protected from view by the carpeting.

In Fig. 4 the stage is represented with the flooring over the trap, and secret electrical contact plates in place, as

shown at A B, C D, E F, G H, and I K. These plates are best cut from thin copper, of about the weight of an ordinary piece of tin. Tin, although cheaper than copper, is far from desirable for this purpose; but should copper not be readily had, thin brass will prove to be the best substitute. Iron as a conductor of electricity is seven times poorer than copper, and as "tin" which comes for roofing, etc., is only iron tinned over, the reason for the

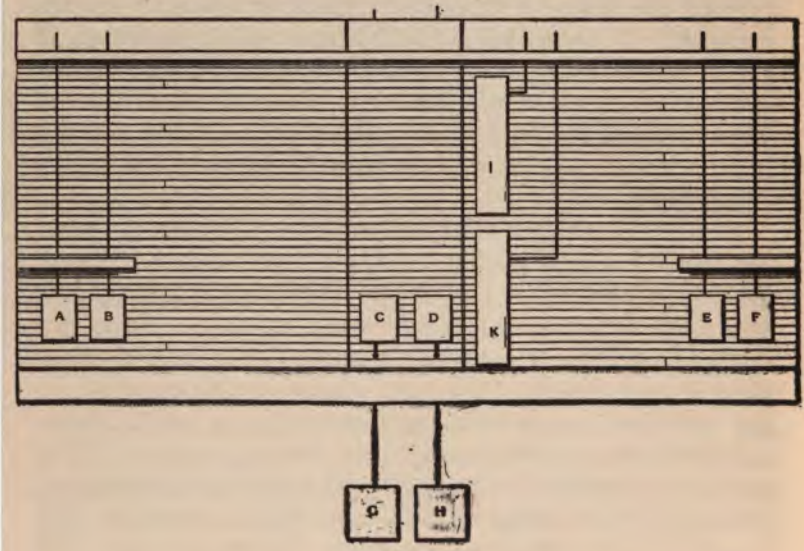


FIG. 4.

copper will be clear when it is learned that contact with the plates is to be effected by a small point pricking through the carpeting. The smaller the contact the greater will be the resistance to the passage of an electric current, so it will be appreciated why the best conductors only should be used.

In describing material for the construction of the apparatus in this little volume, the author endeavors to direct the ac-

quirement of the cheaper materials answering the purpose of the expensive, but in some cases this is not possible. The use of tin plates, while cheap in comparison with copper, is strongly discouraged. The wires which connect with these plates must in all cases be soldered to them. In the last chapter explicit directions are given for making soldered joints. The wire best suited for connecting together our plates is known as No. 14 double cotton wrapped and paraffined bell wire. This wire is large enough to carry any electrical currents magical requirements call for, and takes up but little room under the carpeting. The use of these floor plates is fully described in connection with magical tables, the distribution of them being of course changed to answer any purpose the reader may have, or develop the general use of them in connection with the tables and tricks herein given. The plates G H are off the platform on the main flooring, as secret electric power brought to play under the very noses of the "first row" is sure to conquer. In addition to these electrical floor plates, electrical terminals, or binding posts, will be required at the top of the stage or on the ceiling. Two brass hooks or screw-eyes (do not be led into using iron) should be screwed in to the top of the stage or ceiling, as a trick is given in the chapter on electrical devices which is dependent on a couple of ceiling hooks secretly connected with electricity. The No. 14 cotton-covered wire should be soldered to these hooks and be brought down the sides and passed behind the scenes. There are many tricks described in other works on magic which are dependent on suspension from hooks, although of mechanical character, but they may be converted by an apt reader into electrical tricks of superior brilliancy.

The writer wishes to impress the fact that the stage, together with the tables given in this chapter, is subject to modifications and alterations to suit the tastes and ideas of the reader, if the important points of height, visual

angles, etc., are preserved. In regard to footlights, the author would rather leave their adoption to the tastes of the builder of this little stage, their introduction not always being "becoming," if we may use the expression, in connection with a magical stage and its equipment. If, however, the builder wishes to build an elaborate stage and carry out the more extensive ideas on the subject, there is no reason why effective footlights should not be installed. The only lights which will prove satisfactory are electric or gas. The proper method of connecting miniature electric lamps to the standard electric wires to serve as footlights will be found in Chapter V. If footlights are decided upon, whether electric or gas, it will, of course, be necessary to run a light wooden strip along the front of the stage, to shield the eyes of the audience from the glare. This strip should be lined with tinplate to act as a reflector, throwing the light back on the stage. Should electric lights be decided upon, consult the matter in the end of the book if you are not already familiar with electrical matters. For gas-lighting, a pipe can be run along the front and be tapped every six or eight inches, with a regular gas burner having a small tip. This pipe can be put together by any plumber in a very short time at a small cost, and may be temporarily connected with the gas supply by means of a stout rubber tube. This gas pipe and burners will throw the light rather high and look badly, unless the pipe is let into the floor a little, which may be most conveniently done, as the planking on the stage runs in the direction of the projected pipe, it being only necessary to allow the pipe to slip down between any two of the planks that are chosen as being in the best location or distance from the front.

The Chute Table.

For the sake of simplicity and clearness the several secret devices for the equipment of magical tables are taken up and dealt with separately in the following pages, although designed for combination, making an elaborate composite table, as illustrated at the close of this chapter. Any of the following equipments, when applied to a well-made and correctly designed table, will be found a valuable acquisition to a conjurer's outfit if used in connection with the platform for which they were primarily designed. Although the final combination table will be found of universal usefulness, the work herein directed is based on the independent principle, the instructions leading to the completion of separate tables, each with a characteristic feature, or of a single table embracing the "kit" of features. The chute table constitutes a ready means for getting rid of and exchanging such small articles as watches, rings, packages, and the hundred and one articles associated with magical entertainments which come within its capacity. Let us begin the design of the "chute" table, which is provided with a sliding board and a little travelling "car." Not knowing the size of the stage, and consequently the available table space thereon, it would be unwise to dictate or prescribe measurements for its construction. Having completed a stage, the dimensions of this centre or principal conjuring table can be easily decided upon, keeping an eye to its appearance with the stage upon which it is to be used. It may be stated in general, however, that the length and width of the table govern the admissible depth of its boxing. The deeper this boxing, the safer will be the secret chute from possible discovery. It is therefore a good plan to make the table as large as possible consistent with harmonious appearance with the stage. This large centre table not only provides better protection

for the chute, allowing the table to be brought nearer the front of the platform, but affords ample space for keeping many of the display pieces of apparatus. A small table must necessarily have a short chute, being placed close to the back of the stage in addition, which fact might cause some to suspect the presence of some means of communication with confederates or assistants behind the scenes, especially if there is not sufficient room for the conjurer to walk behind.

The table is a very simple one indeed to put together, the plan for which will be readily understood by referring to Fig. 5. The table is represented here with the top removed, the frame together with the ends of the legs exposed. The table is best started by screwing together a box frame several inches smaller than the proposed table top, which should have an overhang of a couple of inches all around. For a table with the top measuring two feet by four, the boxing can be made seven inches deep, without possessing a clumsy appearance, and should be screwed together from white pine boards about one inch thick. The table legs, which must have square sectional tops, are securely screwed in the corners as shown at A B C D, which give an excellent bracing to the *entire* frame. The legs when screwed in place must not come

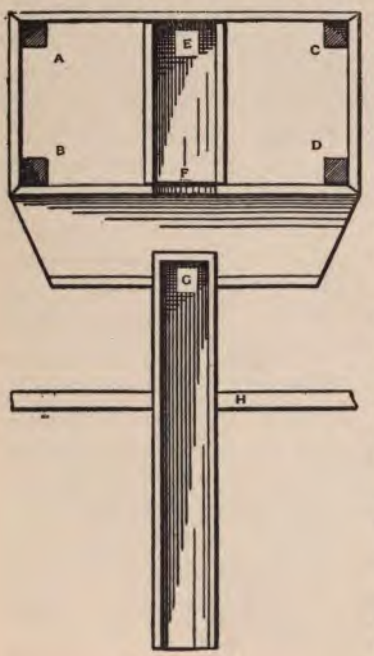


FIG. 5.

entirely up to the edge of this frame, for reasons which will be made clear by referring to the illustrations descriptive of the table with the secret cords and pulleys. Three inches left between the top of the table leg and the top of the framing will allow the necessary room for the little pulleys employed to carry the cord, or secret cable. With a box frame seven inches in depth this three-inch space can be readily spared, as the remaining depth of the boxing is ample for the square shanks of the legs to be screwed against. It is very important to state that screws should be used throughout in the making of this table instead of nails, as the table must be taken apart in order to change the solid turned legs for hollow ones when the secret cable-way and the electrical equipment are added. The legs of this table are of ordinary lathe-turned pattern, tapering gracefully from the shank to the foot, with ornamental grooves cut on near the top and bottom. These legs must be sacrificed, however, should it be decided to make this table of the later combination class. Curving legs are rather beyond the scope of the average amateur carpenter, unless he is provided with a band saw and has a little more than average carpentering abilities. These legs certainly add fifty per cent to the appearance of the table, and for this reason the writer suggests having them made if the builder cares for the finest appearance. The legs for the secret cable-way are round turned legs, the hole being put through the centre as fully described in connection with the cable-way.

If the reader has examined the matter on the secret cable-way in the following pages and has decided to have hollow legs made, they may as well be produced from curving legs if the builder does not mind the expense of having them put together. They can be made solid and with an approved curve, and sawn in half, with the cable way run in each half by means of a large gouge chisel and glued together again. This would certainly make a splen-

did table, but would incur some expense, as the work is rather difficult for the average amateur to attempt, unless, as stated, he is equipped with an approved band saw and has some experience with its use, etc. The table is now ready to receive the box guide for the chute. This guide is represented at E, and is made from smooth pine boards carefully screwed in position. The box frame of the table is cut out at F with a saw, the opening made corresponding exactly in size with the opening in the end of the box guide. The removable chute is made from very light wood and is carefully screwed and glued together. This must necessarily be light in weight, as it is handled entirely from behind the scenes, and must be noiselessly introduced and withdrawn from the table. This chute is represented at G, removed from the table, and drawn partially to the back of the stage, H showing how it allows of the passage of the magician between.

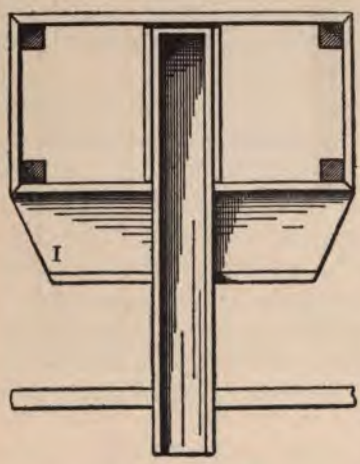


FIG. 6.

A second view of the table framing is given in Fig. 6, the chute being shown in place in the box guide. In regard to the size of this passage-way, it may be stated that six inches in width, inside measurement, and five inches in height will be ample to accommodate a car large enough to effect the disappearance of most objects employed in magical entertainments. The upper edge of the passage-way or chute, as illustrated in the figures, must come up flush with the edge of the box frame, in order to be directly under the table top when it is screwed on, leaving no

gap between the little car and the trap in the table top. As the secret shelf, or "servante," as illustrated at I, is universally known by all who have had any magical reading, the description has been deferred until now. This servante consists simply of a board screwed to the boxing of the table, with the corners sawn off in order to make the presence of a shelf or secret rest behind invisible. The servante is to be padded and lined, in order that small articles may be dropped on to it without producing a sound. The width and

FIG. 7.

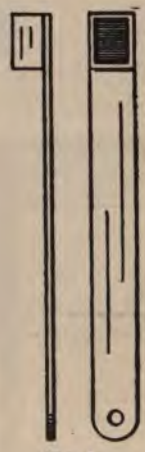


FIG. 8.

length of this shelf had better be determined by experiment on the stage upon which it is to be used, as in the case of the sliding way. The back of this table is shown in Fig. 7, which presents an end view of the chute way and its position in relation to the table top and servante. Fig. 8 gives an idea of the sliding board and little car. This car, as can be seen, is simply a little wooden box made from thin wood, in order to be more commodious, and is screwed on to a thin board, the combined height of box and board bringing the upper edge of the former exactly even with the edge of the passage-way through which they slide. This little box car should have a felt lining to deaden the sound of anything dropping into it. The

chute and sliding board must now be painted to match the background of the stage, and help toward invisibility should the table be awkwardly moved for any cause out of the determined position.

The table is represented in a completed state in Fig. 9, the framing, box guide, and table legs being shown up by dotted lines. The sliding board, carrying the little padded car, is represented in the chute about to enter the table. A small opening in the table top, exactly the size of the opening in the little box car, is now made, and may be cut out near the back of the table or in the centre as illustrated. A small block of wood is attached to the bottom of the box guide to arrest the sliding of the board and car just when it comes under the opening in the table top. This little block can to advantage have a small piece of rubber tacked on to prevent a thump, should the assistant carelessly thrust the sliding board and car back in place. It will be seen what a simple matter it is to withdraw the whole chute at any time, and, as often as may be required, having it removed entirely when the tricks exhibited do not require secret disappearances and changes. To work the chute to *the best advantage,* the performer should take its place behind

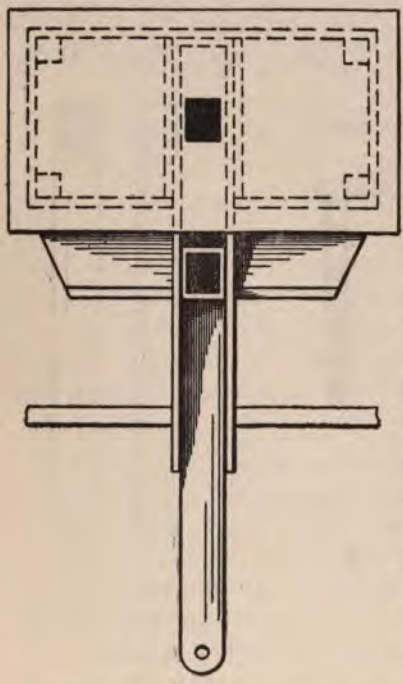


FIG. 9.

the table immediately after it was in use, walking back and forth, even while an exchange or disappearance is being effected, if the work requires more than one "carload." By carrying off a large quantity of matter in loads, the value of the chute will be doubly demonstrated. The table must of course be painted a suitable color, and the table top be covered with a substantial material. Green baize makes a durable and effective table covering, allowing of openings for traps, etc., without fraying or unravelling around the edges. The traps in the table top, as described in detail later, have covers of block tin covered with baize to match, which may be slid over the openings when the audience is assembling, being removed for operation when the audience is seated, with the visual lines below the table top. The table is now ready for trial, and to receive the additional devices which go to make it universally complete for most tricks. The cable-way described in the next pages is recommended, together with the electrical equipment, if the reader wishes to meet with the best results attainable in introducing the experiments for which these equipments are especially intended.

The Cable Table.

The installation of a secret cable-way with its pulleys, travelling cord, and hooks, is intended to furnish a secret "intelligent power" for the running of mechanical tricks, and to effect the disappearance of such small objects as handkerchiefs, colored scarfs, and ribbons. It will be readily understood by referring to the illustrations of this table that the system may be employed on any part of a stage where auger holes have been provided, without the remotest fear of the secret being discovered. The reader is free to make a separate side table, fitted with this contrivance, or to combine it with the chute device. The principal object in combining the two methods in one table is to have at hand two

systems differing in principle, which practice throughout the art of mystification is an extremely desirable precaution. Should the reader wish to elaborate on the preparation for a magical entertainment, the building of a second table with this cable power independent would be a highly desirable thing, giving greater flexibility to the entire equipment of the stage. Should this be decided upon, a smaller table capable of being brought to the forward portion of the stage would be more effective, placing it of course on either side of the centre. Whether the builder places the cable in the chute table, or whether he decides upon a separate one, the directions for the insertion of the cords and pulleys serve equally, as the same kind of work is to be accomplished.

The first step is the making of the hollow legs, and substituting them for the solid ones. The making of these hollow table legs is not a very handy thing for the average reader to undertake, as the holes cannot very well be bored through after the leg is turned to shape on the lathe. Wherever work on the building of the apparatus in this book is really difficult, the writer frankly points it out, and endeavors to describe the more troublesome processes in detail, in order that the reader will appreciate the requirements entailed by the methods, and decide whether he is competent for the undertaking, or whether he deems it best and quickest to employ a carpenter or mechanician to assist him. With a table leg two and one-half inches in diameter, it would be desirable to have a one and three-quarters inch hole through the centre. This may be accomplished at any wood-working mill as follows: For two and one-half inch table legs, timber with a cross section of three and one-half by three and one-half inches is sawn lengthwise in halves, that is, ripped longitudinally, and a groove run in each half. This groove must be cut seven-eighths inch deep in each half in order to form a one and three-quarters inch *hole when the two* pieces are glued together. These

grooves must be as smooth as possible to make them, by careful cutting with a gouge chisel and a groove-cutting plane, and thoroughly finished with sand-paper. Only the best furniture glue should be used, allowing it thoroughly to dry before proceeding with the next step. This consists in carefully chucking the timber in the lathe, and turning it down to shape. In this way very perfect hollow legs can be made, whereas attempts to bore through would only result in loss of time and failure, together with great unpopularity of the author. This boring through has been attempted, starting from each end of a finished leg, but with much labor and the most indifferent results. As the electric wiring, which constitutes a most important acquisition to the centre table, requires holes through the remaining pair of legs, it is highly advisable to order all four legs to be made at the same time, with the same hollow centres. By doing this no further delay will be met with on account of hollow legs, when the electric wires are put in. If the builder of this table decides on curving legs, the hole through the centre can be put in by employing the same method, although a little smaller hole will have to be chosen. If this hole is smoothly cut and sandpapered, however, no difficulty will be encountered in passing silk handkerchiefs, rings, and ribbons from the stage secretly to an assistant behind the scenes. These legs, to be graceful, must taper in two directions, that is, in breadth and thickness. The taper may be given them in breadth by the cutting on the band saw, as referred to in the matter devoted to the chute table. The taper in thickness is best given by thinning down the wood with a large smoothing-plane before cutting out on the band saw. These curving legs had undoubtedly better be ordered from a furniture factory or some well-equipped cabinet-maker. If they are to be gilded, almost any smooth wood will answer if thoroughly seasoned and dry.

Having decided on and received the legs, provided of course

with square shanks at the top as illustrated and described in the matter descriptive of the first table, the work of putting in the cable can be actively begun. In screwing these hollow legs in place, it will be observed that several short screws must be used, as one or two long ones would protrude into the hollow centre and obstruct the passage-way. It will be observed that an additional piece of wood is required for the frame of the table, in order to support the ends of the pulley axles, or pins. It is of course very desirable, in the case of the straight legs, to place the pulleys in such a way that the cord, or cable, will be fed directly into the centre of the hole without friction with the sides. Of course, with the use of the curving legs the cable will come in contact with the sides of the legs at every change of direction, but this will not prove at all serious if the hole is smooth and well sandpapered. The cable pulleys are simply turned up on the lathe from well-seasoned hardwood, having a rather deep groove cut to take the cable, and allow of the passage of a handkerchief or scarf without its coming "off the track." This groove, for best and most trustworthy results, is cut at least one-half inch deep. The cable cord should be of good quality fishing-line of heavy weight. A top view of the table framing with the pulleys and cable, together with the extra side brace which supports the pulley axles, is given in Fig. 10. Little washers, not shown in the cut, are necessary on either side of the pulleys to keep the cable in the centre of the leg, and insure the position of the cord and hook under the trap opening.

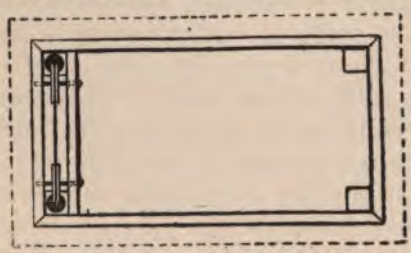


FIG. 10.

Fig. 11 represents a side view of the table section and the *space for the pulley*. The table top is shown above, illustrat-

ing the type of opening or trap best fitted for use with the cable. The cut shows the position of the leg shanks before the substitution by the hollow ones. The edge of this opening or trap is of course painted a dark color to match the baize covering on the table, and a piece of block tin, also painted or covered to match, is provided for use as a cover when the trap is not required. Any small object placed on the front portion of the table, when the trap is in use, screens the opening very effectually, even if the entire audience is not seated, provided the tin cover is drawn backward, uncovering the forward portion of the trap only. Of course, the reader will understand that this is very bold trickery, the manipulation of the trap covers, etc., requiring some little skill and practice.

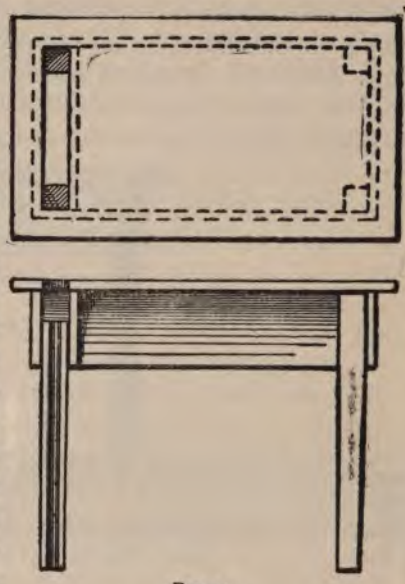


FIG. 11.

Fig. 12 represents the table mounted upon the stage with the pulleys and cord in position. This illustration shows how the upper edge of the pulley just comes on a level with the table top. In order to prevent the cable from coming off the pulleys, a large turned wooden hand-wheel with a crank should be mounted behind the scenes, by means of which the cable is set in motion on receipt of a secret cue from the performer at the front. In addition to this, a weight of one or two pounds should be suspended by means of a pulley from the cable in order to keep it

taut. This weight is familiarly called a riding weight, and is employed in machine shops to keep small belts taut, which would become loose because the pulley at the end is moved about.[1] Almost any kind of small hook or clip is all that is required to make the cable complete and ready for duty, if capable of catching up a handkerchief or scarf and holding on to it until the journey is complete.

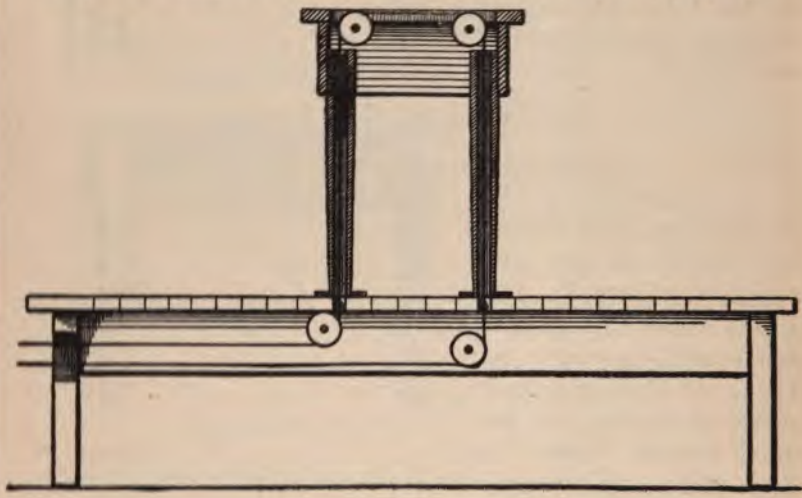


FIG. 12.

This secret cable-way will undoubtedly suggest many tricks to the reader besides the suggestions for its use given here. The trick described in Chapter II., known as "The Salem Seamstress," is dependent on this equipment. In addition to the use of this cable system for the accomplishment of disappearances and general communication with confederates behind the scenes, it will be readily appreciated as a source of motive power, should it be desired to run some piece of apparatus placed upon the table dependent upon some

[1] See use of secret threads, chapter on Mechanical Magic, Fig. 37 and *description*.

form of "intelligent energy." The auger holes in the stage must be at least as large as the hole through the table leg, which must be securely held in position by means of metal "ears" and small screws. The "ears" are screwed to the back of the leg away from the audience, and need only be of small size. Another way of fastening the table, and a better one although entailing more work, consists in cutting out little rings from metal about one-quarter of an inch thick, and screwing them to the floor. This method is shown in use in Fig. 12.

Electric and Combination Table.

In equipping this table with secret electrical wires, conductors for both high- and low-tension electricity must be provided in order to meet the requirements of the electrical tricks described later on. The two methods of wiring will, for simplicity, be taken up separately, and their different uses be pointed out independently. To those unfamiliar with electrical wiring and the general care of simple electrical apparatus, it is earnestly stated that no previous knowledge of electrical matters is essential for the intelligent following of the directions given. It would of course help matters and ease the mind of the builder of the apparatus intended for use in connection with electricity if he has the co-operation of a friend possessing some electrical knowledge and experience, although the instructions furnished are intended for beginners. By high- and low-tension electricity, is meant that furnished from a battery, or even the electric-lighting wires from the street, and that fur nished by an induction coil or plate machine respectively. The plate machine, together with the induction coil, are described in detail in the last chapter. It is the earnest wish of the writer to instruct the non-electrical magician in the simplest principles of electrical engineering, in order that he may take up the subject, and acquire ability, enabling

him to apply this marvellous energy to many experiments other than the number given. Let us take up the simplest side of the problem first—if the question, which is very simple, merits the dignity of the word problem—and begin the putting in of the low-tension wires.

A section end of our table (the opposite end of course from that equipped with the secret cord and pulleys) is shown in Fig. 13 illustrating the hollow legs, which in this case run clear to the table top. These legs are screwed in place, using short screws for obvious reasons, being then ready to receive the electric wires. These legs at the bottom are furnished with wooden stoppers turned upon the lathe to fit tightly into the hole cut to accommodate the electric wires. These stoppers are now fitted with brass spikes or sharp nails pointing downward, as shown at E and F. It is to these nails that our conducting wires are soldered before passing up through the legs to the table top, where soldered connection is also made with the copper contact plates presently to be described. For the most reliable service, all electrical connections of a permanent character should be soldered, insuring a continuous metallic path for the current. As these points and wooden stoppers have half the weight of the table and its entire load to bear, it will be necessary to secure the stoppers to the table leg by means of small screws, in order to prevent them from being pushed up into the hole. The wire employed to run through these legs and make the proper connections is No. 14 double cotton wrapped and paraffined copper bell wire, the cotton covering being of course *removed* where the wire is soldered to make electrical contact.

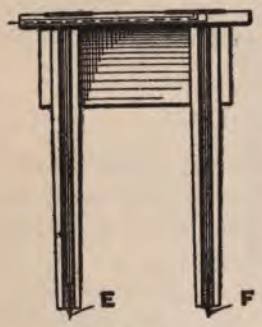


FIG. 13.

This wiring should be called the low-tension service, the sharpened points with which it is connected being specially designed for use on the above described magical stage. The "leg points" E F are intended for contact, by pricking through the carpeting, with the stage floor plates I K illustrated in Fig. 4. It will be observed, on referring to this figure, that it matters not whether the table is placed at the back of the stage or near the front, so far as electrical contact with the plates is concerned. This is in explanation of the length and narrowness given to these two plates, allowing the table to be moved back and forth to meet the requirements of adjustment made necessary by the secret chute and the auger holes in the floor for the cable-way.

The table top is represented in Fig. 14, showing an arrangement of copper contact plates. These are of light weight, the thickness of the thinnest piece of tin, being attached to the table top by small upholsterers' tacks. The distribution of these plates can of course be changed to meet any special requirements, the present arrangement being of general utility for magical use without encroaching on the space required for the opening, or trap, of the secret chute and the secret cable-way. The plates C C and D D are connected to our table-leg wires as shown, any object bridging across either pair of plates receiving an electric current when the table with its spikes is placed upon the connected electric plates on the stage. Any piece of apparatus, having sharp points for feet, as for example the magic clock designed for batteries, placed across either pair of the table plates, can be made to receive an electric current and be

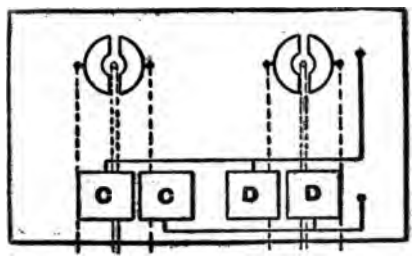


FIG. 14.

made to work. In the case of the clock, a battery is put in the circuit behind the scenes, together with a telegraph key, and made to run or stop at will. In connection with the description of the building of this clock, detailed directions for its introduction are given. The connections of these plates are to be made exactly as shown by the solid lines in the figure, the dotted lines representing the wires of the high-tension system, which we will now take up.

The semicircular-shaped plates, with the centres cut out, are for the high-tension discharge from an induction coil or plate machine, and are especially intended for use in connection with "The Demon Candlesticks" fully described in the chapter devoted to electrical magic. With our high-tension electric currents, such as are produced from the plate machine or induction coil, the greatest care must be given to the question of insulation, to prevent the electricity from leaking away before it reaches the desired spot. These high-tension plates are given four or five coats of the best orange shellac (made by dissolving orange shellac, which may be had in paint stores, in alcohol; this may also be obtained ready dissolved), allowing each coat thoroughly to harden before the next coat is applied. Shellac being one of the best insulating materials known, it should be freely used where high-tension electric currents are employed. The conducting wires, which are shown by dotted lines in the diagram, must be of the best rubber-covered type, of about No. 20 gauge. This is smaller wire than our No. 14, wire diminishing in size as the numbers increase. High-tension electricity is carried on a much smaller wire than low-tension currents, this being the reason for the use of smaller wire, in addition to the increased convenience for its use in making joints. These are connected to the plates as shown, running under the table top to avoid contact, or even proximity, with the wires of the low-tension service. These *wires are* simply passed through the back of the table as

shown, being temporarily connected with "feeders" which run behind the scenes when "The Demon Candlesticks" are being exhibited. As in the case of the other electrical tricks, "The Demon Candlesticks" are minutely described in connection with their construction in Chapter IV. As an induction coil in operation makes a loud buzzing sound, it is very desirable to place it some distance from the audience, behind the scenes, and the feeding, rubber insulated conductors must in addition be supported on small porcelain or glass insulators as a safeguard against excessive leakage of the electric fluid. The series of dotted lines which are seen leading to the centre of this circular set of plates represent small brass or lead pipes, used for the gas supply, which is necessary for the working of "The Demon Candlesticks."

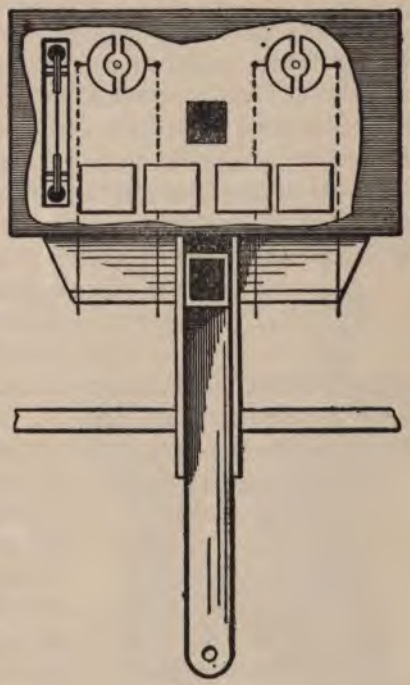


FIG. 15.

Fig. 15 shows a top view of the combination magical table, equipped with the secret chute and sliding car, the secret cable and cable-way, and the electrical contact plates with their connections. The table top is represented with a baize covering partly cut away, in order to show up the work done and the secret possibilities of the combined equipment. The cloth top is neatly

glued to the table top, cutting out the trap openings, but remaining over the electrical plates, as the sharpened points of the electrical tricks prick through, on the same principle as the points on the table legs prick through the carpeting on the stage. As stated previously, block-tin covers, either covered to match the baize or painted, are provided, making the most convenient" blinds" for the traps.

CHAPTER II.

MECHANICAL MAGIC.

The Flight of the Timepieces.

Illustrative of the utility and handiness embodied in the design of the secret chute and sliding car, with which our first magical table is equipped, the initial experiment in mechanical magic is presented associated with this carrier device. While the apparatus introduced to successfully carry out these experiments is of a flexible character allowing many methods of presentation, only one scheme will be given in explanation of any one trick, leaving the reader free to invent and devise other courses to follow, using the same magical apparatus, changing only the sketch of the experiment.

The little wooden mortar illustrated in elevation in Fig. 16 is intended primarily for tricks with watches other than the hackneyed performances in which substituted watches are broken up by means of a pestle. This little mortar is really more innocent in appearance than it is in character, its secret accommodations being shown up in Fig. 17. Fig. 18 shows

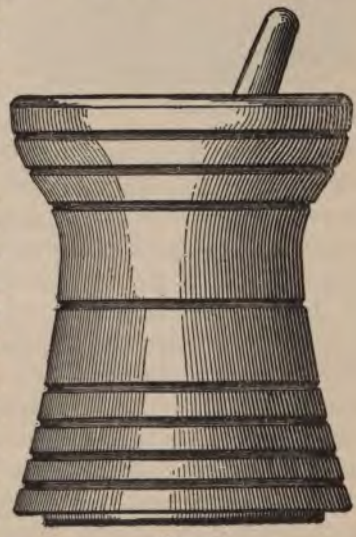


Fig. 16.

the little mortar in cross section, and Fig. 19 illustrates it with its bottom removed, showing how watches may be passed directly into the little sliding car of our chute table.

Before describing the experiment in detail, the construction of the mortar will be first taken up. Almost any practical wood-turner will make this little piece of apparatus without difficulty, and at a comparatively small cost. The first and most important thing to decide upon is the size of the mortar, which must be governed by its projected usage. If for experimentation with ladies' watches exclusively, a diameter of about four inches, inside measurement, across the top and bottom, with a height of five and one-half inches, will be all that is required.

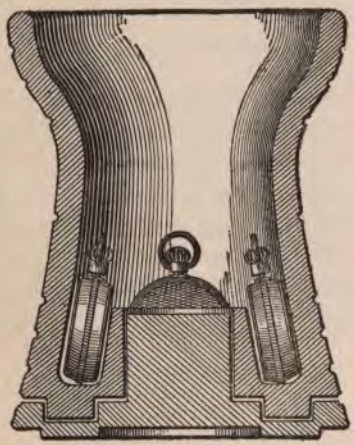


FIG. 17.

This restricted usage is not recommended, however, as a more general adaptability to larger objects is to be desired. The largest gentleman's watch the performer is liable to run across during the course of his magical entertainments will measure about two and one-quarter inches in diameter, and be about three-quarter inch in thickness. If the mortar is to be made to accommodate three or four of these large watches, it will have to be made about four times the size of the illustration, that is, have a top and bottom diameter of seven inches with a height of nine inches. An extremely important feature in the design of this mortar is the width of the grooved shelf which runs around the bottom portion to accommodate and hold the watches in place. This groove will have to be just one

inch wide to allow the watches to enter. If this groove was straight, just the thickness of the timepiece would be ample; but owing to its circular course, it must be about double, or else the watches will bind at the edges and refuse to enter in place.

Another very important consideration, before going ahead with the work of cutting out the model, is the design of the cylindrical aperture in the base. This, for the most obvious reasons, must have a diameter at least as great as that of the largest watch, and this must be borne in mind in designing the thickness of the mortar's walls, both of the outside shell and of the cylindrical core. Having noted and summed up the important features in the design, the actual work of making can be begun. Probably the best wood for the making of this little piece of apparatus is well-seasoned poplar, free from knots, dry and clean, but not in one piece or block. Select straight, smoothly dressed poplar boards from one inch to two inches in thickness (either weight will answer admirably), and glue them together with good furniture or carriage glue, applying considerable pressure. Ample time should be allowed for the thorough drying of the glue before the boards are sawn off to make the block, which may be chucked in the lathe after cutting off the corners with a sharp hatchet or draw-knife. A solid block should not be sought for this lathe work, unless the mortar decided upon is of the small design intended for use in combination with ladies' watches solely. A large block of poplar could be had, but would surely have a tendency to crack and warp after the work is completed. If the reader has had experience with wood-turning he can try his hand at the

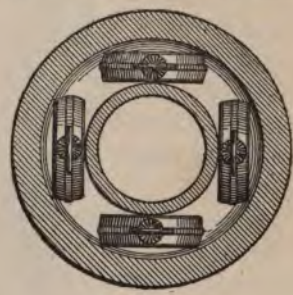


FIG. 18.

work, out if he is a comparatively new man at the lathe he had better put the design in the hands of a practical wood-turner, as neat and careful cutting is essential, especially in the turning and fitting of the detachable bottom designed to clap on without altering the appearance of the mortar. The little grooves are run around the outside for the sake of ornament and utility. The useful office of the bottom

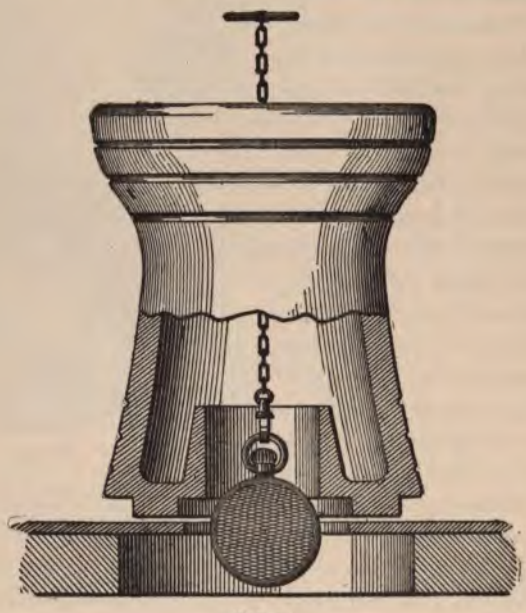


FIG. 19.

groove is the hiding of the crack formed when the false bottom and its core are pushed in place. The cutting tools should be sharp, and the lathe driven at a high speed to insure clean, smooth work. Having completed the mortar and carefully sandpapered before taking from the lathe, it should be given one or two coats of orange shellac, to keep dampness out and prevent cracking or warping. The mortar may

be gilded to great advantage, but a very good appearance can be had by painting or enamelling.

We are now ready for a trial of the mortar in connection with the chute table and three or four watches. The outline of a method of exhibiting the experiment is herein given, subject of course to any variations and improvements the reader can doubtless add. The conjuror comes forward with the mortar in his hand, complete with the bottom core in place, filled to the brim with beans, coffee, or split peas. The contents are poured out on a large plate, making a very large heap, proving that the mortar is hollow and honest. The watches are taken, which have been collected on a plate by an assistant, and lowered into the mortar by their chains, lodging them carefully in the circular groove around the cylindrical opening. Fig. 17 illustrates this stage of the trick, showing three of the timepieces in place. For simplicity the chains are not represented, they being simply lowered in on top of their respective watch.

We are now ready to get rid of the bottom of the mortar, which is an extremely simple matter for any one with a little practice, it only being necessary to stand the mortar down on the table for a second, and pick it up again without its bottom, which may be hidden by pushing it off on to the servant or by placing it behind some small object on one of the side tables. It will be observed that the magician has not explained as yet what he is going to do with the watches, and he should not make known his plans until they are already executed. This is a very important trick of the trade, placing the audience at a great disadvantage, so far as becoming familiar with the secrets of the experiment. The mortar is now placed directly over the trap in the table, above the secret sliding car, which is waiting with "steam up." As the trap in our table top is square, the mortar will not stand evenly above it unless a painted tin or pasteboard disc is provided with the centre cut out to coincide with the ring in the bot-

tom of the mortar. The watches are now marked, by taking them out of the mortar one at a time and attaching little marked pieces of ribbon to their chains. As soon as the chain is decorated with its little distinguishing ribbon, it is again lowered into the mortar, but not into the circular groove, but causing the watch to pass through the cylindrical aperture into the little padded car. The watches should be immediately carried off behind the scenes, in two loads if necessary, the chute being removed between the trips, allowing the performer to walk behind the table. When the watches have departed the performer should stand the mortar on its little bottom, picking them both up together, and holding them in his hand as he walks forward toward the front of the stage and a little table holding the plate with the beans. Here another deception is played upon the audience by means of a very plausible fib. The performer, looking into the empty mortar, remarks that one of the watches looks a little brassy, but that will probably disappear in the rapid flight to which they will presently be subjected. To elaborate on the trick, the introduction of four ends of chain may be made, tied together by means of a fine black silk thread. These chain ends can be turned over the edge of the mortar, in order to be in full sight of the audience, the black silk thread, which is attached to their lower ends, passing out through a tiny hole in the bottom of the mortar or hanging over its side. This feature will require some little sleight-of-hand, but may be adroitly accomplished with practice. The mortar is now to be carefully filled with the beans, very carefully at first, in order not to "jar the works of the watches" which are safely behind the scenes. The mortar is now placed on one of the light side tables, and is covered over with a silk handkerchief. There are a number of ways to effect the production of the watches at the close of the experiment, the method herein presented being only *one of a variety.* The chain ends may be gotten rid of by

pulling them up into the bottom of the mortar when it is inverted, allowing the beans to fall out on the plate; or they may be taken up into the handkerchief by means of the outside thread when the mortar is finally uncovered.

The following, if circumstances allow of its introduction, is perhaps the most brilliant ending of the trick. A light wooden frame is brought in (which may be closely examined), measuring about two feet by three, mounted upon substantial feet. The framing itself should be as light as possible consistent with rigidity, and should be provided with a large hook under the top bar for the suspension of the watches. This frame is placed at one side of the stage, well forward near the side scenes. Above, shielded from view by the ornamental front of the stage, is stretched an iron wire upon which a little pulley can be run. From this little wheel, which may be drawn back and forth across the stage by means of a pair of cords, is suspended a black linen thread provided with a hook to receive the watches. This cord must be of such a length that the suspended watches, when on the stage, will come directly behind the little frame.[1] We must have in addition two large silk handkerchiefs, capable of completely covering the frame front and back. It is now covered on the back with one of the silk scarfs, and attention drawn to the hook in the centre.[2] The performer now holds the second scarf out to its full dimensions, walking well over to the side of the stage. While he is thus holding the scarf outstretched, the watches are pulled on the stage in suspension, and are stopped directly behind the screen. This must of course be done adroitly and with deliberation, not in a hurried, rapid manner. With practice, together with a well-proportioned stage and a "well-adjusted

[1] See Fig. 40 and description under Magical Cords.

[2] These scarfs may be attached to the frame by means of thumb tacks, or they may be hung on light wires and be pushed back and forth like curtains.

audience," as described fully in Chapter I., the watches can be secretly landed behind the screen. If the mortar part of the trick has been skilfully worked, the audience will have no suspicions in regard to the watches being behind the scenes. The front of the screen is now covered with the second scarf, and the whole moved over nearer the mortar, the suspended watches following because of a watchful assistant in charge of the controlling cords. Here the performer must remove the rear scarf for an instant, on the pretext of showing it once more by violently shaking it out, allowing the watches to be placed on the hook in returning the scarf. Here another trick is played which requires a little practice. In hanging the watches on the hook, the performer passes a needle carrying a piece of black thread through the rear scarf, by means of which the watches are pulled back a little, in order that their forms may not show through the front scarf by pressing it out until the proper time, when an assistant releases his hold on the thread, allowing the timepieces to swing against the front scarf, thus becoming visible. We are now ready for the trip, and to explain that the watches are to pass through the air from the mortar to the frame between the two handkerchiefs. A pistol may be fired or rapid magical passes may be made, when at the command the watches are seen to appear between the two handkerchiefs with a bound, and the mortar is found empty upon removing its covering. The front scarf is taken from the screen, and the watches removed from the hooks (the hook of the frame and the hook of the suspension thread, together with the hasty hook made by passing the needle through the chain on the group) and immediately returned to the owners.

The various steps described may seem lengthy and difficult to the reader before trial, but with a little careful repeated practice the various stages of the experiment may be run *through in less* than half the time required to "tell the tale."

With an intelligent audience the performer must expect to exert all his inventive faculties, and go through complicated methods in order to mystify. In these modern times a carelessly performed trick has no merit and no deceiving power. Be not afraid of complicated work if it leads to absolute mystification of an intelligent audience, and never repeat an experiment unless a second method differing radically in principle is at hand. With this equipment repetition is permissible and advisable.

The Mesmerized Dial.

Familiarity with the city of London will doubtless include to most persons, regardless of residence or nationality, acquaintance with an historic centre in that grand old metropolis, known as the "Seven Dials." Seven streets focus at this famous centre, formerly noted as a nucleus of degradation and crime, defining a circular space which, during the early portion of the seventeenth century, enclosed and surrounded a pillar-mounted dial, of fame second only to its famous setting. During the long years of contact with wretched and distressing characters, together with exposure to the action of the elements, this dial acquired a reputation of an indelible character. Doubtless the author will be disbelieved by many of the well-posted readers of this little volume when he states that the mesmerized dial, herein described for construction, contains a latent mesmeric power, capable of being aroused to action and of intelligently controlling a pivoted pointer. As a lodestone, or mass of metallic iron contains a value of residual magnetism, the dial and pointer, when constructed according to directions, will be found to embody a supply of active, intelligent energy. Should the reader construct this piece of magical apparatus, and claim for it hypnotic or mesmeric heritage from the old dial once prominent in London's streets, his audience will discredit his remarks until the experiment has

been demonstrated, when mystification will reign supreme over scepticism and doubt. The magical pointer, when completed, may be spun by the performer or any member of the audience, when placed upon its pivot, and be made to oscillate and stop at any predetermined numeral upon the dial, or give the time of day or night in any portion of the civilized globe. Before describing the steps in the making of this horological device, its effect on the uninitiated observer may not be out of order. The performer, who must emphasize his explicit faith in the integrity and reliability of his clock, comes forward and places the dial in full view of the audience. This dial may be passed around for close examination, and the pointer may be closely observed. "We will now ascertain the exact time," remarks the conjuror, as with his hand he places the pointer upon the pivot and gives it a rapid spin. Music should accompany the rotations of the mysterious pointer, increasing in "time" as the velocity of the pointer diminishes, ceasing with the pointing out of the mesmerized numeral. During the spectators' suspense the conjuror should impress the infallible accuracy of the clock upon his audience, and assume an increasing confident manner as the revolutions of the brass pointer diminish in energy. Assuming the entertainment to be in the evening, let us say nine o'clock, the conjuror causes the magic hand to oscillate and come to rest at two. This will undoubtedly bring forth mumbled remarks from the spectators, who apparently have caught the overconfident performer in an unpleasant predicament. The conjuror, who must be on the alert for audience rumors, quickly looks at the clock in a puzzled manner, and confesses his inability to explain the first mistake ever made by the wonderful dial. He may suggest, with profuse apologies, overlooking the experiment and passing on to the next, when, brightening up suddenly, he calls attention to *his trousers* which are turned up at the bottom, and after

excusing himself to the ladies present, explains that he has been furnished London time, which is five hours behind, making the hour exact upon the proper corrections. The hand may be made to stop anywhere on the dial, answering questions, giving dates, etc., and may be placed upon its pivot and spun by any member of the audience.

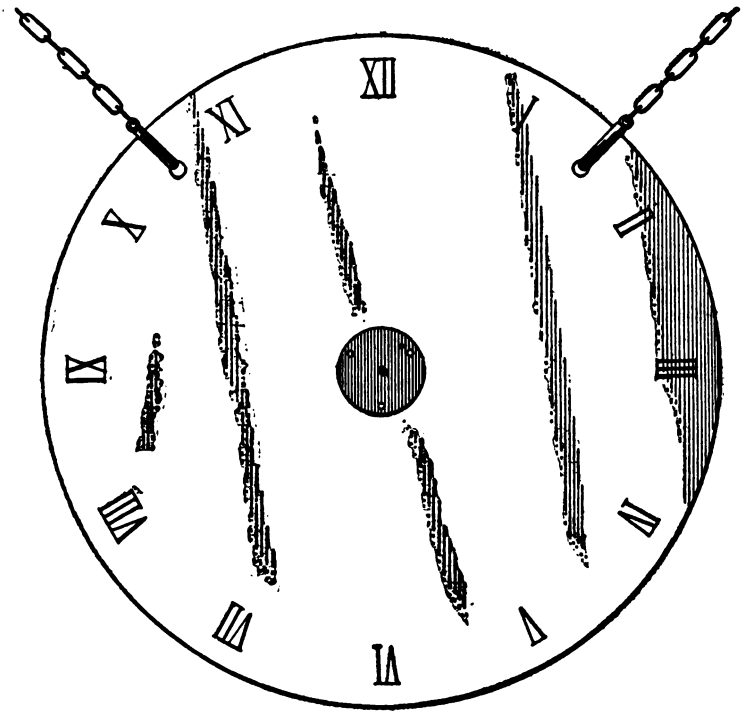


FIG. 20.

Leaving the reader free to apply his talent to the application of fitting remarks to the introduction of the completed "mesmerized dial," the following pages take up the description of the secret mechanism, and the work of actual design and construction. The dial proper may be mounted in several

ways, Fig. 20 illustrating perhaps the easiest and cheapest manner, and Fig. 25, at the close of the description, a more elaborate manner. We will take up the construction of the plain suspended design first, either mount of dial working equally well with the magic hand. The diameter of this dial, which is of clear glass, should be fourteen inches, and may be cut at almost any store where dealing is done in paints, oils, and glass. The glass selected should be clear and perfectly flat, that is, free from any curving places on its surface. If the reader cares to make the dial, it must be of thin glass, cut as neatly as possible around the edges. If he wishes a plate glass dial of considerable thickness, of course an order must be given out for it. The dial made from good window glass will be all that is required to illustrate the merits of the clock, and prove very effective, the maker

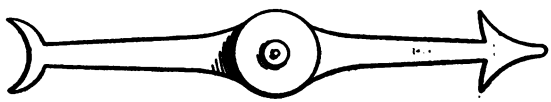


FIG. 21.

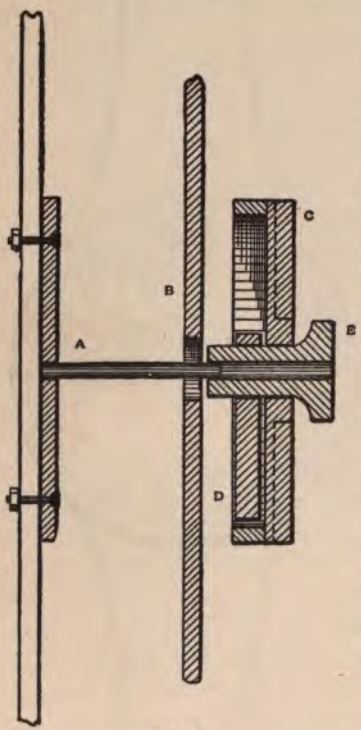
of the clock being free to replace it at any time with one made from plate glass, should he go in for really elaborately finished apparatus. This thin glass dial can have the necessary holes put through without much trouble by drilling with a little cutter made from a file, using turpentine as a lubricant. If the reader has had no experience with drilling glass he may consult an optician who makes and repairs eyeglasses. He drills small holes through his lenses daily, and can perforate the thin glass dial in a very few minutes, as the holes may be of very small size, one-eighth of an inch being ample.

In the suspension type of dial two holes must be made as shown, between the numerals 10 and 11, and 1 and 2, to receive little hooks or clips of the supporting chains. The *centre* of the glass dial must mount a little brass disc, as

shown, being securely attached by three tiny bolts passing through the glass. This little disc must be just one and three-quarter inches in diameter, and be one-eighth inch thick. This disc has a hole drilled through its centre to receive a little pinion or axle of steel or brass, screwed in and soldered, measuring one and one-quarter inches in length and having a diameter of three-sixteenths inch. This little axle is of such small diameter in order to reduce friction when the pointer is placed in position and set in motion. If this axle were larger, the pointer would not oscillate nicely when coming to rest at an exact spot, but would stick in a position approximate only to the desired location on the dial. A sectional view of this little disc, together with the glass plate and bolts, is given at the left in Fig. 23, which illustrates in addition the little axle. Having procured the dial with the requisite holes, and mounted the little disc and axle, the numerals should be provided. These may be bought ready made, and be cemented direct to the dial, taking care to place them in position accurately, and evenly spaced. As the pointer is to be eleven inches in extreme

FIG. 22.

length, they must be placed outside of its radius, if the numerals chosen have a greater thickness than one-eighth inch, in order not to obstruct the passage of this hand. The little bolts for attaching the disc to the glass may be bought ready made, and should preferably be of brass. Fig. 21 illustrates the design and appearance of the brass pointer one-quarter actual size.



FIG, 23.

Now for the secret of the clock. Fig. 22 shows a full-sized centre of the magic hand with the front cover partly cut away in order to show the secret adjustable balance weight. The shape illustrated for this weight is the most efficient for our use, and should be directly copied in cutting out the metal for its making. To make this magical hand, brass at least one-sixteenth inch in thickness should be employed, the cutting out to be effected by means of heavy tinner's shears, and a large flat and half round file for getting the curves and finishing up. The design for the hand should be carefully drawn direct on the polished brass, before the material is touched with the shears or file. It must be exactly balanced, regardless of course of the secret controlling weight, by designing it with equal masses of metal on either end. The curves must be gentle, forming a circular centre one and three-quarter inches in diameter,

where the little box cover and secret weight are soldered on.

The plan of making this hand will be made clear by once more referring to Fig. 23. Here, as previously pointed out, a portion of the glass dial is shown at the left of the illustration, together with the brass disc and pinion, A. The section through the pointer or hand is shown at B, and the little box, or cover, at C. The section of the little adjusting weight is represented at D, mounted upon the hollow controlling hub E. The little covering box may be made in two pieces and be soldered together, or may be turned on the lathe from a single piece of thick brass. To make the box from two pieces, a circular disc of brass is cut out by means of a lathe, or by hand with a large file, at least three-sixteenths of an inch thick, having a diameter exactly to coincide with that cut in the centre of the pointer, namely, one and three-quarter inches. The second portion of the box is made in the form of a collar from brass about one-sixteenth inch in thickness, and is neatly soldered on to the disc. This collar must be made by bending a brass

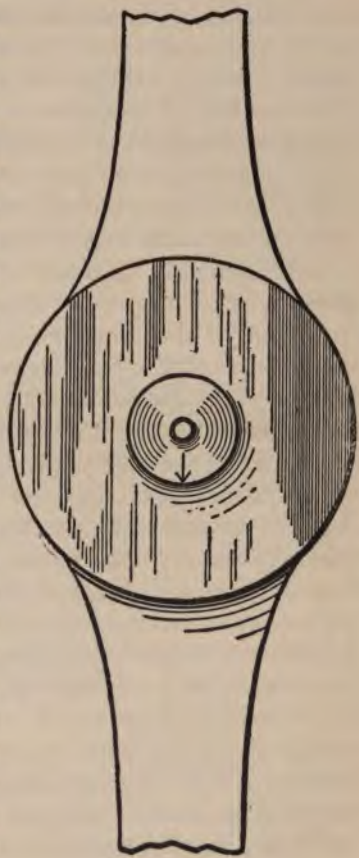


Fig. 24.

strip of the mentioned thickness and three-sixteenths inch wide around a cylindrical form, and carefully soldering together the ends. The diameter of this collar is less than that of the disc, as it is soldered against the disc's surface, not over the edges. When this is completed, it should be placed in the lathe, and a one-quarter inch hole be cut through its centre. Before taking from the lathe chuck, the cover of the little box should be turned down thin, in order to prevent a clumsy appearance of the finished hand. The cover thickness should be turned away as marked out by the dotted lines. The object of employing a thick cover and turning it down is to leave a thick centre where the little controlling hub E. passes through to prevent wabbling and to make a moderately tight fit. It is recommended to cut screw threads on the inside of this cover hole, and on the outside of the hub E., in order that it may be screwed in place. If the maker is not equipped with the necessary screw-cutting set, and has no means of having it done without great trouble, a tight fit of the hub in the cover will answer. Screw-cutting, together with soldering, etc., is described in the last chapter of this book. It is not a difficult art, and will be found a most useful accomplishment when mastered. To make this cover box from one piece of brass, it is only necessary to chuck a thick piece in the lathe and turn it out directly. As lathe work requires practice and instruction, the writer does not attempt to give directions for its mastering, but refers those interested in this wonderfully universal tool to a competent machinist, or else to the catalogues of makers with a view to purchase and practice. The little hub which carries the governing weight can now be made, which is to be provided with a "flare" to serve as a handle to turn by means of the thumb and forefinger. This hub is drilled through the centre as illustrated, the hole made being suited to the little axle of the plate A. The governing weight is cut, by means of a large file, from *brass just* one-eighth inch thick, and, as previously stated,

exactly similar to the illustration, which is just full size. This weight is now drilled through, using a one-quarter inch drill, and is mounted on the little hub after the hub is finally in place. As the slipping of this weight on the controlling hub would cause the clock to make mistakes sure enough, it should be soldered in position. The hand proper should now have a five-sixteenths inch hole drilled through the centre as shown, to allow the little hub to go through without binding. We are now ready to solder the little circular box to the hand's circular centre, taking all the precautions enumerated in the matter on soldering. The practically completed hand is chucked once more in the lathe, and the superfluous solder turned off and the little cover and hand nicely polished.

A little arrow, or index, must be marked on the thumb portion of the little hub, which is illustrated in the finished hand centre in Fig. 24. We are now ready for experimentation. The hand is placed upon the dial's pivot and ready for questions. The reader will immediately wonder how to turn the hub in order to cause the pointer to "oscillate and come to rest at any given numeral." Nothing could be more simple, the method being as follows: Place the hand on the dial, causing it to point at the numeral at which it is wished "to oscillate and stop," and turn the hub until the little index marked thereon is pointing downward. Of course, the little index must be cut on the hub pointing to the lower enlarged portion of the weight. When instructing one of the audience to place the dial and set it in motion, the performer, by way of illustration, places the hand on the dial for an instant, and turns it to the numeral he intends to force on the audience after the pointer is set in rotation. This gives him all the time he wishes to set the secret weight to accomplish the success of the experiment. There are many ways of forcing a number on the audience which the reader undoubtedly foresees even while reading this sentence. The clock should be worked both ways, namely, announcing in

advance what the clock will tell, as, for instance, in the case of "London time," and by forcing a number on the spectators.

To exhibit the suspended dial, a light wooden or metal frame should be provided, equipped with hooks for the suspending chains, and with substantial supporting feet. Fig. 25 illustrates the column mount, and may be put together in a number of ways, being perhaps more effective than the suspension. This supporting column and base may be turned from wood and be painted or gilded, if the base is hollowed out and filled with lead by casting. It should have an ornamental top supporting a quadrant of a circle with a narrow groove cut in to receive the dial. This groove must be cut in the lathe just the right width for the reception of the glass. The glass must depart somewhat from a circle here in order to form a broad tongue which may be run down into a saw cut in the ornamental top of the column. This broad tongue may have a hole drilled through in order that a wooden plug may be used as a locking device. As it

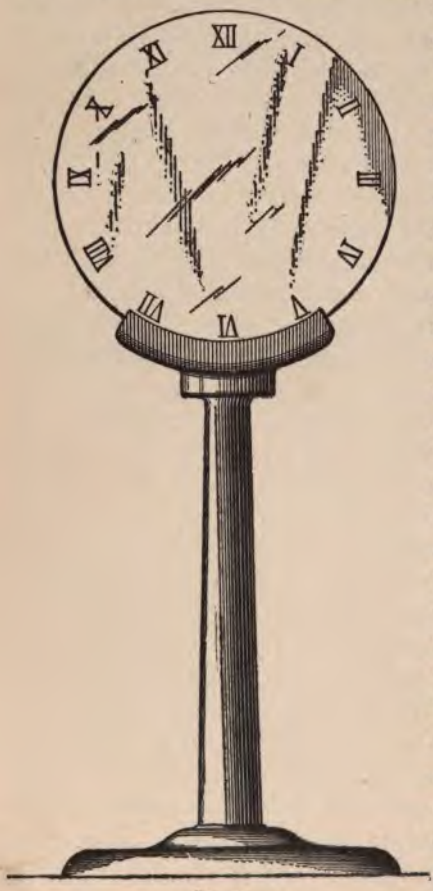


FIG. 25.

may prove highly desirable to detach the dial from the column, should it prove necessary to pack for transportation, the use of cement is not suggested as an additional security to the union of the glass and wood.

The Magical Balance.

Under the title of the Magical Balance, we will have introduced to us a pivoted or fulcrummed beam, carrying for "pans" two little cabinets of wood. As these little cabinets may be used for experimentation separately and independently, or together with the beam of the balance, they will be found of universal usefulness in effecting the exchange, appearance, and disappearance of small articles. Many striking experiments have been performed by the use of large mirrors arranged in cabinets in such a way that objects placed inside may be made to become invisible through the science of reflection. With all the optical magical contrivances with which the author is familiar, large mirrors are the all-important elements upon which deception is dependent. Owing to the expense and difficulty involved in making large optical cabinets, and providing them with the all-important hinged mirrors, their use is in many cases prohibitive. The little reflecting cabinets herein described are dependent only upon small pieces of mirror which may be mounted on hinges without even drilling the glass in order to secure them. Among the uses to which the cabinets may be employed is the passing of a glass of wine through space from one cabinet to the other, the magical balance showing the moment of transfer by a dip or list of the beam. Any small object, such as an egg or lemon, may be made to disappear, appearing in the twin cabinet in the form of a canary or two, white mice, etc., etc.

With thorough confidence in the reader as to the development of tricks to which the beam and cabinets may be used the writer takes up the work of construction. Fig. 26 illustrates

the appearance of one of the "balance pans," the cut being one-quarter actual size. Although a number of tricks may be performed with the aid of only one cabinet, the construction of two is desirable, as the material and labor required for the pair, when duplicate simultaneous construction is carried on, amount to little more than the work and expense entailed in the making of a single cabinet, when the largely increased usefulness is taken into consideration. The wood for our purpose is best selected from three-eighths inch pine board, smoothly dressed and free from knots.

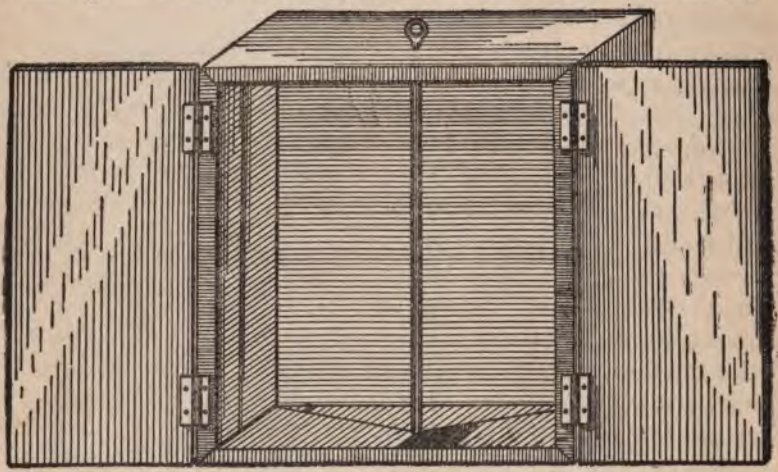


FIG. 26.

Thoroughly seasoned wood is a very important specification to insist upon, when it is to enter into such construction as our cabinets, as a warp or alteration in shape would surely cause the little hinged mirrors to stick and bind at the very moment when they should move silently and frictionless, without jar to the suspended cabinet. These little cabinets measure eight inches by seven and three-quarters, outside dimensions, for the base plan, and are about eight and one-half inches in height. They must be neatly screwed together, after

cutting the sides, back, top, and bottom carefully to size, exercising extreme care to cut each little plank with accurate right angles. Of course, good furniture glue may be used instead of the screws for holding the cabinet together, although a more reliable piece of work can be developed, along with attractive appearance, by carefully screwing together by means of small brass round-headed screws. Two little doors should be added to each box, which can scarcely be called a cabinet yet, and be attached by small brass hinges. Before putting in place the rod, which is seen to pass right through the cabinet, carrying the little suspension ring, the mirrors should be procured and experimented with.

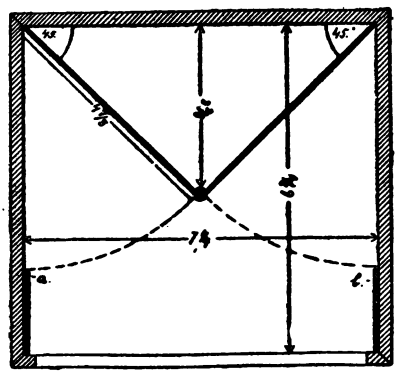


FIG. 27.

By referring to Fig. 27 the scheme of the mirrors and the base plan of the cabinet will be made clear. The mirrors should be of thin glass, carefully cut with the corners square, and be protected on the back with several coats of shellac if the back is not already covered with a strong red paint, common with various grades of thin looking-glass. The plan of the base illustrated, together with the position and angle of the mirrors, must be accurately adhered to in order to obtain the magical effects. These little pieces of looking-glass must measure just four and seven-eighths inches in width, and have a height corresponding to one-sixteenth inch less than the inside height of the cabinet. This slightly undersized height of the mirrors is necessary, owing to the thickness of the material with which we are about to line the cabinets. The little centre rod which is seen passing through the cabi-

net's interior is really a post for the edges of the mirrors to rest against, although the performer states that the rod is merely for suspension, showing in addition an unobstructed passage. These little mirrors must now be mounted on hinges and put in place. For this purpose a portion of the material which goes on for the lining of the cabinet serves for the hinges. Almost any strong material, such as calico, gingham, or percale, will answer admirably for the purpose of hinge and lining, if printed with small ornamental figures. The sides, top and bottom, together with the back must be neatly covered with the selected material, using good glue as the adherent. The piece of material cut out for the back must be large enough to bend around and cover the backs of the mirrors. With the best furniture glue neatly and evenly applied to the backs of the mirrors and covering, the material selected may be made to serve the double purpose of lining and hinge. The post must be in the exact position located in Fig. 27, namely, three and three-eighths inches from the back. The dotted lines in this illustration show the sweep of the mirrors when they are swung around against the sides of the cabinet. Here, as illustrated at *a* and *b*, two strips of lead are provided to serve the double pupose of hiding the edges of the mirrors when they are turned back, and of balancing the cabinet when suspended from the eye in the top of the rod. These side pieces must be of the same thickness as the looking-glass in order to neatly hide the edges. The little centre post, which should be of wood, with the screw eye securely attached at the top, must have a little angle groove on each side to allow of the mirrors entering a little way in order more perfectly to screen the edges from view.

The actual construction of the little cabinets is so simple, after the proportions have been carefully noted, that the reader undoubtedly sees his way clear for successful accomplishment of the work without additional directions. Of

course, the builder may desire to alter the size and certain proportions of the cabinets to meet special requirements of his own, being perfectly free to do so without risk of going astray if he procures pieces of mirror first and conducts a little series of experiments in reflection, drawing off the angles of the mirrors when they give successful reflections in connection with a base of any special shape. Having mounted the cabinet, mirrors, centre post, and doors, getting

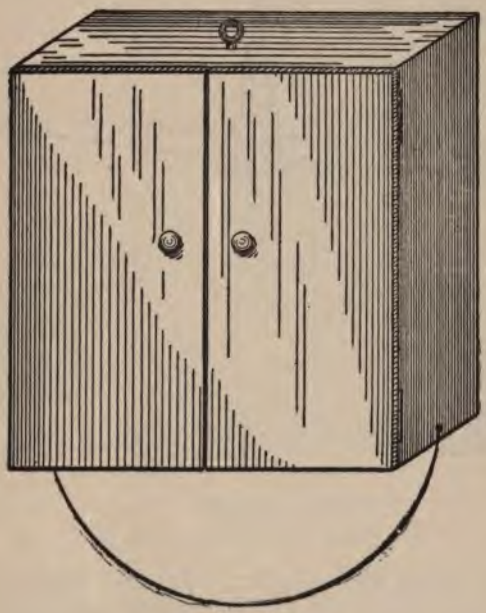


FIG. 28.

them all in successful working order, the question of secretly controlling the position of the mirrors presents itself. There is no simpler way of opening and closing the reflecting glasses than by means of black silk threads. The ends of the controlling threads are passed through tiny holes in the

sides of the cabinet, and carried around under the bottom edge of the mirrors up the cloth lining and secured by stitching.

Fig. 28 shows one of the little cabinets with the doors closed, and the secret thread running around underneath, its ends entering the cabinet on the sides and connect-

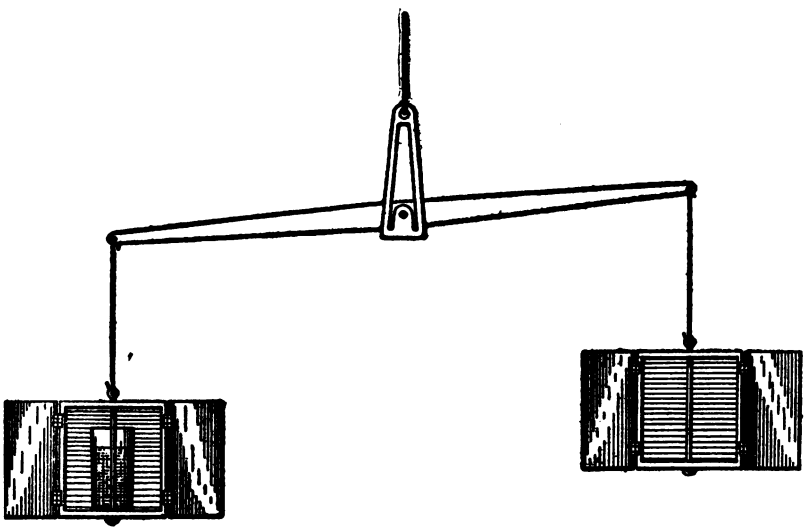


FIG. 29.

ing directly with the mirrors. It will readily be seen that by means of the loop which hangs down, the mirrors may be opened by gently pressing down with the wand. This black silk thread, as is well known by most of us, is entirely invisible to the audience only a few feet distant. To close the mirrors in the second cabinet, the loop must be connected the other way, and be run out through the back. When these little cabinets are complete and tried by sus-

pending them from the screw-eye, it will be found necessary to add a small quantity of additional balance weight, which may be in the form of sheet lead attached by means of tiny upholsterer's tacks. This strip can be applied along under the top edge of the cabinet, and, if necessary, along the upper edge of the bottom in addition, adding rather to the appearance of the cabinet than detracting from it. The finishing touch to the little cabinets should be the attaching of a large round-headed brass nail under the bottom of each, driven up into the little centre rod. This immediately gives to the rod and screw eye a more genuine appearance of necessary support. By referring to Fig. 29, the cabinets are shown in suspension, the effect of the large round-headed nails being illustrated. Having completed the "pans" of our balance, the work on the beam should be taken up. This should be made from wood, and be as innocent in appearance as possible, although it possesses decided trickery. This beam should be at least one-quarter of an inch in thickness, four feet in length, and be about two inches deep at the centre, where it is provided with the "knife edge." The supporting stirrup is easily made by sawing out two pieces of thin wood, to be placed on either side of the beam and to receive the little pin which acts as the fulcrum. The simple and innocent appearance of the beam adds largely to the effect of the tricks requiring the demonstration of suddenly increased weight of either cabinet, as an object travels through space from one side to the other. Let us look closer into the character of the suspension part of the apparatus by referring to Fig. 30, where an enlarged portion of the beam is shown. The little stirrups must be joined together at the bottom by a little block of wood, securely glued and screwed in place. The illustration represents the centre portion of the beam with the back stirrup in position, the covering stirrup being removed to show the part played by the little block, which is drawn in shaded section. It will now be readily observed that the beam can

dip to the right and left through a certain distance before being arrested by contact with the little bottom block. Let us imagine a weight to act on the left-hand end of our beam. The balance will dip under the load until the under side of the beam comes in contact with the little block in the stirrup, as shown, and the point of suspension *a* will list in the direction of the dotted arrow until equilibrium is established. If the beam and stirrup are constructed according to the design, the beam can be most conveniently controlled by means of two invisible black threads attached to the little holes *b*

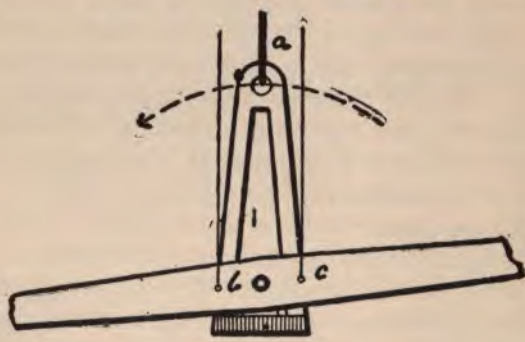


FIG. 30.

and *c*. Without the carefully adjusted stop which the stirrup block affords, the beam would run wild with every change of weight, outside the controlling possibility of the two threads. Let us suspend the beam and try the experiment of "passing an object through the air." A large screw-eye must be provided at the top of the stage, with a large smooth open hook on either side for the reception of the secret threads. The points of attaching the threads *b* and *c* must be at least three inches from the centre pivot in order properly to shift the balance when loaded. When it is desired to increase the weight of the right-hand end, an assistant gently *lifts on the thread b*, which virtually shifts the fulcrum of

the lever to the left, causing the right-hand cabinet to descend because of its own weight. The beam and stirrup should be given one or two coats of shellac to keep out moisture and prevent warping. The cabinets and beam can be painted and decorated to suit the tastes of the builder and finished up as elegantly as he likes.

In order to prevent the cabinets from turning around when suspended, they may be hung by means of wires, as shown, provided with hooks at each end. The doors of the cabinets may be kept closed by any convenient method, little wooden bars and bent brass "ells" making a pretty appearance. In case canaries are enclosed behind the little mirrors when the cabinet is shown "empty," it will be convenient to furnish means of preventing their flying out when the mirrors are drawn back against the sides of the cabinet. This may be conveniently accomplished by drilling tiny holes along the top and bottom of the little box for the insertion of little brass wire rods, forming a cage for the front. One of these little cabinets, worked in connection with the watch mortar and chute table, makes a very pretty ending of the trick. The watches are passed out by means of the secret chute table, as fully described in the trick of the "flight of the timepieces," and placed in the little cabinet, which is brought from behind the scenes, with the little mirrors swung against the post. The audience sees the "empty" cabinet, which should be hung on a little supporting stand or placed on a light table, and the chains of the watches hanging over the rim of the mortar. The performer closes the doors of the cabinet and announces that an aerial trip is about to take place; the aerial trip having taken place some time before, at the convenience of the conjurer. A very startling effect may be obtained by means of the little cabinets by the use of such articles as beans, small candies, or peas. The mirrors are closed against the post and locked in position by means of two pins

passing through the top or bottom, which prevent the mirrors from opening until the pins are removed by means of secret threads. A neat circular hole must be made in the top of the cabinet for this trick, provided with a closely fitting plug or cover. The space behind the mirrors is now filled completely with the beans or candy, and the plug put in place. The cabinet is shown empty and the doors closed. Upon removing the little pins, the mirror may be drawn back, allowing the beans to run forward and make a formidable heap. On opening the front doors, the cabinet is seen nearly full, some of the beans falling out on the floor. This, together with many other experiments, creates a very pleasing effect if skilfully worked in to form a portion of a large trick.

The Salem Seamstress.

"Ladies and gentlemen, we have with us this evening one of the famous witches of Salem, who was burned at the stake in that historic city many years ago and whose spirit, after leaving the charred remains of the body, set out on a great journey. We have right here in this little box the ethereal remains of the only surviving witch capable of making its presence known by accomplishing manual labor in the form of sewing, although I greatly fear her fingers are becoming stiff and her ability to draw the needle rapidly waning. Being of a treacherous and sullen disposition, in addition to her enfeebled condition, her willingness to demonstrate her handicraft in the form of needlework cannot any longer be counted upon. Certain passes of the wand, however, have a very stirring effect upon her, calling into activity both her handicraft and witchcraft, which have been in a latent condition for over two centuries. Let us attempt to call forth her magic powers and beg her to exhibit a little *of her work.* We must, of course, provide her with all the

accoutrements, together with the material for stitching. She is squatting in this little box, in the farthest corner—there, do you see her? (The box is brought forward and opened and the audience allowed to look in. It appears empty.) No? But she is there just the same. You do not believe it? Well, we will see. We will try and get her to demonstrate her presence by handing her the string of sewing articles you perceive suspended from the little frame. Will any of the ladies favor us by the loan of a couple of handkerchiefs? Thank you; we will proceed immediately by placing them in the witch's box. Now for the needle, thread, thimble, emery, and scissors. One moment—Does she require the scissors? As the handkerchiefs are only borrowed we will not trust her with the scissors; we will leave them out. (The performer places the string of sewing articles, with the exception of the scissors, in the box on top of the handkerchiefs.) There, she is ready for work. Let us place the box in suspension in the centre of this little frame. Now let us summon her to work. (Magical passes are made by means of the wand, accompanied with the request that the witch sew the handkerchiefs together. The performer should inquire of one of the ladies if she has had time to accomplish the work of putting in a dozen stitches, telling her to bear in mind that the witch's fingers are stiff.) All right? Shall we open the box and see if the work is complete? Very well, now then. (The performer opens the box and takes out the two handkerchiefs, loosely stitched together.) Ah! she has concluded to show us that she is present." (The handkerchiefs are immediately given to the owners for identification.)

The writer has attempted to give the effect of a portion of the trick upon an audience, and will now take up the description of the apparatus and tell "how it is done." Fig. 31 illustrates the little box for the witch, the little frame with the sewing articles in suspension, and the table, which is

built from the directions given in Chapter I. under the title of "The Cable Table." Assuming that the mechanical table is complete, as fully described in the preceding pages, the witch's box is taken up. This is very easy to make, being shown opened and partly in section in Fig. 32, the cut being about one-quarter size. This box is best made from one-quarter inch white pine, screwing the pieces neatly together. The only trickery embodied in the construction of this box lies in the sliding metal bottom, which is made from two pieces of block tin, one movable and the other stationary. To

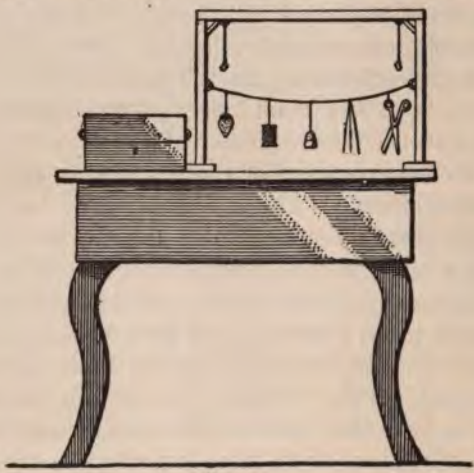


FIG. 31.

make this bottom, a groove is run around the inside of the boxing near the bottom edge, sufficiently wide to allow the entrance of two pieces of heavy block tin. The stationary piece of this tin extends over about two-thirds of the bottom of the box, and the moving piece slides above it and is capable of covering the remaining one-third when it is slid over in the proper position. This movable piece is provided with a stud or button whereby the performer is enabled to move it back and forth through the groove from

the inside. By referring to Fig. 33, a view of the box, looking down into it, is given. In this illustration the extent of the covering effected by the stationary plate is shown by the dotted lines, the movable sliding plate being represented on top. The little box should be provided with lock and key, together with neat brass hinges, and be painted or stained. Having completed the box with its little sliding bottom and decorated the outside to suit the maker, the inside may be given a couple of coats of black paint and the box set aside to dry.

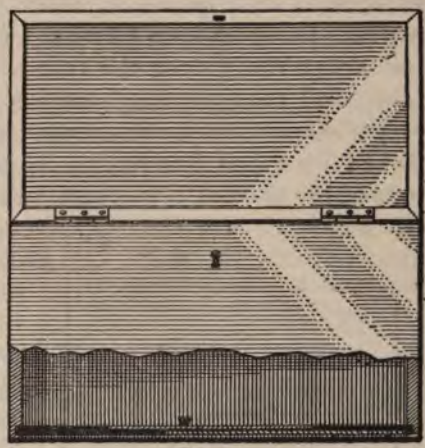


FIG. 32.

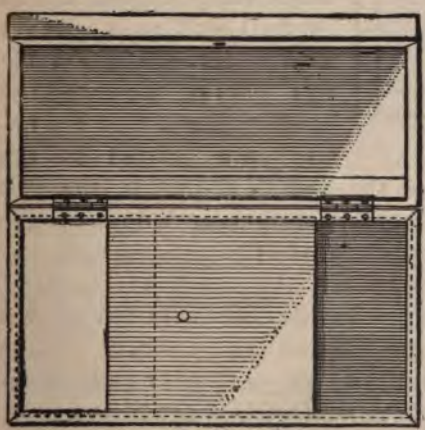


FIG. 33.

Figs. 34 and 35 represent a couple of handkerchiefs which have been placed inside with "the witch," allowing her to have the scissors. As labelled, one of these handkerchiefs is white and the other red. The trick, as performed in connection with these handkerchiefs, requires the cutting out of the centres, which the witch endeavors to repair, but mistakes the colors and sews the wrong centres in. The lit-

tle frame illustrated in Fig. 31 is provided with two sets of hooks as shown, and is put together in a few minutes, provided with little pieces of board for feet. The method of working the trick is as follows: The little box is placed on the table directly over the trap with the secret pulleys and cable, and the frame and sewing articles are freely shown or passed around for examination. The little box is now picked up (with the bottom closed) and brought forward toward the edge of the stage, where the lid is opened and the box held in such a way that all in the audience may clearly see the interior. The performer now places the box on the magical table over the trap with as much apparent carelessness as possible and requests the loan of a couple of ladies' handkerchiefs. Large gentlemen's handkerchiefs should not be accepted unless of silk, which the performer knows by trial will pass without trouble through the table legs. Having borrowed the handkerchiefs, they are immediately carried to the box and thrown in. Here the deception begins, the performer pressing the handkerchiefs down and opening the sliding trap at the same time. Having this accomplished, it only requires a second or so to hook them to the secret cable, and give a cue to the assistant to draw them out behind the scenes, where they are sewed together and returned. While this transformation is going on, the performer calls attention to the sewing articles which hang from the little frame, and takes them from the suspending hooks. The handkerchiefs, which have returned by this time, are lifted up a lit-

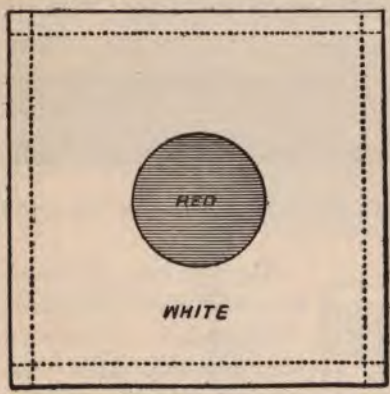


FIG. 34.

tle way in a careless manner, in order to show that they have not been disturbed, and the sewing articles carefully laid in on top. In doing this the box bottom is secretly closed and the top shut down. The box should immediately be taken up and be suspended from its little screw-eyes, either in the centre of the frame or by means of ribbons attached to the top of the stage. The performer commands the witch to begin sewing, and allows several seconds' time for the work to be completed in. On throwing back the lid of the witch's box, the handkerchiefs are taken out sewed together.

This trick may be varied in many ways to suit the tastes and ideas of the conjurer, introducing spools of different colored sewing thread at the selection of ladies in the audience, sewing any stitch that may be called for, etc., etc. Some little practice is necessary in order to get the handkerchiefs off quickly and quietly and in opening and shutting the sliding bottom. As in many other tricks, deception should be played upon the audience throughout the experiment in the form of remarks and requests. For example, after the work has been accomplished the performer should force the audience to believe that it is about to begin, etc.

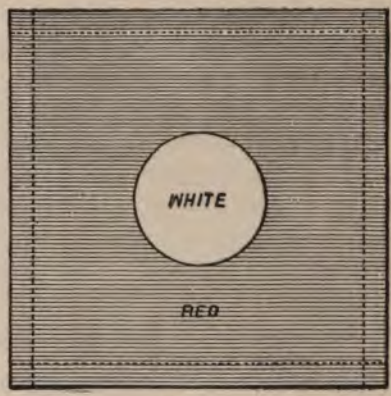


FIG. 35.

A clever deception practised by an English conjurer in connection with a hat trick may be of interest here, and possibly of value in suggesting to the reader other ingenious deceptions. The trick required the introduction of a cannon ball

into a borrowed silk hat. The ball was secretly introduced at the outset of the trick before the conjurer announced his purpose, by means of sleight-of-hand in co-operation with the "servante" of the magical table (the "servante" is described in connection with the "chute table" in Chapter I.), and brought forward and held in the hand while a description of the proposed experiment was given. As the performer stands the hat on a small side table he reads the name of the maker and the initials of the owner, which he has committed to memory, and asks the names the initials stand for. If the introduction of the cannon ball is skilfully accomplished and the experiment described after it has really been performed, such misleading remarks as the reading of the maker's name in the hat and the initials of the owner serve to put the conjurer on a pretty sure footing for success and mystification. The reader should be on the lookout for deceptions of all kinds and use his wits at every turn against the unprepared wits of the audience. If the conjurer attempts to use his talent and ingenuity directly against the wits of a clever audience prepared for deception at the time the deception is made, the performer will have many a hard fight for the goal of success. In using the little box in connection with the cable, it will be necessary for the assistant behind the scenes to attach a little marking string or ribbon on the cable in order that he may know when the handkerchiefs which he returns are directly under the trap opening and in reach of the performer. By sending the handkerchiefs out separately, an additional little deception may be introduced in connection with the handkerchiefs with the colored centres. The lid of the box may be carelessly closed, catching a portion of the handkerchief on the outside of the box in order that it can be seen. When the first handkerchief returns, a portion of its centre, which is of the same color as the second handkerchief, may be caught *in the same* manner under the lid while the first handker-

chief caught goes behind the scenes. All these deceptions require practice, and in going through this work other little misleading tricks of the trade may be invented. Give good attention to the careful making of the apparatus first, practise the skilful working of the same, and study deception and misleading passes. With these three elements in combination mastered, the performer has laid the foundation for a deceiving magical equipment.

Magical Cords.

Perhaps in the entire art of white magic there is nothing so generally applicable and yet so exceedingly simple as the introduction of secret cords and threads for the accomplishment of the most varied results. It being well known that a black silk or linen thread is entirely invisible at the distance of only a few feet if used in combination with a dark background, advantage should be taken of this fact in arranging apparatus from the simplest to the most complicated dependent upon an intelligent source of energy. Although this chapter is largely devoted to the general use of cords and threads, the opening description will outline an experiment performed by the aid of a typewriter, the name or title of the trick being left to the performer as he adopts the sketch of presentation herein given or whether he outlines other plans of introduction. As a typewriter is largely employed to copy pen manuscript, this use of the machine will be adhered to in the following experiment. The conjurer brings forth a small table upon which can be seen a typewriter case. The case is removed from the instrument and its keys run over by the performer's fingers. The machine may be lifted up from the table, in order to show its "freedom from any source of communication." An ordinary sheet of paper, which may be handed around for examination, is now placed between the rollers of the "carriage" and turned down in position for writing. The performer now states

that any sentence written upon paper with a pencil by any member of the audience will be accurately copied upon the spirit typewriter without the performer having seen it. The accuracy of the spirit which depresses the keys is so great that any purposely misspelled words in the sentence written will be reproduced upon the typewriter without the performer having touched the pencil and paper after handing them to a member of the audience. This feature of the trick adds tremendously to its effect upon the spectators, for the sentences may be written as frequently as desired, in any language recorded with English letters, mispelled or correctly spelled, well written or badly written. This part of the trick may be elaborated as much as may be desired and is performed as follows: The paper and pencil are handed to a member of the audience, with the request that he write any sentence in any manner he wishes. As he cannot write without a rest for the paper, a book or magazine should be handed him to facilitate his work. Here the first trickery is introduced. If a magazine is loaned for the accommodation, it must have, between its front page and its second, a piece of "carbon" copying paper and a thin sheet of letter cap. The pencil given should not be too soft, in order to necessitate the writer's pressing a little on the paper. It will be readily observed by any one familiar with carbon copying paper, which is used by almost all cash girls in our large stores for making two records simultaneously of a sale, how easily the writer may be cheated out of his secret, together with any misspelled words or secret dashes it is suggested to him to make. The writer retains his sentence, and the "magazine" is passed to a second and third lady or gentleman for additional sentences, discarding the magazine when the writing is complete. It now remains for the spirit to get possession of the paper and carbon sheet, which is best accomplished by the aid of a confederate in the audience, the last person requested to write a sentence. This is

secretly sent behind the scenes, where the "spirit" controls the keys of the typewriter. The sentences, which should be folded, are taken one at a time and placed upon the rest of the typewriter. The performer commands the spirit to read the writing through the folded paper and copy accurately the sentence on the machine, misspelling any word so written in the original. The machine begins to "click," and the keys are seen to depress as the invisible spirit fingers run over the keyboard. When complete, the paper is taken

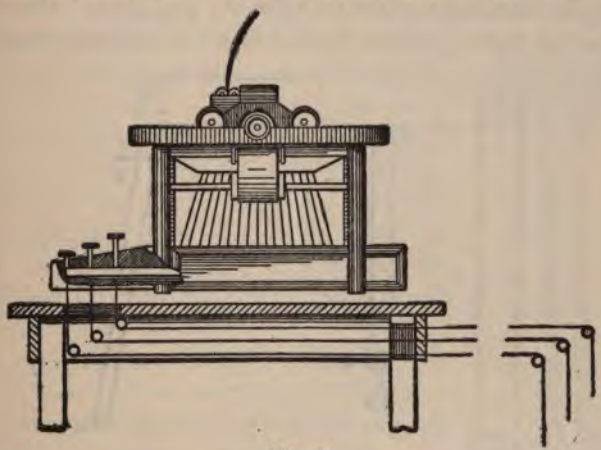


FIG. 36.

from the instrument and passed to the writer of the original for reading aloud.

The arrangement of the typewriter and secret cords will depend to considerable extent upon the make and style of the machine. Some instruments are open under the keys and some are closed, but almost all of the standard makes may be made to run by means of secret cords. Fig. 36 illustrates a machine connected up in combination with a table, the cords running back behind the scenes, where they pass over three horizontal bars. A similar set of bars is illustrated under the table top, causing the curve

or change in direction of the cords. Of course each cord behind the scenes has a little lettered handle, by means of which the confederate operates the proper keys on reading the carbon copy of the sentences. Additional cords may be added to move the "carriage" of the machine and ring the little bell, etc., but owing to the number of designs of machines in use it would not be possible to give any specific directions for connections, etc. Each cord where it passes over the horizontal bar should be under a little smooth staple to keep it from entanglement with its neighbor. Of course a series of little pulleys mounted on a common shaft for

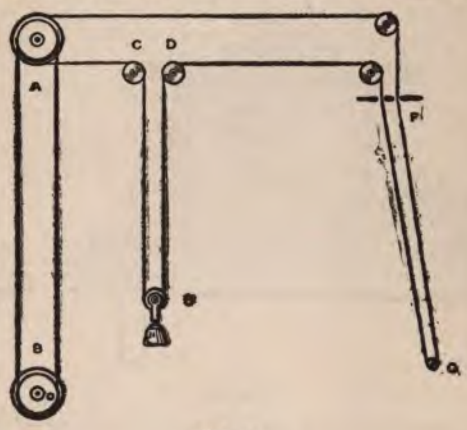


FIG. 37.

each bank of keys would cause the machine to be driven with less friction, and the reader will undoubtedly be able to handle the little problems which arise and make all the necessary arrangements for successful operation.

Let us now pass on to the consideration of threads and cords for varied purposes. Fig. 37 illustrates a very flexible means of carrying secret power to any portion of the stage, with means for automatically keeping the thread taut and under *constant tension*. The grooved wheels illustrated at A and

B are situated behind the scenes, and are connected by means of a belt as shown. The wheel B has a little crank handle, by means of which the system is put in motion. From the upper wheel A the secret thread, which is of strong black linen, starts, the bottom side of the "secret belt" passing over the little pulleys C D, which are also behind the side scenes, supporting the little weight riding on the pulley E. The thread now runs above, under the protection of the top of the stage, and passes over an additional pair of small pulleys before going through two tiny smooth holes in a metal or porcelain plate, F. A porcelain, perforated soap-dish strainer answers admirably the purpose. This plate prevents the thread from coming off the grooved pulleys when it is carried about to different parts of the stage. Finally, the little secret belt runs over the little wheel G, which may be concealed in any convenient manner, ready to furnish "intelligent power."

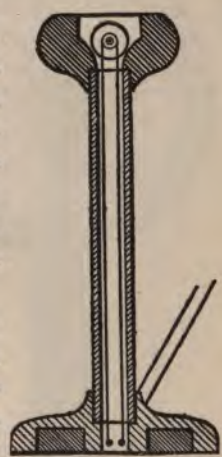


FIG. 38.

Fig. 38 represents a little weighted column of heavy glass, carrying at its top a turned wooden capital, mounting the little wheel which receives the secret belt. As shown the thread enters two smooth tiny holes in the weighted base and ascends to the little grooved wheel at the top, which may be made to turn or accomplish the moving of any piece of apparatus placed above. The little column may be freely carried about and placed upon any table, when it will be immediately ready for duty. It may mount a clock dial and pointer, which may be taken apart or cause a magic wheel to revolve with "perpetual motion." This little column is made in the same manner as the magical candlesticks, which are described in the electrical chapter, the column being of

heavy glass cemented into a turned base and capital. The weights in the base are made by cutting auger holes and casting in with lead.

By referring to Fig. 39 it will be readily understood how a wheel or dial may be run by means of a tiny silk thread, it making no difference where the wheel is located within large limits. In the present case the thread is tied at the juncture of two spokes in a bicycle wheel, rotating it with ease by simply pulling on the thread at intervals. In this manner an entire bicycle may be put in rapid motion by an invisible thread. The bicycle is introduced and a spirit rider presented and requested to mount and drive the wheel at a rapid rate. To accomplish this, the thread must run to the pedal farthest from the audience, by means of which the rear wheel may be driven at a truly rapid rate. In order to drive the front wheel we must resort to an invisible belt of black linen thread, passing over the ends of the hubs of the two wheels. This cannot be done with all bicycles, however, as some hubs allow no margin to work the belt upon. As the hubs of the wheels are of very small diameter, and on well-kept wheels polished, it will not be possible to drive the front wheel from the back unless the margin on the hubs not encroached upon by the spokes be provided with heavy rubber bands slipped on. To accomplish this, it will, of course, be necessary to take the wheels off the bearings for

FIG. 39.

a moment. In addition it will be necessary to provide means for preventing the turning of the handles, and consequently the front wheel and hub for obvious reasons. The bicycle may be either suspended or mounted on a stand which allows of the free turning of the wheels.

As a means for getting objects on the stage in one of the boldest ways possible without detection, the scheme illustrated in Fig. 40 is given. The belted hand-wheels shown at the left are conveniently located for the concealed assistant.

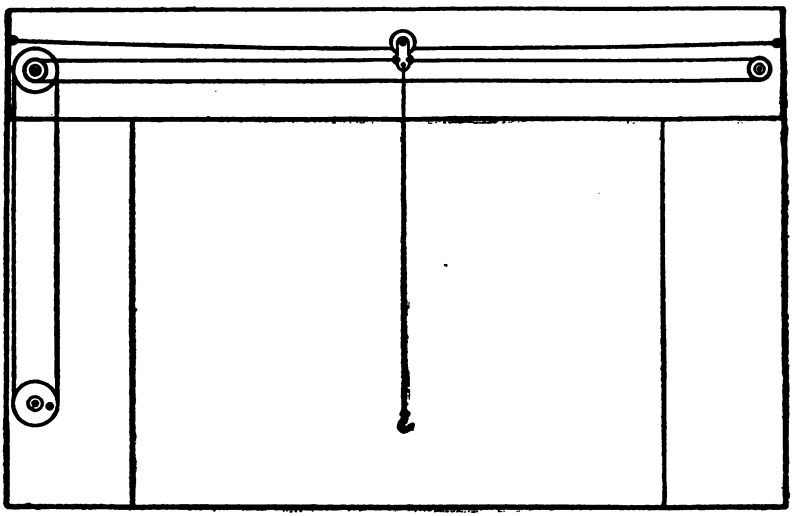


FIG. 40.

A steel wire runs across the width of the stage, which mounts a little wheel carrying the suspended hook. By means of the second, or horizontal, belt this little wheel, together with its hanging clip, may be drawn on or off the stage by simply turning the hand-wheel, which is provided with a little crank handle. Of course the articles suspended from the end, or hook, must be screened from the audience in some approved manner, which may be done by practice in connection with

the conjurer's body. He simply walks to the extreme side of the stage, when the assistant causes the suspended "cargo" to swing behind his body. The performer walks to the spot intended for the appearance of the articles, the hook travelling directly behind him until the assistant gets the chance of landing the "freight." In this manner the performer's body serves as a convoy and screens the passage of the objects. This travelling "crane" is referred to in the trick entitled "The Flight of the Timepieces," and will prove of value in many other experiments in magic.

CHAPTER III.

CHEMICAL MAGIC.

The Enchanted Sun-Glass.

A story is told of a "bull's-eye" window pane, in the olden times, enkindling a heap of musty documents in the secluded abode of a noted alchemist through the accidental focussing of the sun's rays. Fortunately the occupant discovered the combustion of his valued property in time to extinguish the flames before the infliction of serious damage. Had these peculiar circumstances been brought about at night when the alchemist was asleep, as pointed out by one of his learned friends and advisers, this inconsiderate lens would have been responsible for a great conflagration. Those who regard the whole story as improbable, and who look upon the possibility of a night fire through the antic behavior of a bull's-eye glass with cynical scepticism, will be afforded an opportunity of observing the latent powers of an historic lens producing intense heat independently of the sun's rays. Undoubtedly this "bulging" pane of old had collected and concentrated the silvery light of the moon on many occasions, causing the condensed spot of ghostly heat to wander about the interior of that wizard's dwelling, although for unaccountable reasons no previous harm had been done, the related incident of the "spot of heat" alone revealing the treachery of its projector. As the story runs, the old glass was removed from the window and for ages lay in a dormant state, together with the crucibles and tongs disqualified for further use. "What eventually became of the old glass?

Did I hear some one ask its fate?" inquires the conjurer of his modern audience. "Ah! that is here among my treasures, carefully preserved and mounted in this little ring, just like an ordinary reading-glass. Did I hear some one say he did not believe it? We will see. I prefer to demonstrate rather than assert. Let us inflame this mass of paper by the light of the moon, or better still by the light of a candle." An ordinary newspaper is crumpled up and placed on a common kitchen plate, and the feeble rays of the candle are focussed upon it through the medium of the enchanted glass. The paper bursts into flame, showing that the treacherous powers of the old glass are still active.

The author has endeavored to outline a sketch of the trick, drawing a rather long yarn, which is not intended for the reader, but for those not so well versed in the secrets of magic. Let us examine Figs. 41 and 42 and discuss the mechanism and chemical application which constitute the necessary features of our innocent looking glass. The circular frame for the lens should be at least four inches in diameter for effect, and may to advantage be even larger. For a four-inch frame, a brass strip at least one-eighth of an inch thick and five-eighths of an inch in width should be bent carefully around a form and the ends be neatly brought together. A piece of three-eighths inch brass rod should be tapped with a screw thread for a distance of one-half of an inch and the little threaded length cut off and securely attached to a piece of brass the same width as the ring, but one-quarter of an inch thick and two inches in length. In order to make the connection reliable, a hole should be drilled in this little strip and the threaded length screwed in and soldered. This little support with its screw must now be placed in a vise and carefully sawed in half before soldering to the free ends of the ring. This will be made clear by referring to Fig. 41, where the ring is illustrated partly open, each end carrying half of the screw and supporting block. By taking to pieces almost any ordinary

reading-glass, the method of making will be made additionally clear. We must now procure a piece of heavy brass tubing and tap one end with a screw-thread to receive that on the ring. This heavy piece of tubing should be about one and three-quarters inches in length, and be provided if possi-

FIG. 41.

FIG. 42.

ble with a little ornamental ring around the top where the split piece screws in. We can now make the handle, which is of wood, thoroughly seasoned and dry. This is turned up on the lathe with a gentle taper on the outside and a smoothly cut hole on the inside, accurately bored to receive the brass

tube with a tight fit. A plug is now turned to fit snugly in the bottom of the handle and allow an open space between its end and the brass tube of at least one inch. This wooden plug should be glued in position after careful measurements as to length and fitting. It now remains to solder a tiny wire collar around the upper portion of the brass tube, to prevent it from slipping down into the tube beyond its proper distance, that is to say, it must not encroach upon the one-inch space left in the interior of the wooden handle.

We are now ready to refer to Fig. 42 and install the all-important portion of the secret mechanism. This consists of a small brass tube, bent at right angles at one end and left straight at the other, for the reception of a rubber bulb similar to those sold with fountain pens as refillers.[1] These may be had at drug-stores under the name of medicine-droppers. A small hole is now drilled through the brass tube supporting the frame for the lens, and the little end of the bulb tube, which is bent at right angles, is pushed through and soldered, leaving only a fraction of an inch protruding. The other end of this little tube, which should project about three-eighths of an inch below the large tube, receives the rubber bulb after passing through a perforated rubber stopper or cork to steady the whole and prevent strains from coming on the soldered tip. The rubber bulb is put in place on the free end of the tube and securely attached by tying with silk thread. It will be readily observed, by referring to Fig 42, how easily the tube with the screw-threads carrying the little tube and bulb may be removed for refilling or possible repairs. A small hole, one about one-quarter of an inch in diameter, is now bored through the side of the wooden handle leading into the hollow chamber reserved for the reception of the little rubber bulb. This little hole should be smoothly

[1] In order to bend this small brass tubing without closing up its interior, it should be filled with lead before bending, which may afterward *be melted out.* Lead may be poured in or lead wire thrust in.

cut and be fitted with a little button, by means of which the rubber bulb may be compressed from the outside. This completes the mechanism of the instrument, putting it in condition for shellacking, painting, or staining.

We must now direct our attention to the "old bull's-eye glass." The chances are largely in favor of running across a roughly cast lens in looking over bull's-eye lanterns in the hardware stores which are sold at very low figures. Of course, if the reader has access to a small blast furnace, such as is used in melting metal for small castings, a glass lens may be readily cast in a sand mould. If the reader does not care to go to this trouble, of course a plain piece of window glass will answer if cut to shape, provided the performer introduces the glass with a different yarn. The lens may be conveniently held in place in the frame by bending two rings of spring brass wire, placing one on either side of the glass and soldering at two or three points. This brass spring wire should be of about No. 16 gauge for appearance and proper strength.

Having finished the work and put the several parts together, we are ready for a trial of the incendiary powers of our glass. To make and preserve the fluid upon which the working of the enchanted glass is dependent much caution should be exercised, as careless handling of the ingredients, and especially of the finished product, will result in damage to surrounding objects and painful burns. The fluid with which we fill the little tube carrying the rubber bulb consists simply of a solution of white stick phosphorus in carbon disulphide. There are two conditions of phosphorus, the white waxy state, which we must obtain for our solution, and the reddish-brown phosphorus, which is insoluble and of no value for our experiment. Phosphorus comes in sticks about four inches long and one-half of an inch in diameter, and must be kept constantly submerged in water to prevent spontaneous combustion. This white, waxy phos-

phorus, if kept in a glass vessel of water exposed to the light, gradually turns red and becomes insoluble in the carbon disulphide which we will use. Be sure, in ordering from the chemical dealers or druggists, to state that the phosphorus must be white and waxy. This phosphorus may be cut under water with a knife, in the same manner as wax, but is highly dangerous if handled in the air. To make the solution, cut off a piece of the phosphorus about an inch long and drop into a two-ounce bottle provided with a glass stopper containing about one ounce of carbon disulphide. The phosphorus readily goes into solution and must be kept in a

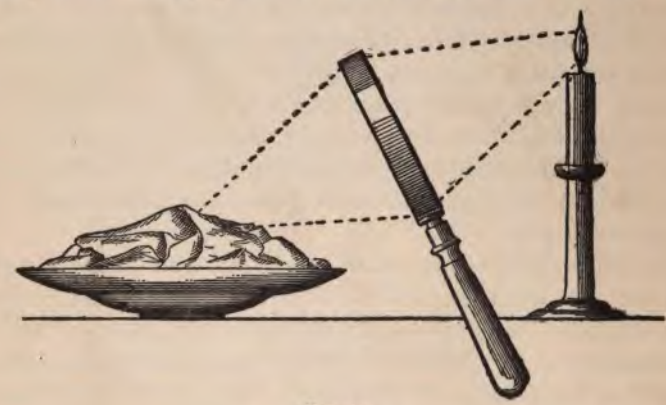


FIG. 43.

safe place, as an accident to the bottle will surely result in a fire if near inflammable material. This solution is also poisonous.

Having pointed out the character of the compound we are handling, the writer can conscientiously leave the matter to the care and wisdom of the reader. To fill the little pipe, the large brass screw tube is drawn out and is disconnected from the frame and glass for convenience in filling. The bottle containing the chemical fluid is tilted to one side, and the end of the little tube with the bulb com-

pressed is introduced. The end of the small tube should be freed from superfluous fluid by applying a scrap of blotting paper, which should most emphatically be treated with respect and put either out of doors or in the fireplace. The frame may now be screwed on and the supporting tube inserted in the wooden handle. The little push-button should not be put in place until the glass is ready for use, as it affords a ready means for accidental pressure.

FIG. 44.

Fig. 43 illustrates the use of the magic glass. To set fire to an object, it is only necessary to approach "within range" of the object to be inflamed and secretly "press the button." The fluid will do the rest. As it requires several seconds for the fluid to inflame paper, or cotton or linen in the case of a handkerchief, the performer is given ample time to move

the glass back and forth, "to get the focus." The fire starts exactly as if the concentrated rays of the sun were brought to bear, and spreads rapidly after ignition. If a cotton or linen handkerchief (of course an old one) does not blaze up quickly enough, it may be moistened with alcohol.

In order to vary the principle of the trick and produce the same effect, of apparent heat from a candle, the following experiment has been designed, bringing into play that beautiful chemical change, precipitation. By referring to Fig. 44 the enchanted glass is represented, in an inverted state (after the first experiment has drained the tube of its fluid), melting wax from a couple of fancy candles by focussing the rays of a third candle. The deception here lies in the two candles which are apparently melted. By introducing this trick immediately after the burning experiment, which differs entirely in principle, it seems certain that the enchanted glass undoubtedly collects sufficient heat to accomplish "anything it fancies." The wine-glass herein represented is said to contain water, in order that the melted wax may be conveniently collected and passed around for examination.

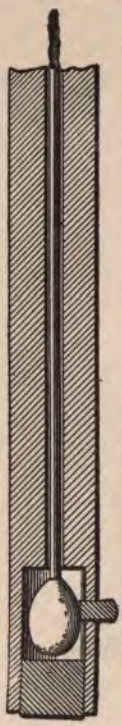


FIG. 45.

Fig. 45 shows up the trickery of the fancy candles. They are simply made of wood and painted or enamelled. One is painted white and the other a dull brick color. Each candle is fitted with a tiny brass tube and rubber bulb, together with a little press-button and hollow to receive it. A plug is made as shown to put in the bottom, which is of a removable character. The upper end of the tube is roughened with a file and blackened to resemble a wick, and is perforated *near the* end of the candle. The wine-glass should now

receive a crystal of silver nitrate about the size of a bean and be nearly filled with filtered water. After the silver nitrate is dissolved the glass should be set aside until required. The tubes in the candles are filled with two solutions respectively. The white candle should contain, in its little syringe, a saturated solution of common salt in water; the red candle should contain a solution of potassic chromate. A few crystals of the salt are dissolved in water and placed directly in the little tube. By focussing the heat from a candle flame upon the white candle and secretly pressing the little button, some of the salt solution is forced out and allowed to fall in the wine glass of "water"; as soon as the salt solution comes in contact with the solution of silver nitrate in the wine-glass a thick, white body forms and goes to the bottom like wax. This may be closely inspected by any member of the audience so desiring. The red candle is worked in a similar manner, allowing its solution to fall in the same wine-glass on top of the white "wax." A dense body of "red wax" forms instantly and goes to the bottom with the white. The glass may again be passed around for examination, and the "melting of wax" may be carried on until the glass is full of solid matter and nearly running over. Do not allow the contents to spill, however, as the sodium nitrate which has been formed is harmful to objects with which it comes in contact.

The Mysterious Goblet.

"Ladies and gentlemen: Unlike the glasses with which we are all familiar, the mysterious goblet is practically inexhaustible. When placed upon this little stand, completely isolated by a glass column and covered by this little metal cone, which, as may be observed, is entirely empty, rich red wine may be commanded to enter and completely fill the goblet as many consecutive times as may be wished. You would prefer to see? That is very natural. Let us examine

closely the magical goblet." The glass is passed around for examination, the closest inspection revealing only an ordinary goblet of rather large dimensions. The metal cone is rapped with the wand, emitting a hollow sound, and is held with the mouth toward the audience in order that all may see its unobstructed interior. "We will now place the goblet upon the little stand, which consists simply of a turned wooden base and top, cemented to a glass rod or column." Having satisfied the onlookers that the cone cover is entirely empty, it is placed over the goblet, and the whole covered with a colored handkerchief, concealing only the metal cone and a portion of the little stand's top. "Let us have a little music please, professor, during the time the magical passes are being made with the wand. Thank you, that will do. Let us now remove the covering and see if the wine has taken the place of emptiness." The handkerchief is thrown aside and the metal cone slowly lifted, revealing the *goblet full of a rich* red claret. "Let us pour the wine into this

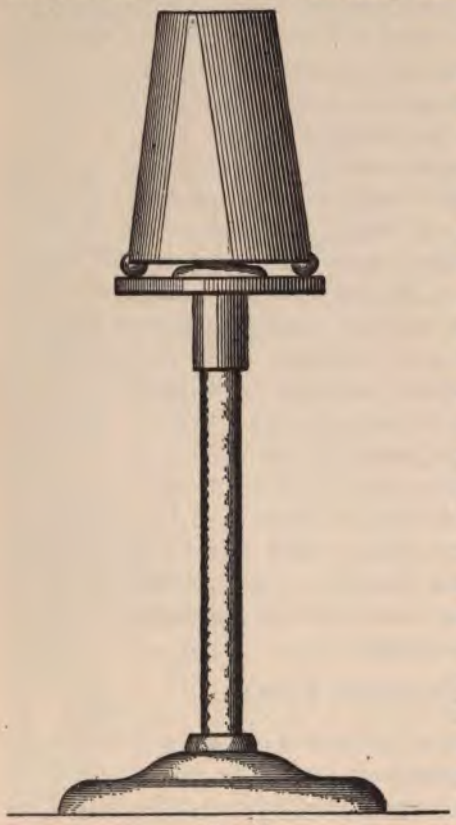


FIG. 46.

large decanter, and request the mysterious goblet to again fill itself." Suiting the action to his words, the conjurer again places the glass upon the stand and protects it from "draughts of air" by the cone cover and colored scarf. The music is again started and stopped, and the wonderful tumbler is uncovered, containing, as before, beautiful claret wine. This may be repeated again and again, if desired, until the spectators are willing to admit that the goblet is really inexhaustible.

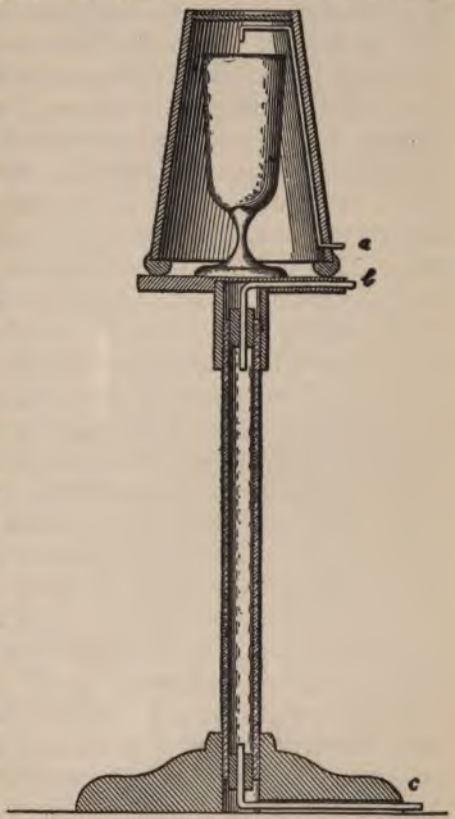


FIG. 47.

"I will now show, ladies and gentlemen, that this wonderful glass has, in addition, the power of dissipating the wine into space. For this experiment, I will simply place the goblet on these books, which, as you may see, are of ordinary style (the performer opens the lids, and shows the leaves and text), and cover with the same cone and handkerchief. A little more music please; there, that is sufficient, let us remove the covering." The cone and handkerchief are thrown aside and the glass is seen to be empty, and may again be passed around for inspection.

Having outlined the introduction of the trick, the construction of the apparatus is taken up. Fig. 46 illustrates the appearance of the stand, glass, and cone cover from the chairs of the audience, the whole being placed upon a light box or table, as convenience may require. We may now refer to Fig. 47, and study the section and principle of the apparatus. The glass column consists really of a piece of heavy glass tubing, known as "combustion" tubing by workers in chemical laboratories, which may be obtained by addressing any of the dealers in the chemical supply business. This tubing should, for our purposes, be about sixteen inches long and about three-quarters of an inch external diameter, of the heaviest weight made. The walls of this tube will be about one-eighth of an inch thick, making it very strong, and, when filled with filtered water, resembles so closely a solid glass rod that detection is impossible. A base is turned, from thoroughly seasoned wood (walnut is an excellent wood for this purpose), about six inches in diameter at the base, and bored through the centre to receive one end of the glass tubing, which may be cemented in place, allowing, as shown, a space between the end of the tube and the bottom of the stand. The little turned top is a trifle more complicated. A circular piece of walnut is cut from stuff about one-half an inch thick (the thinner it is possible to make this top the more effective the apparatus. The author does not suggest a thinner weight of wood, as it usually requires more skill and familiarity with tools than construction with thicker wood. If, however, the reader is well equipped he will undoubtedly choose the lightest material possible if he sees he can gain in appearance and effectiveness) and mounted upon a cylindrical block of the same wood, bored out to receive the other end of the glass column, leaving an unobstructed space between top and tube, as in the case of the bottom. To mount this *cylindrical* piece, a circular cutting is made in the little top

by means of the lathe, and two pieces securely glued together with furniture glue. We should now fit the stand with two little conveying pipes, which may conveniently be placed, if made from lead, owing to the ease with which it is possible to make bends and fittings. This lead pipe may be had of about the diameter of a good-sized lead pencil, and is sold in hardware stores for use with pneumatic bells.

To make water-tight connection with the large glass tube, two soft gum stoppers should be ordered from the chemical supply house, which come with holes through the centres. These stoppers are shown in place with the lead tubing in our illustration. The lead pipe C is placed in position by simply cutting a little groove under the base, after bending to right angles. Should the bore of the pipe close up too much in bending, try another piece, packing it full of powdered rosin under considerable pressure. In order to get the upper tube B in place, it will be necessary to cut away the table top on one side, and after running a couple of half-round grooves, putting together again. The end of the upper tube should protrude just enough to receive a piece of soft gum tubing which the performer secretly puts in position when the handkerchief is thrown over the cone. The cone may be made from sheet brass or tin, the former being to advantage polished, and the latter painted and decorated. This covering cup is neatly soldered together with the exception of the top, which is left until the last moment in order to facilitate the placing of the little lead tube which is illustrated inside, and terminating at A, receiving the other end of the short piece of rubber tube. This the conjurer secretly introduces to complete the system of piping when the apparatus is ready for mystification. This tube in the cone is simply soldered at intervals, taking care not to melt the pipe with the soldering iron when applying the solder. This may seem a difficult and almost impossible *thing*, but it is not, requiring only that the

worker apply the solder quickly, removing the iron the instant the solder "flows" in order to avoid melting the lead. Having placed the pipe in the cone exactly as shown in the figure, the top may be soldered in place. Little elevating feet add very much to the appearance of the whole, and may be of ball or straight cylindrical pattern. The "wonderful and mysterious" goblet may be almost any goblet at all, if of good height and considerable size.

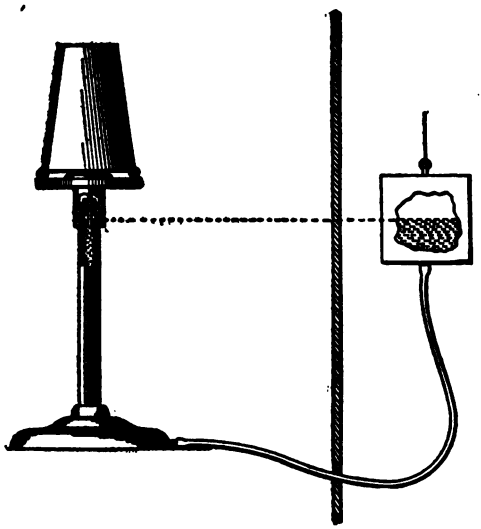


FIG. 48.

The method of keeping the glass column constantly full of filtered water, and of causing some to enter the goblet at will, is readily understood by referring to Fig. 48. The lead pipe at the base of the apparatus is joined by means of a piece of gum tubing to almost any length of the pneumatic bell piping, and is led away behind the scenes. Here a tank is seen suspended free to be raised or lowered by virtue of its rubber connections. By filling this tank, which consists of

a large tin bucket with outlet nozzle soldered on, the height of the water in the magic column may be moved to required levels by carefully controlling the tank. It will be readily understood that the raising of the tank causes the water to rise in the system of piping in the magical column and cone until it overflows into the mysterious goblet. On the other hand, it will be observed that the water level in the glass column should always be kept under protection of the cylindrical wooden portion of the stand's top, otherwise the hollow nature of the glass column will be revealed. Of course, the confederate behind the scenes must have a couple of marks between which it is permissible to move the tank, and must endeavor to keep the goblet from overflowing as best he can, although a little accident of this character would not injure the effect of the trick. Having made the water enter the glass, the question arises about the red wine, where the only passage open is the transparent glass column. This is where chemistry comes to the rescue, and gives the experiment the finishing touch. After the goblet has been passed around for examination, the conjurer slips two little crystals about the size of beans into it, one of ferric chloride, and the other of potassic sulphocyanide. The moment water comes in contact with these bodies an intensely red liquid is formed, resembling so closely claret wine that one is tempted to drink it. This must not be done, however, as the latter chemical body is poisonous. It is now quite obvious that the trick may be repeated many times, only

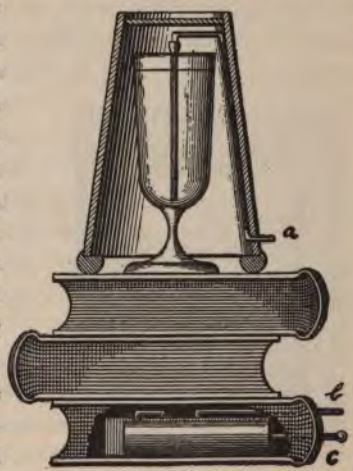


FIG. 49.

being limited by the supply of chemicals and the capacity of the tank behind the scenes.

The next illustration (Fig. 49) represents the cone cover in position to cause the wine to disappear, being mounted on a trio of large books. The two uppermost books are without trickery, but the bottom one is full of it. As illustrated, the little tube in the cone has been secretly supplied with a rubber extension running to the bottom of the glass in order to drain the last drops when suction is applied to the little protruding end of the cone's tube. The mechanism in the bottom book is merely to cause this suction and provide a place for the "wine" to go. To cause the contents of the goblet to disappear, it is necessary to join the pipe ends *a* and *b* by soft gum tubing after covering the cone with a colored scarf, and to give the handle C of a little vacuum pump in the book a strong pull.

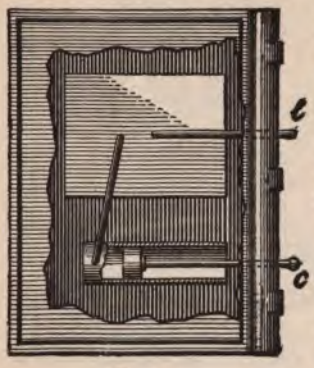


FIG. 50.

Fig. 50 will make the arrangement clear. Here a large book is represented hollowed out to allow room for an air-tight tank provided with the tube *b*, which is connected to the tube in the cone. The second pipe leads from this air-tight tank to the little suction pump. To start the siphoning effect, the pump piston is pulled strongly out, making a vacuum in the air-tight tank which starts the siphoning. The siphoning once started will not continue, however, unless the air-tight tank is opened to the atmosphere, which may be effected by pulling the piston completely out of the pump. This allows the siphon to work until the last few drops have been transferred to the tank in the book. As *this tank must* be absolutely air-tight, it had better be made

from a can which is known to be perfect, and need not be square as illustrated. This tank should hold a trifle more than the goblet, and the pump should have as large a piston area as possible in order to exhaust a large volume of the air.

The following proportions are good. Diameter of tank, if cylindrical, two and one-half inches; diameter of pump piston, two inches. These figures can of course be increased or diminished, provided the proportion is retained. The length can be made to suit the volume of the goblet and the available space in the book. Of course, all connecting pipes must be well soldered, and the pump's piston be well packed. The pump is conveniently made from a large piece of seamless brass tubing with one end closed by soldering on a head. The thickness of the tubing selected should be at least one-sixteenth of an inch. The piston may be turned from hard-wood, containing grooves for the reception of packing in the form of cotton string, etc. A brass piston accurately turned to bore, with grooves packed in the same manner, is far more desirable, although more difficult to make, requiring a metal-cutting lathe. The book can be cut out by means of a sharp knife, cutting out a few pages at a time. The cover, of course, and some fifteen or twenty pages should be left intact in order that the book may be opened with the other two. The apparatus of this trick must be carefully made, with due attention to neat appearances.

The Miniature Inferno.

"Like that described by Dante in his far-famed work, the 'Divina Commedia,' the miniature inferno to which we will introduce some travellers this evening causes them to undergo severe tests by fire and pressure, terminating in happiness and safety. The name Commedia was bestowed upon this immortal poem by the author himself, by reason

of its awful beginning and happy ending. As the little inferno with which we are to work this evening is of very limited capacity, the travellers must necessarily be of modest

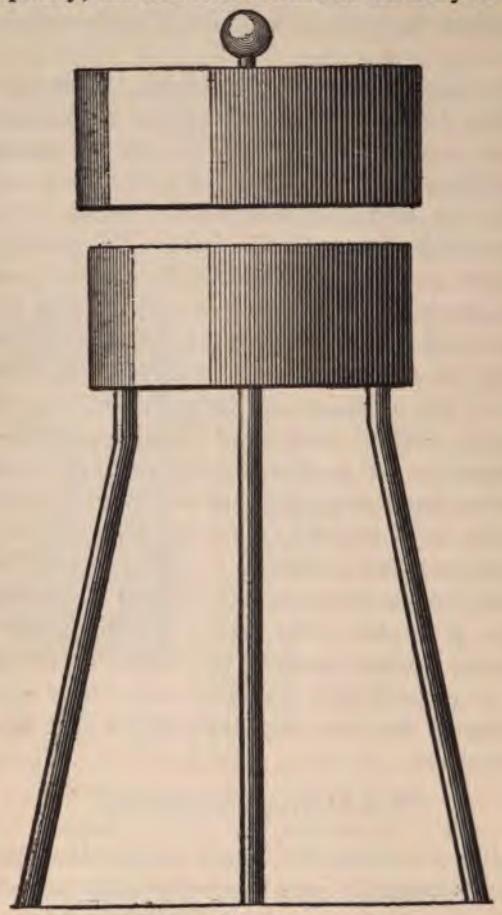


FIG. 51.

dimensions. In order to make the initial stages of the experiment as distressing as possible, and the closing features *as bright as those* accompanying the rescue from destruc-

tion of valued friends, the little travellers should be small, delicate, and of great value. To thoroughly satisfy these three requirements it will be necessary to borrow four or five diamond and pearl rings. Will the ladies present this evening be kind enough to assist by lending a few rings? Any small rings with delicate settings. Thank you very much. May I have one or two more? Thank you, that is very gracious of you. I am greatly indebted by this accommodation and kindness. We will now ask one of the ladies to string the rings on this bit of ribbon and take charge of them until everything is ready." A little cylindrical brass box is now introduced which is mounted on three slender legs. This little piece of apparatus is illustrated in Fig. 51, providing the abode where discomfort and destruction reign. This little receptacle is placed upon a small round table, and is brought to the edge of the stage close to the seats of the audience. The top is lifted off a few inches and is rapped sharply with any convenient metallic body, showing up brass construction by virtue of its ring, the bottom portion of the little box being struck in the same manner. The little furnace illustrated in Fig. 52 is next brought forward, and is placed upon a second little table, to which a rubber

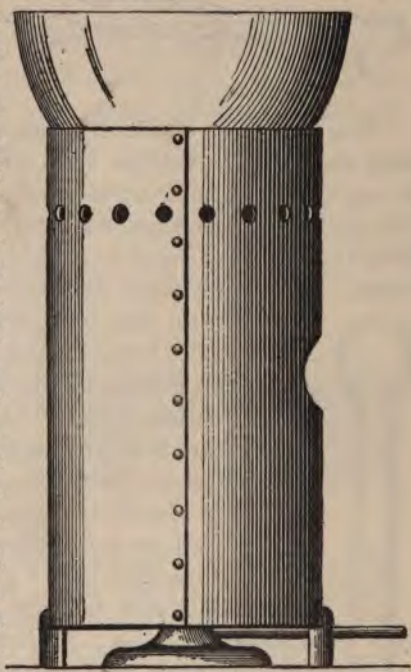


FIG. 52.

tube is run in order to supply the necessary gas to the Bunsen burner through the medium of which intense heat is obtained. Long and short crucible tongs are provided by means of which the iron dish shown at the top of the furnace may be handled when hot. These are illustrated in Figs. 53 and 54. In addition to these articles, a couple of round wooden pill boxes, together with several good-sized hunks of lead, are placed upon the table with the furnace.

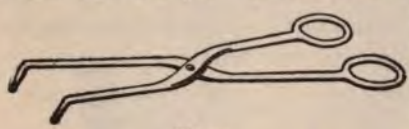


Fig. 53.

"We will now conduct some experiments with molten lead, showing its intense heat and properties of solidifying to any desired shape upon cooling. Let us place some of this lead in the iron pot and start the gas burner under the little furnace, and make a cast of lead in one of these wooden boxes." The performer lights the gas and arranges the pill boxes while the lead melts. "The metal has become fluid," remarks the conjurer as he gives the iron pot a gentle tilt to one side by means of the short crucible tongs. "Let us pour some of it into one of these boxes and note the result." The box is brought down from the stage and supported on a fire-brick placed on a small convenient table in order that all may see the metal cast. The lead is poured into the box with a steady hand, charring the wood a few seconds after it comes in contact with it. The box continues to smoke and char, impressing upon the audience the destructive temperature of the fluid lead. The conjurer gently touches the surface of the lead with his wand, and pronounces the metal still in a molten condition. "Before we allow this cast to solidify, I will push this little wire rod down to the bottom of the mould in order that *it may* be conveniently removed." When the lead "sets,"

Fig. 54.

the box, which is still smoking copiously, is broken off the cast, and the lead is removed by means of the rod, which has the appearance seen in Fig. 55. This the performer passes around, cautioning those who wish to inspect not to touch even the wire handle. "I am now ready for the rings. Will you kindly hang them by means of their ribbons on the end of these long tongs? Thank you. Watch them closely, please, while I place them in the little 'infernal region,' which is an improvement upon the pill box as it will not burn or crack, but retain the heat without contact with the air after the cover is placed on it." The conjurer places the rings directly in the little box, and again starts the fire. Another hunk of lead is placed in the pot, which is removed with the short tongs when the metal has become fluid. "This molten lead, ladies and gentlemen, furnishes the destructive element of the miniature inferno, which I will pour in on top of the rings, casting them into a solid cylinder of lead. The lead is now directly emptied into the little brass box, its silvery stream being seen by all in the audience. The cover is placed on it and time allowed for the metal to begin its solidifying. "As we cast a wire in the first mould, we will cast a second in the present one," remarks the performer, as with his hand he attempts to remove the cover. "The tongs must be used for this. Ah! that is an improvement. I will place the cover here. The lead is about set; I have just time to cast in this wire. That is fine! One moment and it will be ready to come out!" The magician waits a minute, and then produces on the end of the wire a second cast of lead, exactly the size of

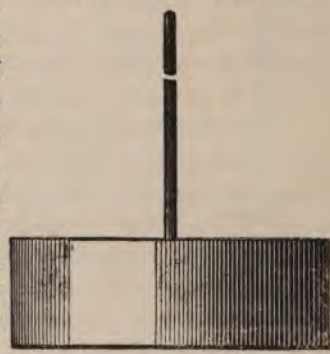


FIG. 55.

the little brass box in which it was moulded! "The rings are in the centre of this cast, under terrific strain, at a temperature of 617°! Those who do not believe that the rings can be removed from the very centre of this hot lead cast unharmed will have an opportunity of observing for themselves. I will remelt this cylinder of lead, and take the rings from the iron pot while it is still on the fire." The iron pot is shown to be entirely empty, before placing on the furnace, being passed around for inspection if desired. The cylinder of lead is placed directly in the pot and the burner started. In a short time, the heretofore rigidly attached rod may be easily removed, and the bunch of uninjured rings can be picked out by means of the long crucible tongs held at arm's length.

This is the effect of the trick upon those in the audience, if the apparatus has been skilfully handled. Let us now look into the secret of the experiment, and take steps toward the construction of the necessary implements. Everything is devoid of trickery with the exception of the little brass box and stand, and the magician's wand, the furnace, tongs, and crucible are of ordinary pattern. The first melting and casting of the lead is genuine, pieces of the metal being simply fused in the iron pot, and cast directly into little wooden moulds. The lead when only partially melted should be passed around in the crucible by means of the tongs, showing the unmelted lead floating about on the fluid. In melting the lead over this little furnace, the performer should state that the metal is becoming fluid before it really is, for which reason the reader will understand presently when reading the description of the second melting.

Having shown the spectators the ease with which he causes lead to cast itself into cylindrical masses, the performer begins the second "fusion." Here the first real trickery is introduced. Several pieces of the lead are *dropped into* the crucible, and the burner is started. The

Bunsen burner has a little collar around the bottom portion of its tube, in order to give a non-luminous and luminous flame at will. For greatest heat the non-luminous flame should be applied, as in the melting of the first lead. For the second "cast" really no heat is desirable, although it will be necessary to maintain a small flame, in order that the absence of fire shall not be noticeable through the holes in the little furnace top. For the second "melting," therefore, turn the burner's collar in such a way that the gas burns with a luminous flame, and have that very low. The little furnace is the simplest possible to construct, the writer deeming directions unnecessary beyond stating that the seams cannot be soldered, and must be riveted instead. The performer, wand in hand, approaches the crucible after a few moments' time and pronounces that the lead has begun to "flow." This of course is not the case. The reason for the deception in the first melting is simply to lead the audience to believe that it only requires a few moments to melt lead, in order that the crucible (which must have cooled off entirely) may be removed from the furnace before its contained mercury is heated. When the performer approaches with his wand, he simply touches the inside of the crucible with one end of it, allowing its contents of mercury to run in with the lead.

FIG. 56.

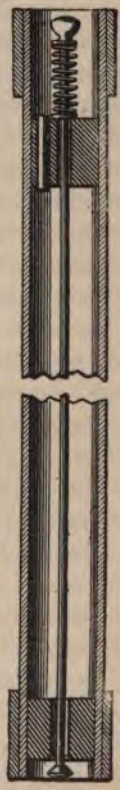


FIG. 57.

The elevation of the wand is illustrated in Fig. 56, and the section showing the mercury chamber and valves in

Fig. 57. The second melting, therefore, is a bold deception, mercury being shown as molten lead. If the crucible is removed from the furnace, and passed around for inspection, as was suggested in the case of the first cast, the spectators will perceive the lead which was thrown into the crucible floating around on top of the mercury which was secretly introduced. The effect is deceiving in the extreme, it being impossible to detect the difference between the real thing and the substitute, especially if the mercury is a little dirty. If a few small pieces of solder are put in with the lead, some of the tin in the solder will amalgamate with the mercury, causing it to flow with a little more difficulty, and resembling, if possible, still closer the molten lead. The reason for removing the mercury so quickly from the little furnace, and for having the Bunsen flame turned down so low, is to prevent the mercury from heating and emitting its poisonous vapor. Do not heat the mercury under any circumstances! This will not be necessary if the audience is deceived in the time required to melt the lead in the first case.

Let us now examine the little wand and take up its construction. This consists of a steel tube with thin walls, seven-eighths of an inch external diameter and fourteen inches in length.* It should be ornamented by a couple of brass collars brazed on as illustrated, which may be made from tubing of slightly larger diameter, cut to fit on the lathe. The internal mechanism is very simple, consisting of the steel rod and spiral compression spring, supported by a couple of perforated rubber stoppers. These may be had together with crucibles, tongs, etc., from any of the dealers in chemical supplies. The lower stopper simply has a central hole, forming a valve seat for a little brass knob. The upper stopper has, in addition to its middle opening, a little

* The use of brass is not advised for this wand, as it is slowly attacked by the mercury.

hole near the edge for the reception of a short piece of brass tube, which serves for the filling of the wand with mercury. One charge of this wand is sufficient, and by a little practice the crucible on the fire may receive secretly the necessary amount of "molten lead." It is only necessary to carelessly touch the inside of the crucible with the wand, and press the button or knob at the top.

Now for the little "inferno" itself. By consulting Fig. 58 the trickery of the little box will be revealed.* This consists of an accurately made cylindrical receptacle, mounted, by drilling and soldering, on three little brass tubes for legs, which open into its interior. Directly in the centre of this box is the little chamber for the reception of the valued rings. This little box has a small hole through its bottom provided with screw-threads as shown, the use of which will be made clear presently. On either side of this central opening will be seen two little centering pins, entering two tiny drillings in the bottom of the ring container. The top portion also contains mechanism which is in the form of a cast lead cylinder having a little chamber exactly to accommodate the little ring box. This lead weight is cast in a turned wooden mould a little larger than the brass box with which it is to be worked, and accurately cut to size on the lathe. It is on the lathe that the chamber for the reception of the ring box is cut. This lead form, which must fit to a nicety, is supported under the cover of the "little inferno" by means of a screw on the end of a short rod terminating in the little ornamental brass ball on top. A little washer is illustrated between the lead weight and the under side of the top of the box, which allows of the hollow ring of the metal when the box is struck from the outside with a metallic body, giving, to all appearances, an empty account of itself. The little washer is soldered fast

* The use of brass for the box and other portions of this apparatus is permissible, if the inside receives a thin coat of shellac.

to the little ball's shank and screw, so the top of the box may still be held in suspension by its handle after a turn of the thumb on the knob causes the lead mould to be released.

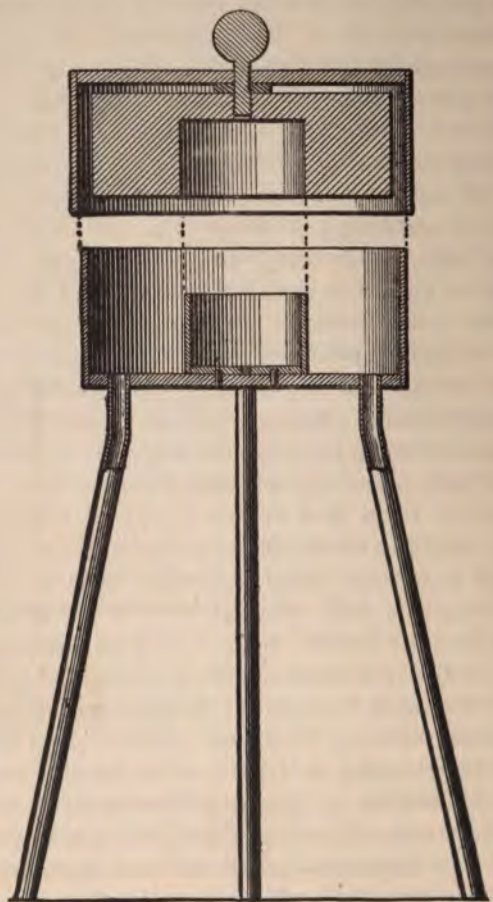


FIG. 58.

The rings once placed in the small central box, the "molten *lead" may be* poured in around it, taking care not to allow

any to get on the rings, as it is sure to amalgamate with the gold and cause a controversy with the owner, and give a clew to the secret of the trick, which is even worse, if such a thing is possible. One of the hollow legs must be opened at the bottom, and be so placed that the mercury can run into a little reservoir in the table top. The cover is now placed in position, and the knob secretly turned to the left by thumb and forefinger, which releases the lead form, allowing it to remain in the box when the cover is again removed. This should be removed with the tongs, the performer merely touching with the thumb and forefinger an instant, secretly turning the knob and feigning to burn himself. The lead cylinder is now ready to receive the brass wire which is to be "cast" in the centre. We will now understand the reason for making the small hole with the screw threads in the bottom of the little ring receptacle. The little brass rod has a corresponding screw thread smaller than that in the lead "cast," which allows it to pass through without engagement. This little rod is now screwed in place by a secret twist when the lead is ready to be removed and exhibited.

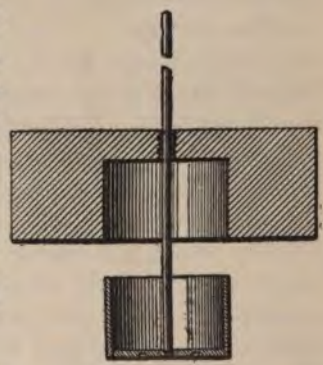


FIG. 59.

Fig. 59 shows a section through the lead "cast" with the little ring box pushed out. In order to restore the rings the lead cylinder is placed in the iron pot and the fire started. To give the appearance of fusion it is only necessary to unscrew the rod and remove it, as if the lead had melted away from it. The two pieces of lead and brass respectively, which constitute the trickery of the inferno, are taken to pieces by means of the tongs while in the cruci-

ble, and the rings removed and handed to their owners without touching them with the hand. The apparatus must be very carefully made and introduced only after repeated practice with it, bringing in all the plausible deceptions which tend to enhance the effect. The experiment may of course be varied somewhat to meet the ideas of individual conjurers.

The Strange Disappearance.

"During my visit to East India, ladies and gentlemen, it was my good fortune to behold the strangest case of disappearance I had ever witnessed. Although the objects dealt with were of very modest dimensions, I deemed the experiment well worthy of study and attention. I am going to reproduce the disappearance this evening, and trust it will prove as interesting to you as it was to myself. The little wooden column or stand, which you see placed close to the edge of the stage, serves to isolate the little traveller, cutting off all means of communication with the stage and surrounding room. I will now introduce a little silver elephant, and mount him upon the little column, making a miniature statue. He is very solid and heavy, as you may judge by the sound produced when I allow him to fall upon the table. There! He is a veritable paper-weight, apparently possessing no qualifications which will enable him to float off in the atmosphere. We will now place the little column upon a plate of glass, and put this crystal shade over the statue. There! See how important he appears through the glass. I will now cover the shade with this colored scarf; it does not fall all the way to the bottom, but that does not matter. It is my intention to cause the little elephant to leave the column, passing through the glass shade and away into space. Where would you like him to appear? Shall I ask him to enter the pocket of some one in your midst? Very well, I will take up my wand and command him to leave. *One, two, three!* he has left; let us remove the scarf and

see for ourselves." The cover is taken off, revealing the little stand without the elephant, which is taken from the coat

FIG. 60.

of a gentleman in the audience. This is the effect of the trick in its simplest form.

Let us look into the secret of the experiment and elabo-

rate upon its introduction if we wish. Fig. 60 illustrates the appearance of the little elephant and stand before the glass shade is put over them. Apparently the stand and elephant are free from trickery, but it would be difficult to say which is the greater fraud. The little elephant consists of frozen mercury, and the little column of a recep-

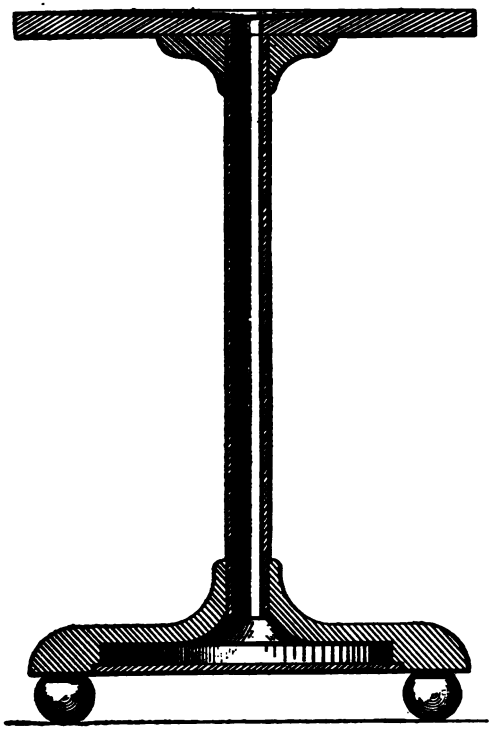


FIG. 61.

tacle to receive the mercury after melting. By referring to Fig. 61 a section through the little stand may be seen. This simply consists of a hollow, turned wooden base, and a "dished" wooden top, joined by a length of brass tubing. *The "dish" of the* top portion is readily made on the lathe

after turning up the disc. This dishing need be only very slight, in order to direct the mercury as it melts to the central hole where it falls into the base receptacle. The construction of this little column being too simple to require detailed directions for making, the following pages are devoted to the freezing of mercury.

In these days of wonders it should not be asking too much of the scientific conjurer who wishes to advance his art to look into some of the great possibilities of science. Mercury may be frozen as hard as stone by the evaporation of solid carbonic acid dissolved in ether. Not only can the conjurer freeze the mercury necessary for numerous experiments, but he will be enabled to freeze quantities of water in the most mysterious manner and produce ice-cream directly upon mixing together the necessary ingredients. As an elephant is a trifle more difficult to "cast" than a cube or cylinder of mercury, the directions will be for the freezing of simpler forms to begin with, leading up to more complicated objects. For example, the mercury elephant could be frozen with some six or eight substituted "diamond rings" inside which may be tied together with a ribbon and inserted in the mould before reducing the temperature.* By doing this it is obvious that they will remain on the little column after the elephant has departed.

FIG. 62.

Let us take up the use of the solid carbonic acid, which we will refer to as CO_2, its chemical formula. This may be bought in a liquid state, and even in its solid state, from some of the large chemical supply firms. When ordered in its solid state its use must follow within an hour or so, as it evaporates slowly and disappears. In its liquid state it can be bought in small steel cylinders and kept for any length of time. Fig. 62 shows one of the small containers with a convenient valve for allowing it

* Do not allow genuine gold rings to come in direct contact with mercury under any circumstances.

to escape. (In ordering this cylinder state that it is wished to furnish a stream of liquid CO_2, not the gas. For the liquid the valve must have a long siphon tube running clear to the bottom of the container.)

Assuming that the reader who wishes to experiment with artificial cold has procured a small cylinder of this interesting

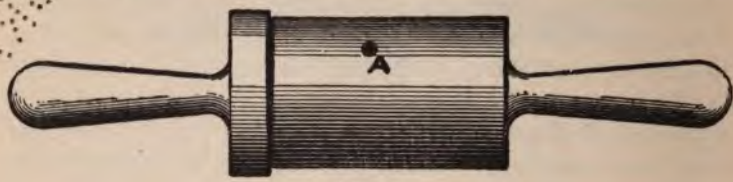


FIG. 63.

compound, the writer takes up the description of a little collector for the solid, which may be made by a tinsmith or be ordered. Fig. 63 illustrates the outside appearance of the collector and Fig. 64 its section, a transverse section being given in Fig. 65. This little cylinder is made of brass with wooden handles driven on brass tubes leading into the inte-

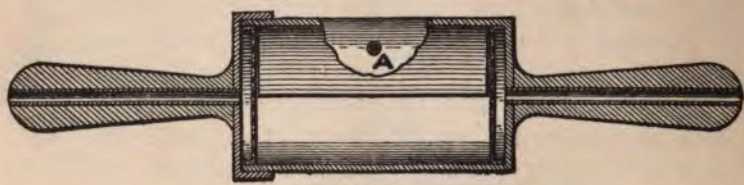


FIG. 64.

rior as shown. Covering the ends of these tubes on the inside are two perforated metal discs, to allow of the escape of gas, but arresting any solid. In addition to these the little chamber is provided with a deflector, or curving brass plate, illustrated opposite the tubes A and A in Figs. 64 and 65. By screwing this little box on to the cylinder containing the liquid CO_2 by means of the screw-sleeve at A in Fig. 65, and

opening gradually the valve, a stream of liquid carbonic acid enters. This stream strikes the curving deflector and passes around the box with great vigor, a portion evaporating and forming a white solid which is detained by the "strainers." The gas resultant of the evaporation passes out through the hollow handles. The solid should be shaken out and put into a wooden form with a rammer (Fig. 66) and be packed into a solid cylinder. When this is full the bottom should be pushed out, and the cylinder of solid CO_2 be transferred to a glass beaker of the same size which is supported by a wooden ring within a muff box. Fig. 67 illustrates this with a watch-glass over the beaker, and an air space all around. With this arrangement the snow-like solid will keep several hours. A word or two of precaution should be given as regards handling the solid carbonic acid. The best rule is not

FIG. 65.

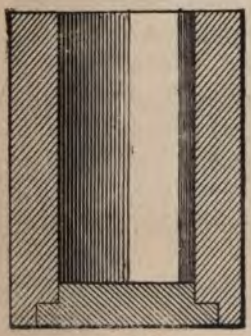


FIG. 66.

FIG. 67.

to touch with the hands at all, although pieces may be picked up if very lightly handled. If, however, a piece is pressed between the fingers painful frostbites result. Do not try to keep the solid in any confined place such as a flask or bottle, but in the beaker simply covered with a watch-glass. As the temperature of the solid is kept below its melting point by its own evaporation, it will be apparent why it is kept only lightly covered. If confined, the gas generates and creates a dangerous pressure. To freeze a pound or two of mercury, procure a little cylindrical wooden box top and pour the mercury into it. Now cover the mercury, by pouring in some ether and throwing two or three pieces of our solid CO_2 into the ether. By the rapid evaporation of the CO_2 in the ether the mercury is soon frozen into a cake. In pouring the ether do not stand near any flame, as its vapor is inflammable. Having produced simple "casts" of mercury the reader may undertake more elaborate work. The small ice-cream moulds which are made from pewter answer admirably for our purpose if closely ground together to hold the mercury without leaking.* A wooden or plaster mould does not answer as well, as a metallic mould conducts the heat away from the mercury much quicker when it is immersed in ether and covered with our solid CO_2. With a little practice and experimentation almost any form may be "cast" in frozen mercury.

A word about handling the frozen mercury must now be given. The same rule as given in regard to handling the solid CO_2 may to advantage be followed. To introduce the "elephant" it may be suspended from little colored ribbons and handled in this way. To freeze any small objects inside the mercury, it is only necessary to place them carefully within the mould and pour the mercury around them. The objects should be raised on a little piece of wire in order that they will be cast in the centre and not on one side. A

*The moulds must receive an inside coat of shellac.

very pretty effect with frozen mercury may be shown by freezing in a wire handle by means of which the mercury cake may be suspended. A large clear glass receptacle is filled with filtered water and the mercury suspended within. On melting the mercury falls to the bottom in silvery streams through the water. The reader is free to perform many beautiful experiments and invent other tricks dependent upon secret freezing.

CHAPTER IV.

ELECTRICAL MAGIC.

The Obedient Padlock.

Had the cell doors of the Bastile, or the gates of detention in the fortress San Leon, been equipped with such accommodating mechanism, friendly to those of the Black Art, as the herein-described magic lock, the notorious Count Cagliostro would have fared less badly because of his illegitimate use of sleight-of-hand and fraudulent practice of medicine. Although this celebrated trickster caused the bolts in the Bastile to be unbarred, regaining his liberty to again practise theft and impose upon the ignorant with his "elixir of immortal youth," the locks of the fortress San Leon were turned upon him with less mercy, imprisoning him until his death in 1795. As the following pages are devoted to a constructive description of a specific piece of mechanism and its accessories, the author refers those interested in this famous quack to the miscellaneous essays of Carlyle, where an absorbing picture of him is painted. By referring to Fig. 68 the "portrait" of the lock may be seen, its true "character" not being learnable from its face. In addition to familiarity with the physiognomy of the lock, one may become intimate through handling, unlocking, and locking by means of its key, without the slightest chance of the lock's real character being understood. Unfortunately for those who practise sleight-of-hand on the streets of our modern cities, the lock herein depicted is the only one in existence, although the following description may lead to the completion of others for the liberation of ghosts *and phantoms.*

Fig. 69 shows up the lock from behind, the back plate being removed. This lock should be made at least eight and one-half inches in height, measuring from the bottom to the top of the hinged staple or hasp, and six inches in extreme width. The lock is best made from hard, well-seasoned wood, and is put together with furniture glue in combination with brass brads or round-headed screws. In starting the construction of this padlock, a satisfactory design is drawn full size by means of French curves and compasses, on a smooth piece of pine board one inch thick. If the lock is to be painted, black walnut will answer admirably, the thin covers for the front and back being readily obtained in this wood. Having completed a full-sized drawing of the lock on the one-inch board, the design is cut out by means of a band saw, the use of which may be had in almost any pattern-maker's shop or saw-mill. This cutting may of course be done by hand, employing a fine tapering blade used in sawing out circles, but the resultant model is liable to be a little less accurate. Having this accomplished, the centre must be sawn out,

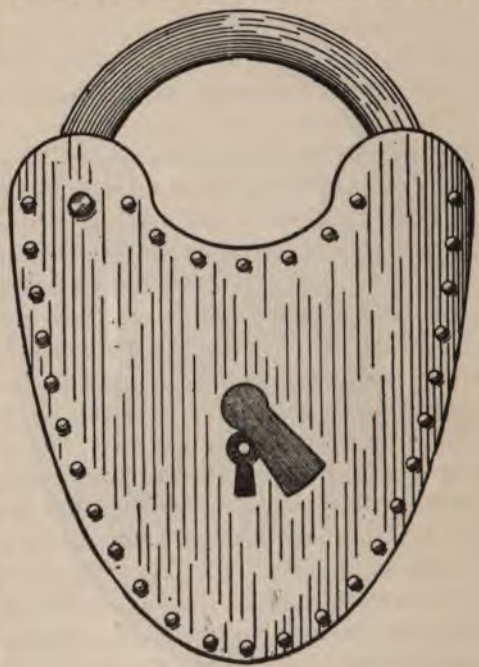


Fig. 68.

leaving a wall at least three-eighths of an inch thick all around. Where the staple of the lock hinges, the wall must have an inward curve, as illustrated in Fig. 69, the wall being shaded with cross-sectional lines. Two additional pieces of wood must be sawn accurately to pattern, from wood one-eighth of an inch in thickness, which constitute the front and back covers of the lock by gluing and screwing respectively to the thick pattern or frame. The front plate is securely glued and screwed to the front of the lock, some thirty round-headed brads or screws being put in for effect. In order to prevent the splitting of this frame by the screws, small gimlet holes must be carefully made for their reception.

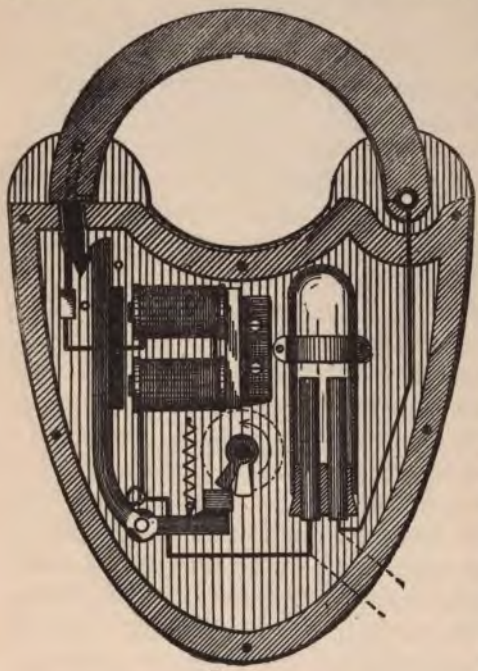


FIG. 69.

The hinged finger or staple is sawn from a piece of the one-inch board to a perfect semicircle five-eighths of an inch in depth, by the one inch in thickness. A thin brass catch is filed to shape, and attached to the free swinging end of the hinged hasp as shown. This catch may be made slim and broad, extending across the width of the lock, *or it may be* a little over one-quarter of an inch square,

with a one-inch shank running into a hole in the staple. If a square catch is made, the wall of the framing should have a neat square hole cut out to allow the easy entrance of the catch into the lock. In order to make the connection between the shank of the catch and the swinging staple secure, both should be drilled through and be provided with little hardwood plugs driven in. The catching mechanism on the inside is very simple, designed to be tripped or thrown by means of a key, as illustrated, or by means of the pair of electromagnets.

This catch may be made entirely from iron, or be cut from brass and be equipped with an iron armature opposite the magnet poles. As the front of the lock is only a thin wooden cover, the magnets and the pivot cannot be made very secure by screwing directly to the wood, so the use of a thin brass plate is introduced. This brass plate (not shown in the drawing) can to advantage be made to cover the keyhole, being drilled out to just admit the key. In order to prevent the key from wabbling in the lock, the back plate before screwing on should be provided with a pin, fitting into the hollow of a chosen key for the operating of the mechanism. A spiral spring keeps the catch away from the magnet poles and in contact with the locking-catch. It will now be seen that the lock is closed and opened exactly like an ordinary spring lock, having a secret pair of electromagnets in addition capable of releasing the catch with the key absent. This lock, being self-contained, carries its own battery for the operation of the magnets.

Before describing the type of battery, the operation of the lock will be explained. It will be observed that the brass catch on entering the lock makes contact with a spring jack, or electrical contact strip of brass. This spring jack leads to the electromagnets, and thence to the pole of the little battery. The other pole of the battery is connected to the pivot of the swinging staple. This pivot is of brass mounted

on a little brass plate for strength, and is screwed to the wooden sides of the lock. Two thin strips of brass or copper are bent around the staple, and are attached by the smallest brads. As illustrated, these do not meet in the centre, but are separated by a space of about one-eighth of an inch. It will now be readily seen that any metallic body brought in contact with the under side of the hasp will complete the circuit by bridging across. One of these strips is secretly attached to the pivot of the swinging staple, and the other to the brass catch, joining up in such a way that the catch of the lock will be thrown the instant the little gap under the hasp is bridged.

The battery in the present case consists of a large glass test tube or combustion tube, such as are used in chemical laboratories, fitted with a rubber stopper having two holes. These may be had from the chemical supply houses, the combustion tubes being preferable because being made of heavier glass. The elements of the battery consist simply of a carbon and zinc stick. As illustrated, the battery is seemingly installed upside down, but this was intentionally done in order to put the battery out of use when not needed, by turning the lock bottom side up, causing the exciting fluid to occupy the free end of the tube. The exciting fluid may be either a solution of bisulphate of mercury, or bichromate of potassium and dilute sulphuric acid. To excite the battery with bisulphate of mercury, about one-half teaspoonful of the powder is put in the glass tube, and sufficient water added to allow of the covering of the elements when the battery is in use. To charge the cell with bichromate of potassium and acid, an ounce of sulphuric acid should be added to three ounces of water, and a lump of bichromate of potassium dropped in about the size of a walnut. With this solution the zinc of the battery should be amalgamated with metallic mercury. This is quickly done by dipping the zinc in the acid *solution for a few* seconds, then removing and rubbing with

mercury by means of a rag until the surface of the zinc shines like a mirror. The magnets should be wound with comparatively fine wire in order to secure good excitation with a single cell of such small dimensions. For best results the resistance of the magnet wire should equal the resistance of the battery. Of course, if two such cells are added, the lock will open with more energy.

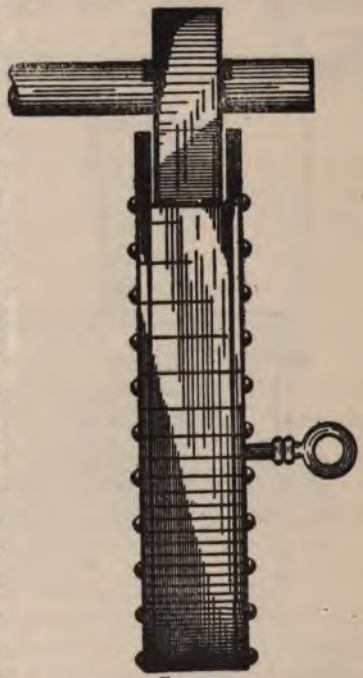


FIG. 70.

It will also be apparent that the lock may be worked from an outside battery, whose wires can be secretly brought in contact with the copper bands under the staple if the two wires where they enter the little contained battery are twisted together. These wires are marked with dotted lines, showing how easily the battery may be "shunted out." The back plate of the lock may now be screwed on, and the lock carefully sandpapered in order to make all edges neat-looking and even. The back of the lock should have the same number of screw-heads displayed as the front, for the sake of appearance, but only six of these need be genuine screws in order that the back may be easily removed. Some little care and skill are necessary in the making of this lock, as it should present only the neatest and most innocent appearance coupled with smooth working. Having charged the battery and screwed on the back, the lock may have its preliminary test.

Fig. 70 shows a method of exhibiting "the wonders of its intelligence." In this case the lock is represented hanging from the end of the magician's wand. The wand has a little metallic saddle of copper or brass attached near one end, which may be brought in contact with the bands under the staple of the lock by secretly turning the wand.

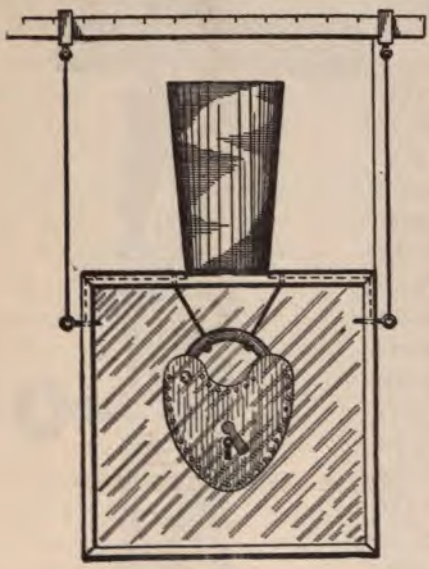


Fig. 71.

The conjurer may hang the lock from one finger, allowing the double bands to come in contact with his ring when the lock is commanded to open.

Figs. 71 and 72 illustrate two additional methods of presenting the trick. Fig. 71 represents the lock hanging from a couple of hooked wires on the inside of a glass box. The box has thin wooden framing and glass sides like a honey box. The screw-eyes are for effect, made to pass right through the sides of the framing. The top of the box is provided with little copper plates connected with the supporting hooks, which may be joined by standing any metallic body upon them. In the present case a little tin cup without any bottom is represented standing upon the plate. The bottom edges of this cup have been shellacked, making the device inoperative, unless the key or a coin is thrown in.

Fig. 72 shows a design for an automatic device with which *the lock* may be opened without the assistance of the opera-

tor. This little stand may be placed upon a piece of glass, and be covered with a glass shade, and yet the lock will be opened at the command of the magician. This stand has at the hook a couple of small insulated saddles, with connecting wires running to the base. Here a cheap watch movement is provided capable of connecting the circuit at almost any predetermined time. The performer must know when to expect the watch to make contact by experimentation after it is once released, or he may state that the lock will open when a despatched spirit has completed a certain journey, arriving, as a place of destination, within the glass shade which covers the lock and stand.

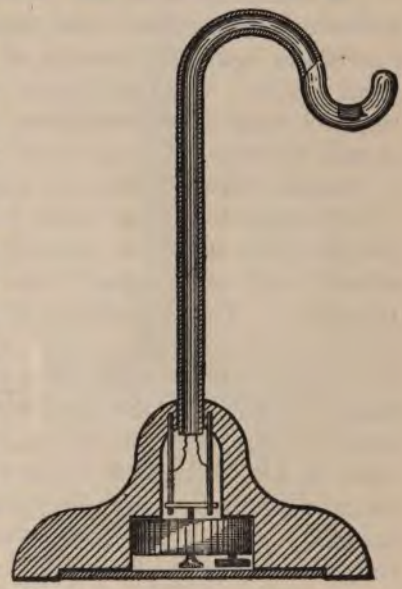


FIG. 72.

The lock may be taken from the little stand at any time, and be examined by any one who may unlock it by means of its key, locking it again himself with a snap. Without the "proper key" the lock is as stubborn to the outsider as an every-day mule.

The Demon Candlesticks.

The demon candles and candlesticks represented by the following illustrations were designed for the purpose of furnishing light and a source of flame for the modern conjurer's table. They are capable of mysteriously extinguishing and relighting themselves as many consecutive times as may be required at the wave of the magician's wand, and if brought forward near the edge of the small stage create a very surprising effect when exhibited upon a light board placed across a pair of trestles, small round stands, or the electric and combination table described at the close of Chapter I. The appearance of these magical candlesticks mounted upon a light trestle is shown in Fig. 73, viewing them from the audience. The effect of this is perhaps enhanced by standing the candlesticks on pieces of newspaper, and covering them with tall glass shades, giving the appearance in a very marked manner of absolute isolation from things surrounding. In addition to this the shades may be covered with silk handkerchiefs or colored scarfs, allowing the candle flame to be seen through the colored silk, as it apparently jumps from one candle to the other, through the glass shades, silk scarfs, and intervening atmosphere. The candles can be made to answer queries, and count out the spots on cards, in addition to numerous other tricks which will undoubtedly suggest themselves to the performer. The supports or stems of the candlesticks are made of glass for effect, as they discourage electrical theories as regards the lighting of the candles, and add to the effect of total isolation. These glass tubes are very conveniently cut from glass tubing, known to chemists as combustion tubing, of which we have already become familiar, if the chapter on Chemical Magic has been read. This tubing is rather thick, *but may be severed*, as the average reader doubtless knows,

by cutting a notch around with a sharp triangular file, using turpentine to promote its "biting." The tube is then very easily separated at the file cut, if made sufficiently deep,

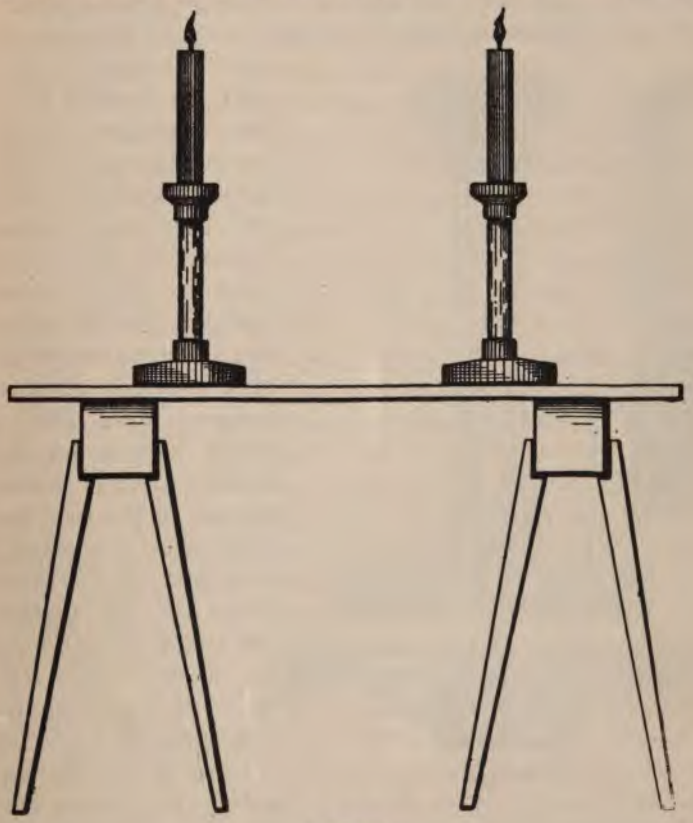


FIG. 73.

by pulling on the two pieces in addition to a breaking or bending strain.

A cross section of one of these candlesticks is shown in Fig. 74. The base A and the top B are turned up on the

lathe from thoroughly seasoned hard-wood, and cemented on to a piece of glass combustion tubing. Walnut is an excellent wood for this purpose if thoroughly seasoned and dry. As the high-tension discharge from an induction coil or plate machine is employed to light the tiny gas-jet at the candle-tip, it will be readily seen how important the matter of thorough insulation is, requiring only the best and driest materials. The base contains three leaden weights (two of which are shown in section at C and D, cast in the auger-holes HH to serve as weights and contact plates), the two shown in the sectional view being connected to the ends of the stout wires GG by casting. Two small gimlet-holes, as shown, join the auger-holes with the little opening under the glass stem, through which the wires pass.

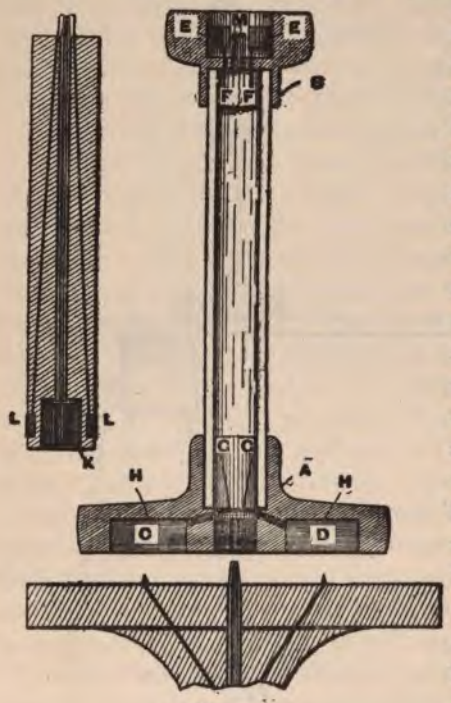


FIG. 74.

Two very fine bare copper wires (No. 36 or No. 40) are soldered to the ends of the heavy wires GG and are carried up through the glass tubing and soldered to the ends of the two stout wires FF, which pass through the wooden cap as illustrated, terminating with soldered joints with the *little copper plates* EE. The joints of this fine wire solder-

ing should be sponged off with water, if zinc chloride has been used as a soldering fluid, as it would not require many days' exposure to its corrosive action before the fine wires broke off, unless the joint is washed. It is next to impossible to detect the presence of these fine wires in the glass stem, even upon close observation, although they are amply large to carry the high-tension current employed. The copper plates EE are attached to the inside portion of the wooden cap by soldering on a little sharpened spur in the centre, and pressing the spur into the wood. If the inside of this cap is well shellacked, it will tend to hold the plates in position, in addition to adding increased insulation. A little metallic tube M fits tightly in a small gimlet-hole in the cap and is cemented around the joint. It can now be readily seen how electrical communication is established between the wires and the sharpened points in the little table top, partly shown in section, and the little contact plates in the cap of the candlestick.

By referring to Fig. 74, at the left, a section through the electrical candle may be seen. This can be made from a genuine wax candle, but is much more durable if made from wood and enamelled. This must also be of the driest material for the sake of insulation. A tiny brass tube runs through the centre, as illustrated, ending in a fine point or tip at the top, and terminating in a little auger-hole or recess at the bottom, with a soft-gum stopper K having a tiny hole through its centre. Two little contact plates LL are let into each side of the candle after soldering on two fine insulated wires and boring fine holes through the candle as illustrated. It is desirable to shellac the covering on these wires before pulling them through, giving them the best possible insulation. The little tip at the end of the brass tube should be blackened to resemble a candle wick, and the fine wires which run to the top must have platinum tips where the wire bends over the tube, in order

to stand the heat when the gas is ignited. It will also be evident that the soldered joint must not be very near the flame, as it would be better economy to invest in a few inches of platinum wire and have the joints away from the flame than to have a short connection and fusions at critical moments, putting the apparatus out of service. The little plates LL must be about the size of the ones in the cap of the candlestick in order to make proper contact, and the size of the candle at the base must just fit the candlestick.

Let us now examine the system of gas supply from the little table to the tip of the platinum wires. The small brass tube with the tapering point, as fitted to the little round table in Fig. 74, projects about one-half inch above its top, as shown, entering the soft-gum stopper in the recess of the base of the candlestick, when the magician places it carefully on the table. The gas ascends through the glass stem to the cap, and passes through the little brass tube M with its own tapering point, which in turn enters the soft-gum stopper in the base of the candlestick. It is now clear how the electrical connections are established between the sharp points in the table top and the platinum-tipped wires at the top of the candle. It will also be readily seen that the candlesticks may be lifted up from the table at any time during their exhibition, and the candles taken out in order to impress upon the audience that they are only ordinary candles and candlesticks. It is also very evident that the placing of a newspaper under the candlesticks would in no way interfere with the lighting of the candle, as the tapering tube and sharpened points would immediately puncture the paper and make the necessary connections. It should also be observed that the glass shades and colored scarfs have no effect on the working of the trick, as the tiny flame requires but little oxygen, and will burn for a long time under a large shade. *Of course,* for the sake of the shade, it must be tall enough *not to come too* near the little flame. These candles, with

very minute blackened tubes filed down to the size of mere wicks, with a gentle gas supply, resemble so closely real candles at a distance of only a few feet from the front of the stage that detection is a very difficult matter. It is also readily seen that the bottoms of the bases of these candlesticks can be covered by gluing on dark green baize, cover-

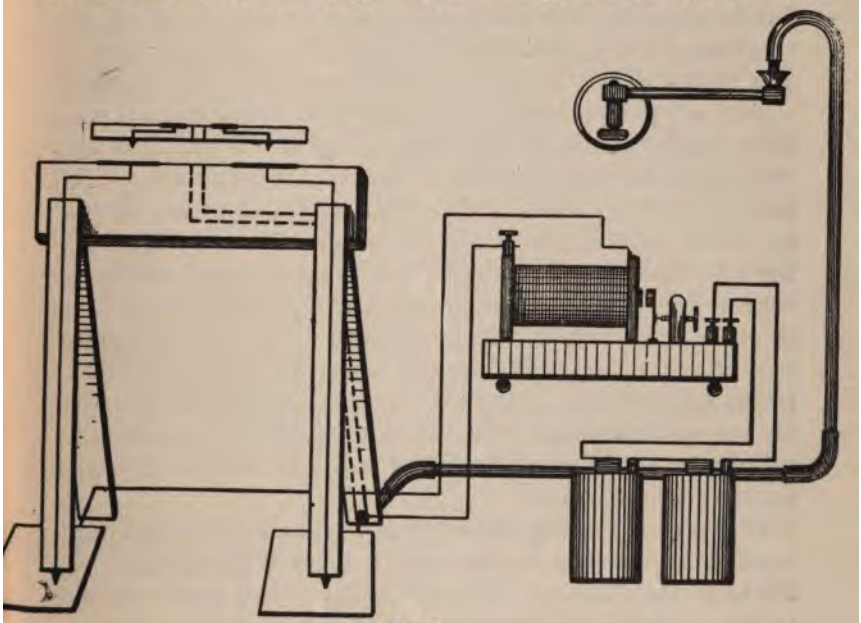


FIG. 75.

ing the weights entirely, allowing only a tiny slit for the gas tube to pass through, which allows of the candlesticks being examined very closely if real candles are skilfully put in the place of the electrical ones.

Fig. 75 illustrates the connections for a "doctored" pair of trusses and light board. While the large magician's table given in the opening chapter is admirably adapted for exhibiting these candlesticks, the light wooden board and trusses

present a more innocent appearance. This arrangement is shown only as an example, however, for varied means for exhibiting the candles are sure to suggest themselves to any conjurer making the candlesticks and equipping them with the electrical fittings. The floor contact plates in this illustration are shown uncovered, but, of course, are worked under a thin carpeting, the sharpened points on the bottom of the truss legs pricking through and making the necessary contact. It is seen that the board in this illustration is also equipped with sharp points, which are designed to make contact with little copper plates on the truss. The gas is supplied by a small tube let into a groove in one of the legs and covered with putty, and painted over. The leading-in wires from the induction coil must be of the best rubber insulated type, and the floor contact plates should have a thin coat of shellac on both sides, relying on the points to cut through the shellac on top in order to make metallic contact. The rubber stopper joint must be duplicated in the board where it rests on the truss, and must be fitted with a little tapering tube as described in connection with the candlesticks. An induction coil capable of giving a two-inch spark is necessary, or else a large plate machine.

In working the trick, the gas is first turned on and regulated from the key at the burner to give the proper size flame at the "wick." The induction coil or plate machine is kept running all the time, but at sufficient distance from the audience to prevent the sound from the buzzing of the coil or the running of the plate machine being heard. Having regulated the key at the burner to give the proper pressure, the candles are extinguished by compressing the rubber tube which may be employed to make the gas connections, or in any other convenient manner. With two candles, it is, of course, necessary to have two entirely independent gas supplies and electrical circuits. To light *the candles it* is only necessary to allow the gas to flow

(provided the coil is in constant operation) by releasing the pressure on the tube. By alternately compressing and releasing the rubber connecting tube, the candle is extinguished and relighted. By equipping two candles with the independent gas supplies, and furnishing a thoroughly insulated switch for the induction coil, in order that the same coil may alternately supply the two candles with the electric spark, the candle flame may be made to "jump from one candle to the other." Should these candles fail to work at first, examine the insulation, determine if the induction coil is in good condition, and discover where the current leaks away. If the directions given have been carefully carried out, the high voltage current may be made to appear in the form of a useful spark at the tip of the candle "wick." It is always a good precaution to use shellac wherever a high-tension current is employed, as it is one of the most reliable insulating materials known. The wooden portion of the candlesticks should, for effect, be gilded and be given a protecting coat of shellac. As the board and truss are somewhat more difficult to equip with the secret wires and tube, the reader should work the candlesticks first in connection with his central table, where they will prove of great service in connection with numerous experiments, not to speak of the ornamental effect.

The Spiritualistic Cash Box.

Those familiar with the literature devoted to magic will doubtless recall the valuable experiments in the Black Art conducted in Algeria by Robert Houdin, acting under a commission of the French Government. Charged with the suppression of the objectionable feats of magic and hypnotism, as carried on by the Marabout priests and Mohammedan miracle-workers, the great French conjurer and magician set out, carrying such magical apparatus of his own invention best suited, in his keen forethought and judgment, to convince the Marabout that a European could not only surpass their miraculous exhibitions, but expose their fraudulent occult demonstrations, with which they continually awed the more ignorant Arabs and excited others to discontent and rebellion.

Probably no other experiment had such success or such humiliating effect on the great priests as that performed by the aid of Houdin's greatest electrical trick, "The Light and Heavy Chest." Although this trick is referred to in a number of magical works, the writer has never seen the mechanism of the box together with its secret pulleys and electromagnets described beyond a vague statement that the trick was dependent on electromagnetism and trick pulleys. While the box designed and described by the writer probably differs very radically from the historical one used in Algeria, it will be found extremely light or extremely heavy, at the will of the operator.

Before describing the construction of the box and platform, the method of introducing and working the trick may not be altogether untimely. Fig. 76 shows the appearance of the writer's design of box, which includes a low "insulating" platform, both of which may be closely observed by *spectators* without the least fear of any telltale portion

being discernible. After filling the box with beans, coins, cut paper, or any handy objects or material associated with magical exhibitions, it is placed on the little platform and locked. A light rope is seen hanging from a couple of pulleys fixed to the ceiling, with which the box may be hauled up a few feet in the air. The performer, having lifted the box a couple of feet or more from its platform, requests that some spectator take the end of the rope and hold the box in suspension. The performer now makes the usual mesmeri-

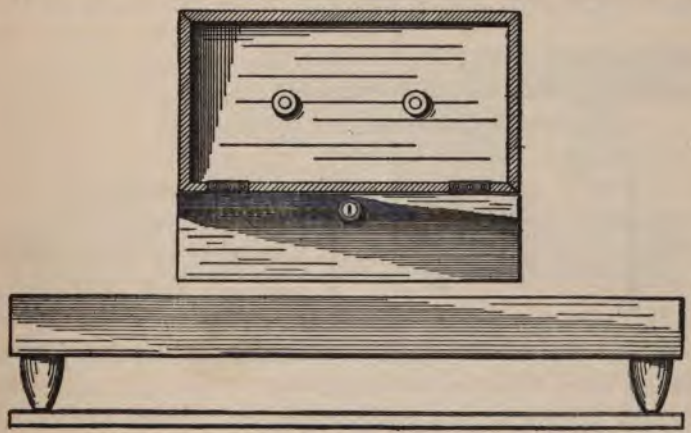


FIG. 76.

cal passes, and commands the box to increase gradually in weight until it rests upon its little stand or platform. The magician may have a couple of fingers under the handle of the box, and slowly lower his hand as the box descends, showing that he alone has the power of sustaining its weight and of arresting its rapid downfall.

The box once on the platform, the rope is untied or unhooked, and the person who was unable to resist its slow but sure descent is requested to stand on the platform and endeavor to lift it up independently of the rope and pulleys.

He will be as unable to do this as he was to prevent the descent of the box, until equalizing mesmeric passes have been made by the performer, rendering the box as light as a small block of pine wood.

By referring to Fig. 77 the pulleys, together with the secret wire, will be understood. The box is suspended from the left-hand end of the hanging rope, and is pulled into the air from the end at the right. The fine, blackened steel wire passes through the supporting beam, over the small concealed pulleys, and is attached to the main rope as illustrated. To cause the box to increase in weight gradually, it is only necessary to suspend a large pail or other commodious receptacle from the end of the secret steel wire behind the scenes, and allow water or sand slowly to fill the same, when the pull, as will be seen, acts on the right-hand rope and taxes the strength of the person endeavoring to hold the box in suspension. Once on the platform, the double pair of electromagnets are brought into play, making it next to impossible for the box to be lifted without the sanction of the performer.

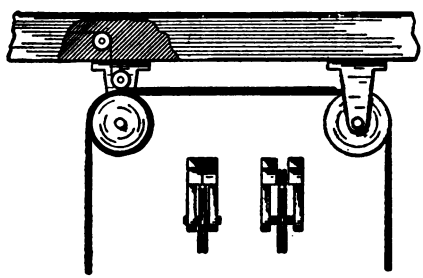


FIG. 77.

Let us now take up the construction of the box and platform, together with the electromagnets, leaving the pulleys until the last. The present design represents the smallest box and magnets advisable to construct; in fact, the dimensions may be increased with advantage if the trick is to be shown to a number of persons on a stage. The box given here measures about twelve inches by seven by five, and is *made from pine* board one-half inch thick. An iron plate

three-eighths of an inch in thickness is screwed on the bottom, and the whole given a coat of mahogany stain, making the whole appear as wood. The iron plate can to advantage be let into the bottom, in order that the sides of the box may cover the edges of the plate. A lock and key should be provided, as well as a neat brass handle. The base or platform is made from a piece of pine board two inches thick, and measuring about two feet by twelve inches. It must be provided with turned wooden legs, which raise the

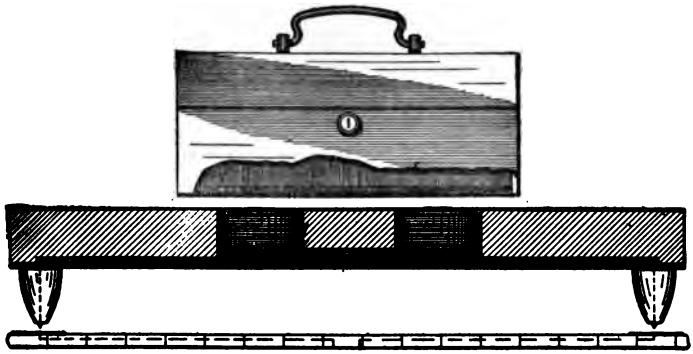


FIG. 78.

board about two and a half inches from the ground or stage upon which the trick is presented.

Fig. 78 shows the box partly cut away, allowing the iron bottom to be seen. The position of a pair of the magnets is also shown, together with the turned wooden legs, which are provided with sharp steel points, connected with the windings on the electromagnets. These sharpened points prick through the carpeting on the stage and make contact with a couple of heavy copper plates, which have wires soldered to them, leading to the source of electrical energy and the controlling switch.

The electromagnets are fitted to the interior of this board

or platform by making four three-inch augur-holes or lathe cuttings, to receive the bobbins, with a couple of joining grooved channels chiselled out to receive the frame or bar of the magnets. Before doing this work, however, the magnets should be made and wound, the plan of construction being made clear by referring to Fig. 79. It will be seen from the dimensions marked on the illustration that the two-inch baseboard will just take the magnets when they are carefully adjusted in the auger holes, with the grooved channels cut to the proper depth.

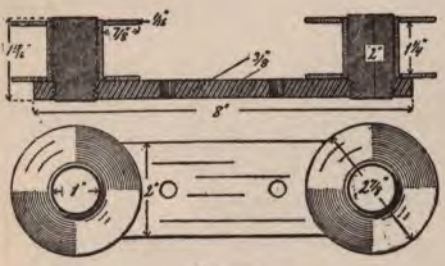


Fig. 79.

Having made the magnet cores as shown, the spools may be put together. These spools are made by soldering brass discs on thin brass tubing, which is slipped over the poles of the magnet core. These circular brass discs are quickly made by cutting out eight pieces of sheet brass one-sixteenth of an inch thick, to squares measuring a little over three inches. This can easily be accomplished by using tinner's shears, getting the squares as nearly equal as possible. They are now put together and soldered all around the edges in order to securely hold the lot from moving or slipping among themselves when the whole is chucked in the lathe, and the hole cut through the centre to receive the brass tubing. Having cut the hole through, the pack is removed from the lathe chuck and mounted on a lathe mandrel in order to cut the solder away and bring the plates down to true circles.

Let us now wind these bobbins with double cotton-covered magnet wire of No. 18 gauge, after giving the inside of

the brass spools six or eight coats of orange shellac, allowing each coat thoroughly to harden before the next coat is applied. Each spool must be wound full in even layers, a coat of shellac being applied to each layer as it is wound on. In order to wind the four spools full, and have a quantity of wire left for the electrical connections, four pounds of this No. 18 wire are required. Of course each pair of magnets must be wound for north and south poles, by reversing the convolutions of the wire on each bobbin, with the two pairs of magnets connected in series as shown by dotted lines in

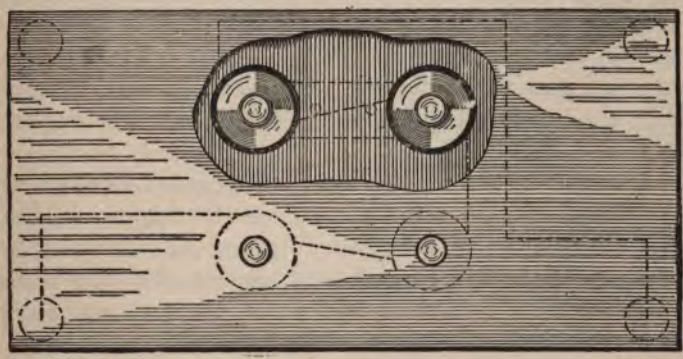


FIG. 80.

Fig. 80. This plan also shows clearly the position of the two pairs of magnets, designed to attract the iron bottom of the box on the four corners, each magnet pole taking one-fourth of the pull or strain put on the handle of the box. With this distribution of the magnet poles in relation to the handle of the box, which lies between them, it is impossible for a side strain or twist to concentrate its effect on any single pole, causing the bottom of the box to be disengaged from it.

Having completed the magnets they are pushed into the interior of the baseboard or platform, and adjusted by

shaving down the grooved channel, or by putting pieces of tin underneath, as the case may require, until the poles of the magnets project about one-sixteenth of an inch above the level of the platform. Having the adjustment perfect, the shank or bar of the magnet is screwed firmly in place by means of stout screws, and the holes shown in the bar illustrated in Fig. 79. The top of the baseboard is now covered with a piece of the thinnest wood, securely glued on, with circular holes accurately cut to allow the magnet poles to pass through. Walnut may be had of this extremely light weight, which may be planed down to meet the magnet poles after the baseboard top is glued on, allowing them to protrude about one-sixty-fourth of an inch. The top is now completed, with the exception of paint or stain, a dark paint hiding absolutely the poles of the magnets if the work has been neatly done.

The bottom of the platform must have grooves cut with a gouge chisel to receive the wires from the magnet windings before a similar wooden bottom is glued on and painted to match the top. The turned legs are glued on the bottom and the proper wire connections made, preferably by soldering.

The magnets may be excited by a large plunge battery of eight or ten cells, or by connection with an incandescent electric-lighting system through a bank of lamps arranged in multiple arc. If the service is of the usual 110-volt pressure, eight or ten lamps wired in multiple arc, and included in the circuit, allow sufficient current to pass for energetic excitation of the magnets.

The pulleys for carrying on the suspension part of the trick are too simple to require any detailed description. They may be turned from wood or metal, and be provided with either wood or metal blocks.

In exhibiting this box and stand, the performer elaborates *on the fact that* the little platform is purposely raised from

the stage in order to allow a clear, unobstructed view under the box at all times, isolating it from all possible connection with devices under the stage. The spectator requested to lift the box is, of course, made to stand on the platform after the running rope is untied, his weight serving to press the points in the little legs to good contact with the copper plates under the carpeting. Owing to the freedom with which it is possible to pick up the little platform at any stage of the trick and exhibit it as "an ordinary board," and the use of the pulleys and secret steel wire, theories as to the working of the trick are difficult to form, as in most tricks performed by bringing two methods into play differing in principle. Of course, a second pair of similar electromagnets can be set into the flooring of the stage to great advantage, in order to show that the little raised platform is merely an isolated stand, having nothing to do with the trick. By elaborating in this manner a most effective trick is sure to result.

The Magic Clock.

Numerous mechanical devices for secretly moving the hands of timepieces have been worked out, producing more or less magical effects. Timepieces as well as magic date back to the early stage of civilization, and their combination is therefore not untimely. The magic clock herein described may be sealed up under a glass shade and made to run for years without breaking the seal, which adds greatly to the mystery, and forms a most suitable clock for a magician's table, or even his library mantel.

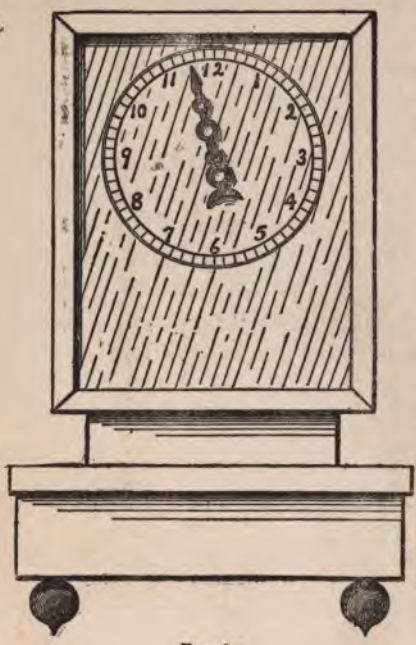


Fig. 81.

Glass shades usually come with wooden bases provided with little ball feet, and it will be readily seen that the electrical contact system can be duplicated in the glass shade and stand in the manner it is used in connection with the clock base and table.

Fig. 81 represents the general appearance of the simplest design of clock which may be built on this plan, having only one hand to point out the time. A clock can, of course, be put together having two hands, but it will require another set of wheels in the base with additional gearing and a second *moving glass* plate.

If the clock is constructed with only one hand it had better be large and of an ornamental design cut from bone or ivory, as some will suggest that the working of the hand is dependent on magnetism if the hand is iron or steel.

Fig. 82 represents a section of the clock from behind. All the mechanism is shown here with the exception of the elec-

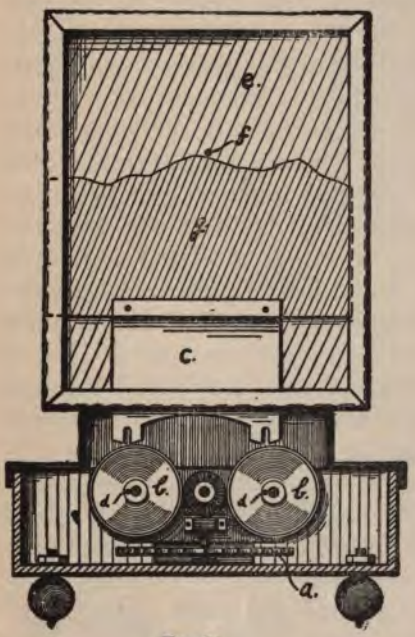


FIG. 82.

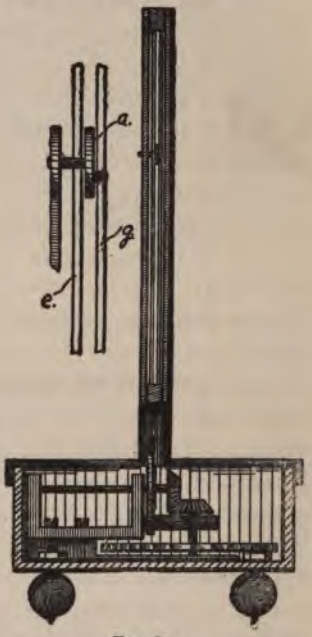


FIG. 83.

tromagnet and ratchets which move and control the ratchet wheel, *a*, which turns in a horizontal plane. This ratchet drives a set of bevel gears, which in turn, through the medium of a little cog-wheel at the back, drives the large wheels, *b*, *b*.

This mechanism will be made clearer by referring to Fig. 83. The brass plate, *c*, in Fig. 82, has the slotted projections

cut to engage two small eccentric pins or cranks, *d*, *d*. These slots are filled up until the top of the plate, *c*, is hidden by the frame of the clock when the little pins are at their highest point. The stroke, or throw, of the little pins must of course be small, in all cases a trifle less than the thickness or width of the frame.

The frame holds two pieces of thin clear glass, one stationary and the other movable. The stationary plate is represented by *e*, and fits tightly into the frame. The little hole, *f*, which is drilled through the stationary plate, serves to mount the little spindle and hub which carry the hand. The second plate, *g*, is a little smaller than the frame; that is, it is cut free to move back and forth, as well as up and down, through a distance fully equal to the throw or stroke of the little eccentric pins, *d*, *d*. The movable plate is shown at *g*, partially cut away for the sake of clearness. This is represented in the illustration at its extreme left position.

This movable plate also has a little hole drilled through (the plate being cut away here, the hole is not shown) at such a point that it will describe a tiny circle about the hole in the stationary plate. It will be readily seen that the circumference of the little circle which this hole describes will be equal to the little circles described by the little eccentric pins when the wheels are revolved.

Fig. 83 shows a side section of the clock mechanism, with a diagram of the glass plates and hub at the left. The working of the plates and hub will be made clear by reference to this sketch, where *a* is the hub carrying the hand on a little spindle, with a little crank pin at the back, with *e* the stationary plate, and *g* the movable plate, turning the little crank pin on the hub, as it is moved by the little crank pins of equal stroke in the base.

Fig. 84 shows a plan of the mechanism with an electro-*magnet and ratchets* in position. The little nuts, *a* and *b*,

in this figure are the terminals of the winding on the electromagnet, *c*.

Fig. 85 illustrates the clock being driven by battery power with a swinging pendulum in combination with a little mercury cup which completes the circuit through mercury at every beat. This arrangement is only intended for exhibiting the clock before an audience, as the hand is made to travel fast enough to be noticed. The hand should be attached so it may be taken off at any time and passed around. Of course, the circuit can be closed through a telegraph key and the clock run by hand. If the clock is intended to keep time on a library mantel, the connection with a regulating timepiece will have to be different. Here the number of teeth on the ratchet wheel in the base will have to be taken into account as well as the reduction in gearing between the ratchet wheel and the little wheels which carry the crank pins. By making electrical connections with projections on the escapement wheel of a large clock, the hand on the magic clock can be made to follow the hour hand of the regulator clock, if the problem of teeth and gearing is correctly worked out.

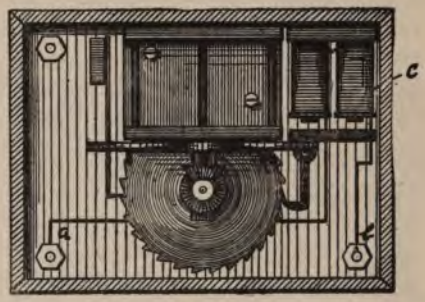


FIG. 84.

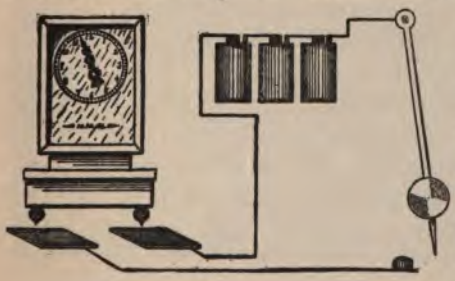


FIG. 85.

Of course, the magic clock can be placed a long distance from the regulator if good battery power is at hand. For a real timepiece a large battery of bluestone cells or telegraph battery will give the best service. The base plates which make contact with the sharp points of the balls can be covered with almost any table or mantel covering, as the clock is heavy enough to pass the points, if sharp, through very heavy material.

Spirit Chirography.

During the early periods of civilization those possessed with the faculty of inscribing their thoughts and expressions on parchment were classified among the highly edu-

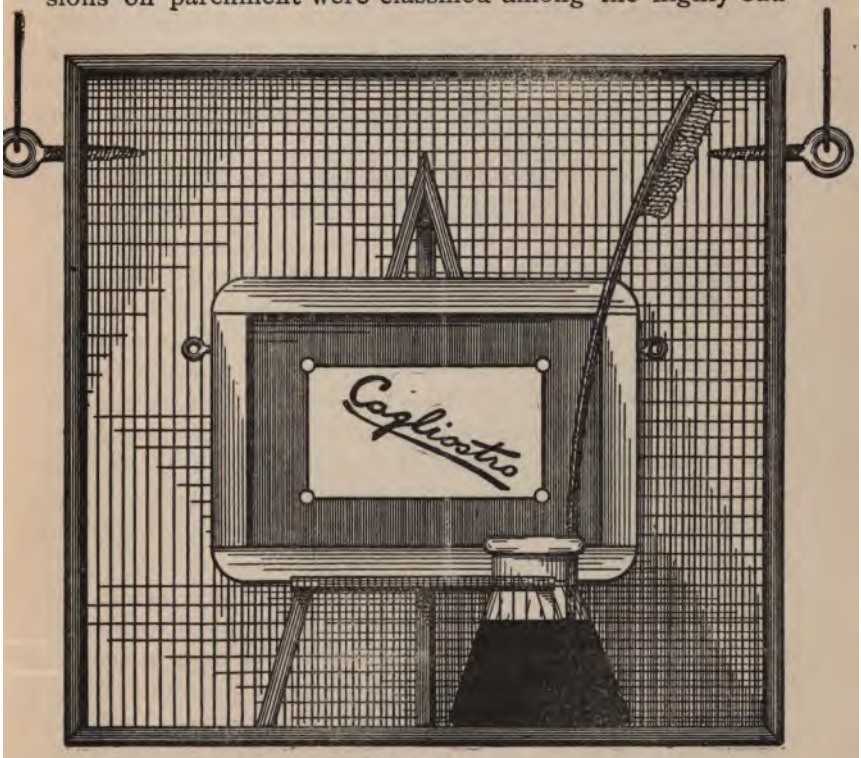


Fig. 86.

cated. Waiving the modern and liberal meaning of the term, we will have introduced to us, associated with the following experiment, a highly educated spirit, whose manifestations are apparent in a very "marked" degree, although the ethereal constitution of the phantom hand prevents an

impression of its image on the optic nerve. The necessary simple requirements for the use of this unseen hand consist of a coarse quill pen, flagon of India ink, a school slate and light wooden easel, together with the little swinging cabinet illustrated in Fig. 86. The spirit never protests at a close examination of the pen, ink, and paper upon which its writing is dependent, and allows of a close, unobstructed observation of the slate, easel, and cabinet, which serve merely to mount the "parchment" and provide a place for the pen and ink respectively.

Before describing the secret of the spirit hand, the effect of the experiment will be given. Having satisfied the sceptical by freely presenting the writing material for scrutiny, the paper selected is immediately mounted on the slate in full view of the onlookers, by means of small gummed wafers, and the whole placed carefully on the little supporting easel. Attention is called to the little cabinet which is seen swinging from a pair of cords or colored ribbons, which may be swung around in any position in order to show up its construction. The cabinet is sharply rapped inside and out with the magician's wand, demonstrating wooden construction, and proving the absence of wires, strings, and other delicate and complicated contrivances.

The easel, slate, ink, and pen are now placed inside, and the cabinet is covered with a silk handkerchief or colored scarf. Sounds are heard within, and the cabinet is seen to tremble as if a material living thing had entered. When the moving ceases and sounds are no longer emitted, the covering is removed, displaying an inscription plainly written across the paper, and the pen, which was previously in the ink, removed from the bottle and lying on the bottom of the cabinet. The paper can be taken from the slate at once and be passed around for inspection, where the writing will be immediately identified as executed with the India ink. *Almost any inscription* or answers to queries may be pro-

duced in connection with this cabinet if the performer is quick and exercises some little skill and ingenuity. A small bell placed inside may be made to ring by the spirit when the writing is complete, or rappings can take place inside in response to questions.

The explanation of these manifestations is as follows: The paper, which may be closely examined, is previously written on with diluted sulphuric acid and allowed to dry thoroughly. Many sheets of paper may be prepared in this way, being secretly marked by pin pricks in order that the performer may know one inscription from the other. By subjecting these sheets of papers to heat the inscription appears in the blackest and most vivid characters, bearing the closest resemblance to dried India ink. The slate and easel, together with the cabinet and the supporting "ribbons," provide the heat through the "medium" of electricity. The pen is drawn from the ink, and the rappings and bell ringings are accomplished by black silk threads.

Different kinds of linen writing-paper should be written on with pure acid of varying strengths, until the most perfect results are reached. Linen paper with a slightly rough surface, and a suspicion of yellow in its whiteness, will usually give the best results, it being very difficult to discover any traces of writing when the acid has dried. The acid used should be the purest, the cheaper grades of sulphuric having a yellow tinge. To make the writing fluid, add about fifty drops of the concentrated acid to one ounce of filtered water, and test the writing done with this after drying by holding over a Bunsen flame or alcohol lamp, if the electric slate is not made. The blackest characters will appear in a few seconds and be of permanent character.

Let us now take up the construction of the "electric slate" and easel. Fig. 87 represents the slate removed from the frame, being wound with the heating wire. This slate is designed for direct connection with a 110-volt electric-light-

ing service, and will heat up nicely if the directions are carefully carried out. Before winding the slate a small hole is drilled in each of the upper corners, as shown in the figure, to facilitate the putting on and the securing of the wire. An ordinary school slate measures seven by eleven inches, not taking into account the wooden frame. The frame can be taken apart without breaking the corner mortices by applying a strong pressure alternately at two diagonally oppo-

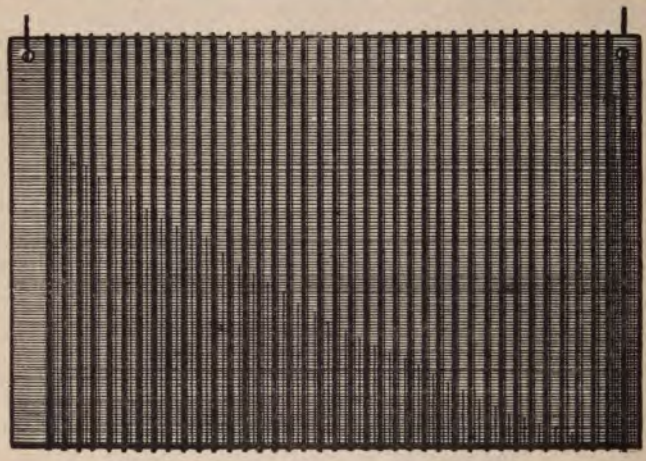


FIG. 87.

site corners. In this manner the glue used in joining the frame is weakened and parted without injuring the frame.

The slate is wound with fifty-five feet of No. 27 tinned iron wire, the different convolutions being put on with a space between of a trifle less than one-quarter of an inch. If this winding is neatly done the fifty-five feet of wire will just go on. As the two covers for this slate and winding are made from thin Russia iron, the wire winding must be covered with sheets of mica. Plates of mica are carefully laid on *each side of the* slate, and sheets of mica are bent around the

edges just before the iron plates, accurately cut to the proper size, are laid on and temporarily attached by binding with twine.

Great care must be exercised to prevent the ends of this winding from coming in contact with the Russia-iron sides,

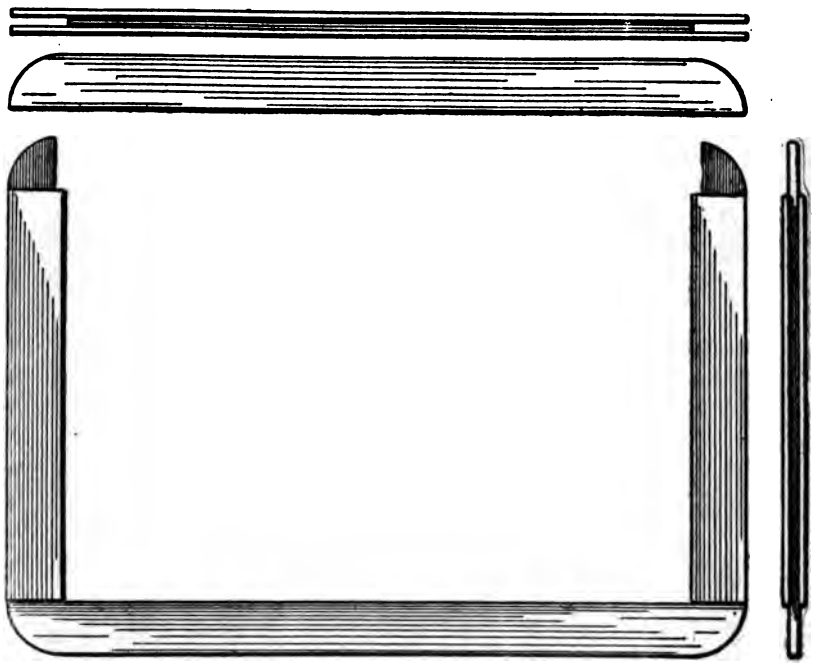


FIG. 88.

and to prevent this the following precaution is suggested: Where the holes are drilled, insulated copper wire can conveniently be made to join the iron by cutting off a small length of the insulation and wrapping the copper wire about the iron. As copper conducts electricity about seven times as readily as iron, the copper wire will not get very hot, and consequently its insulation will not be injured. The copper

wire should be about No. 20, being larger than the iron winding, which gives it an additional factor against heating.

Fig. 88 shows the frame of the slate partially taken apart, illustrating the usual construction of the frames. As the slate with its winding, together with its iron sides and mica, is thicker than the width of the groove in the framing, it will be found necessary to widen the groove all around. This can be accomplished by taking the frame to pieces, and

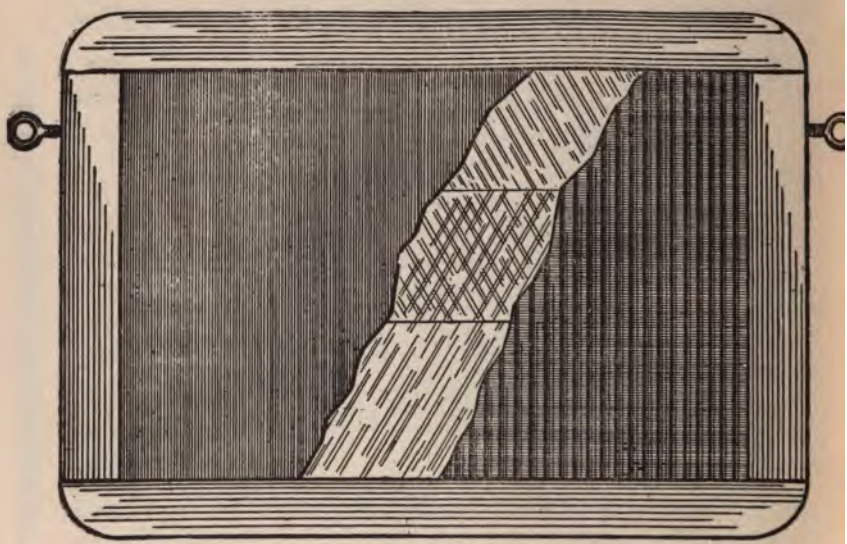


FIG. 89.

after clamping in a vise, running over it with an adjustable plough or groove-cutting plane. Almost any carpenter is ready to do this if the reader does not possess such a plough.

The slate, with its winding, mica covering, and iron sides, is illustrated in Fig. 89, with the mica and Russia iron partly *cut away.* The screw-eyes serve as one pair of terminals *for the winding,* allowing of the suspension of the slate di-

rect to the lighting wires should the performer wish to vary the trick. A 4-ampere fuse is sufficient to place in the circuit of this slate and the lighting wires, fusing out quickly without damage to anything should the iron covers of the slate accidentally come in contact with the wire on the slate. As a matter of precaution, even with the most carefully made "electric slate," the writer strongly recommends careful fuse protection. The ends of the winding of the slate can be conveniently brought out through the crack formed at the juncture of the pieces of framing and secured secretly to the screw-eyes.

As the slate is primarily designed to stand on an easel, it must have a second set of terminals for the winding near the bottom, where the framing rests on the shelf of the easel. By referring to Fig. 90 the idea will be made clear. By means of a very small gouge plane or chisel a groove is run around the outside of the frame, designed to accommodate a copper wire in order to make contact with a copper stud at the bottom of the frame. This is done on each side as illustrated, the groove being filled with putty after the wire is in place. The little easel is not quite as innocent as it appears, having a wire concealed in each leg and a pair of contact studs on its little shelf. The floor of the cabinet is equipped with little brass or copper plates, for contact with the studs under the feet of the easel, which lead to the large supporting screw-eyes of the cabinet.

The ribbons, which are innocent in appearance, possess their own trickery in the form of copper conductors, No. 14 copper wire being sufficient to carry the current economically. This wire had better be of the double cotton-covered type, which may be tinted the same shade as the supporting ribbon, and effectually hidden from view if a little care is taken to stitch the wire to the ribbon with silk thread. The Russia-iron sides of the "slate" may be given a slate-colored covering of mineral paint to resemble so closely the real

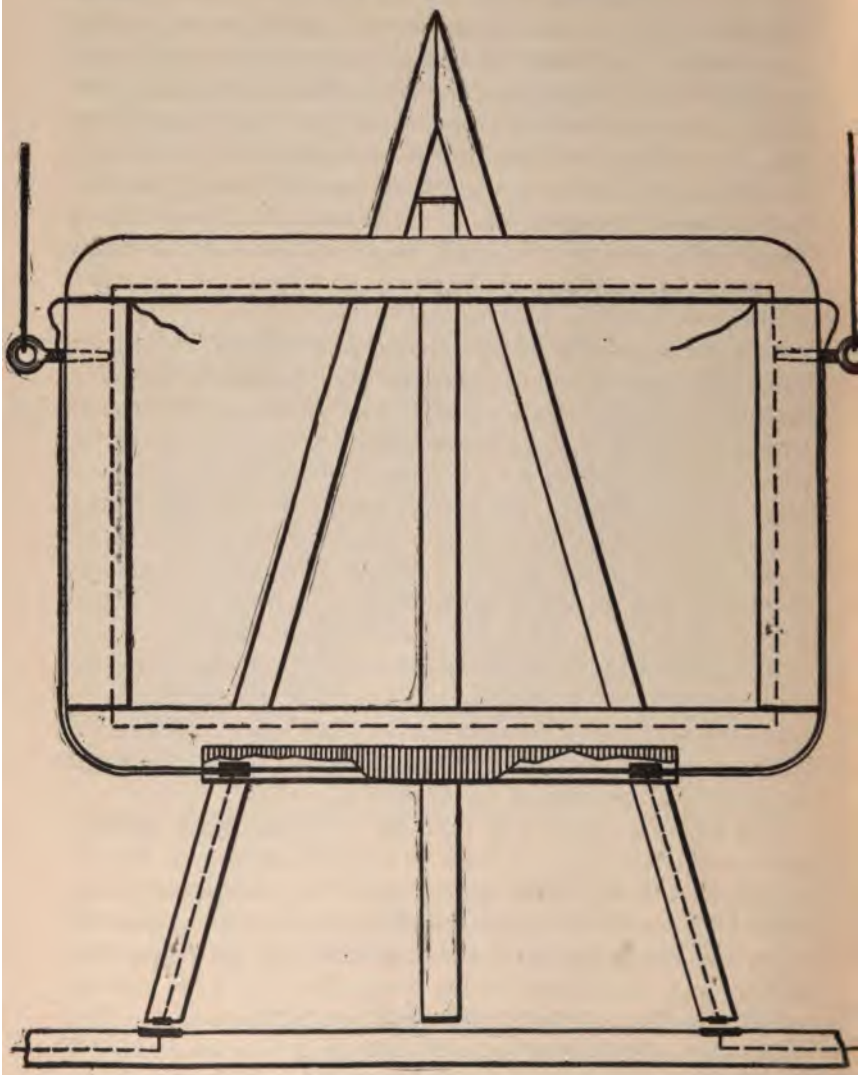


FIG. 90.

article that detection is very improbable. The slate as described here requires about thirty seconds to get "piping hot" and accomplish the "spirit work." Numerous trials should of course be undergone before exhibiting the trick to an outsider, as the performer would find it awkward to remove the covering scarf with a flourish and find the spirit had not completed the writing. Of course, the ribbons with the secret wires must run to innocent-looking hooks above, and the circuit must be equipped with a switch readily reached by an assistant behind "the scenes." The writer wishes to impress, on closing, the importance of neat and, above all, careful work in the question of insulation and fuse protection, as a voltaic arc within the cabinet would make things too uncomfortable for any well-behaved and properly brought-up spirit to associate with.

CHAPTER V.

EQUIPMENT AND WORKING NOTES.

Miniature Electric Footlights.

As the magical stage described in Chapter I. is rather small for a row of standard 16 candle-power lamps, it is suggested to those caring to light the stage by electricity to install a row of miniature lamps. The light from these small incandescent bulbs produces a prettier effect than that from the standard pattern because of finer distribution. The following instructions, while primarily intended for the connecting up of footlights in using miniature lamps, are equally reliable in wiring these little bulbs for any other magical decorative purpose. These little lamps may be run by means of any of the large electric-lighting systems, if correctly wired, or by means of a storage battery. The most satisfactory and economical method lies in their maintenance in connection with the wires of some electric-lighting system, whether of the alternating or direct-current type. The electric-lighting plants in our towns and cities supply, with rare exceptions, electric-lighting currents at one of the three following voltages: 110 volts, which is the most common, and 55 and 220, which are less often met with. The voltage of a system should be inquired before ordering lamps.

The problem of figuring out the voltages of small lamps, in order to determine how they shall be wired on feeders intended for large lamps, is extremely simple. Let us take, for *example, the* case in which it is desired to maintain a num-

ber of small lamps intended for 28 volts (28-volt lamps, as they are called in the trade) on a 110-volt lighting circuit. It is only necessary to join in "series" (wired together like a chain) enough lamps to sum up approximately 110 volts—represented thus: 28+28+28+28=112. Here each figure 28 represents a miniature lamp. Therefore four 28-volt lamps, if joined in series and wired across the 110-volt feeders, will be lighted up nicely. By joining in this manner, four times the voltage prescribed for one will be necessary, 112 volts. When lamps are connected in series, the current has to pass through each lamp in regular turn, or order, while for large 110-volt lamps they are connected singly direct to the feeding wires.

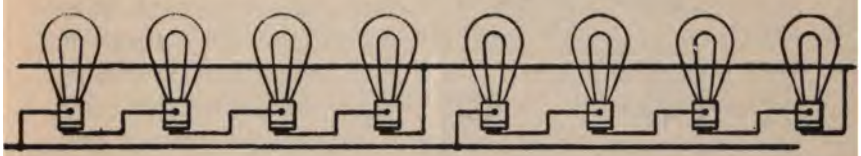


FIG. 91.

By referring to Fig. 91, the joining of lamps in series will be understood. The main feeding wires are here represented by the heavy horizontal lines, which supply current at 110 volts. In this diagram eight 28-volt lamps are given, two sets of four, one set independent of the other. By this method each lamp in each set burns nicely. The reader unfamiliar will probably ask why two sets are wired independently. If all eight lamps were wired in series (one long chain) they would be represented thus: 28+28+28+28+28+28+28+28, requiring a voltage of 224; but as we only have a voltage of 110, each lamp would receive only 14 volts instead of 28, and consequently would burn very dimly. Having learned this simple rule, the conjurer will be able to wire any small lamps for any purpose provided at least four lamps are used. A single 28-volt lamp wired direct to 110-volt wires would immedi-

ately be fused or burnt out, resultant of the great excess in voltage of that required. Should we have 28-volt lamps and a 55-volt circuit, little groups of two each must be wired on 28+28=56. Should, however, the system be of a 220-volt character, eight lamps in one string will be necessary to prevent burning out.

The writer has gone over this in a rather lengthy manner at a risk of being tedious to those who have already covered the field, but he trusts that it will give a clear idea to those of his readers possessing less familiarity with electrical rules. In making connections of a permanent character, the joints should all be soldered, for loose connections get hot and cause the lamps to burn dimly, in addition to fire risk, if the joints come in contact with inflammable material.

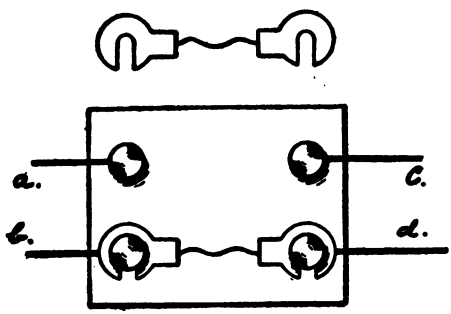


FIG. 92.

We will now take up the important little subject of the "safety fuse." By referring to Fig. 92, a double safety-fuse block can be understood, being simple in character and operation. These fuse blocks may be had from any electrical supply house, provided with fuses designed to "feed" or "carry" any number of lamps. A standard 110-volt lamp of 16 candle-power requires a little over one-half ampere of current, when placed across a pair of 110-volt conductors. Therefore if ten standard lamps were wired to the mains, they would require a 5-ampere fuse, or a double pair as illustrated in Fig. 92, which amounts to the same thing except having greater reliability. A 10-ampere fuse block will answer for one row of footlights if twenty-*five or thirty* are sufficient to do the lighting. The fuse wires

which join the slotted discs, as shown in the figure, are very easily melted out if the current rises above the amount for which they were designed, thus saving the lamps from destruc tion, which are also designed for a limited current. Should our wires get in a bad tangle, wearing off their cotton cover ing, etc., or should a "short circuit" be formed, as by contact with a gas-pipe, screwdriver, or other foreign body, the fuses will immediately melt and cut off the current. Should these objectionable circumstances be brought about without the protection of a fuse, our connecting wires would have to melt or "blow," which would be a very awkward and undesirable thing to have occur, especially in the midst of a magical performance. To connect one of these fuse blocks with a row of lamps, as in Fig. 91, the ends of the two heavy horizontal wires are connected to the short lengths of wires as shown at the right or left, *a*, *b* or *c*, *d* as illustrated in Fig. 92. This leaves a remaining pair of wires from the fuse block which may without fear be connected direct to the feeders of the city or town supply. The method of connecting with the "live" wires is simple, and without risk of shock (which from a 110 supply is a little painful, without being dangerous) if only one connection is made at a time. If the connections are made out of doors, as an additional precaution the joiner may stand on a dry piece of board, although really unnecessary. Fig. 93 illustrates the plan of connections. Here *a*, *b* are the city wires, connected to the left-hand side of our fuse block. The little arch in the upper connection indicates that the wire passes the feeder, *b*, without touching it, being bent away from it. This diagram illustrates a method of reducing the strength of the city supply by inserting standard 16 candle-power lamps to cut it down. After passing through our fuse wires the current is made to split or divide itself. The lower wire on leaving the fuse block goes to a little "knife switch," by means of which the current may be conveniently thrown on and off. These little switches come

in all sizes, one of 10 amperes capacity meeting all of our requirements. The upper wire on leaving the fuse block runs to the short vertical wire, *c*, which is attached for convenience on the left-hand edge of a pine board (not shown in the illustration). Along the other edge a similar wire, *d*,

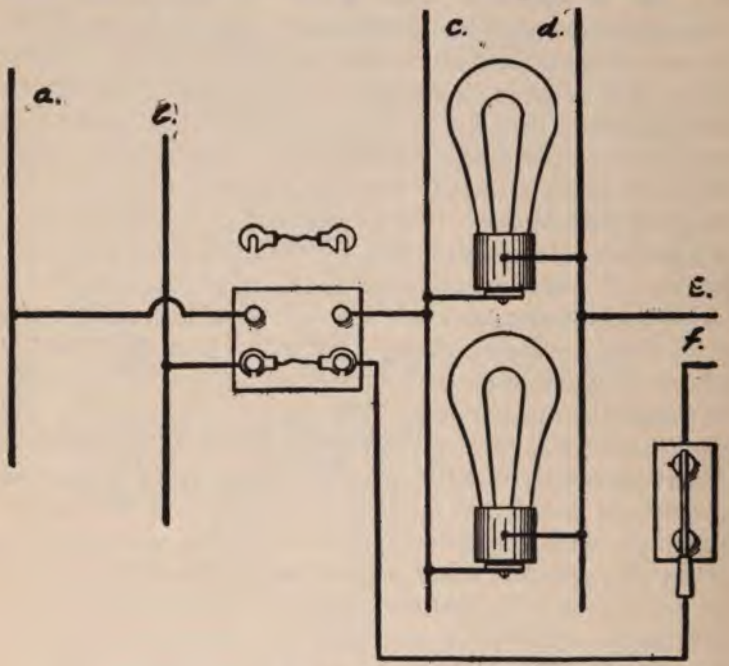


FIG. 93.

is run, to which final connection is made. It is now evident that no current can be had at *E*, *F*, unless something connects the wires *c* and *d*.

In order to obtain a weak current at *E*, *F*, something of a small current-carrying capacity must be connected across *c* and *d*. For this purpose we use the standard 16 candle-power incandescent lamp. By inserting one lamp—that is,

connecting across like a bridge as shown—we get the carrying capacity of one lamp, or one-half ampere. By putting in two lamps as shown in the diagram, we make two bridges of one-half ampere each, giving one ampere at the terminals *E* and *F*. On this plan, by putting in ten lamps we get five amperes, which is a strong current. The beauty of this arrangement lies in the fact that the current strength may be increased from one-half ampere to almost any amount by easy stages. Lamps come in many higher candle-powers, as follows, 32, 50, 100, 250, etc., each taking more current than the one of lesser power. By putting large lamps across as illustrated, 10, 15, and 20 amperes may be had, the use of which is applicable in our experiments in electric heating and in the light-and-heavy chest trick described in the preceding chapter. This is a safe system to use, no harm being done if the ends, *E*, *F*, are brought together, the lamps simply burning up brightly. This plan, if the electric current is available, economically takes the place of batteries. For the induction coil which is described in the following pages, this plan is well adapted if batteries are not handy.

As many inquiries have been made of the author in regard to running small lamps by battery power, a few words will be said on the subject in closing. If storage batteries are to be had with convenient sources for charging and transportation they may be used; but on no account be led into buying primary acid batteries. The primary battery is expensive to keep in order and unsatisfactory for lighting, regardless of type and manufacture. The writer strongly advises the use of gas footlights, as described at the close of Chapter I., unless an electric-lighting system is available, or very favorable facilities for storage-battery charging, with means for transportation. These batteries would be too expensive to buy for this use alone, and should be rented fully charged.

The Induction Coil and Plate Machine.

In Chapter I., in describing the electric and combination table, high- and low-tension electricity were spoken of. The little piece of apparatus known as the induction coil most conveniently transforms low-tension electricity into high-tension electricity, suitable for the requirements of the demon candlesticks. Fig. 94 illustrates the ordinary type of coil in elevation. These coils come in all sizes, being rated by the length of spark they are capable of giving; the range

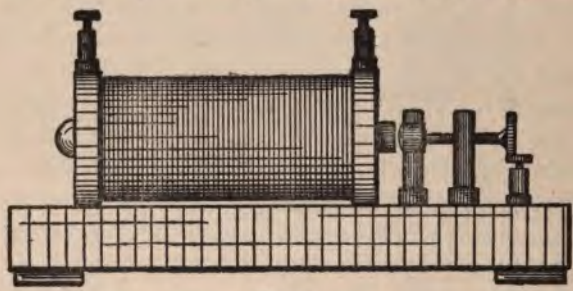


Fig. 94.

running from less than one-eighth inch to over two feet. For our magical purposes a coil capable of giving a two-inch spark will answer all requirements admirably. By referring to the plan view of the coil in Fig. 95 the method of connecting up will be made clear. The brass binding posts, or screws, *a*, *b*, receive the supply of low-tension electricity, which may be taken from the wires, *e*, *f*, of Fig. 93, but preferably from a battery. Upon connecting the screws *a*, *b*, with an electrical cell, to be described presently, the little hammer on the spring begins to buzz, and for the reason of the noise made the coil should be placed some distance away *from the* audience. When the coil is in operation, high-*tension electricity* exhibits itself in the form of a spark, if

wires connected to the screws *c*, *d*, are brought near each other.

While the current from the cell which supplies the working power of the coil may be taken without even being felt, the transformed current, on leaving the coil, is very severe and should on no account be taken. With the coil placed behind the scenes and some distance back (because of its buzzing sound) the wires which connect with *c* and *d* supplying the high-tension current must be thoroughly insulated. The best rubber-covered wire of about No. 22 gauge answers admirably if supported on small porcelain insulators. With

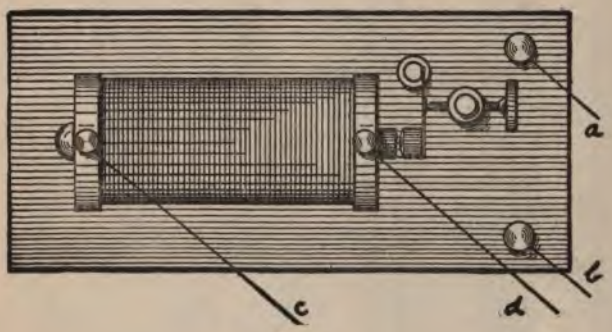


FIG. 95.

these precautions, the high-tension discharge may be carried some distance without leaking away.

A very suitable electrical battery for the operation of this coil is represented by Figs. 96 and 97, where a cylindrical glass jar is shown covered with a perforated wood top carrying carbon sticks and a zinc rod. Fig. 96 illustrates a section through the jar, the centre rod being the zinc, and the ones on either side the carbons. To make this battery, procure a jar from eight to ten inches in height with a diameter of about six inches. Turn a wooden disc from one-inch wood to cover the top, and bore eight holes as shown in Fig. 97, the proper

size to receive electric-light carbons. The carbons should fit in tightly, with the uncoppered ends down. All eight carbons are joined together with a wire to form one pole of the battery, as shown. To join the wire to these carbons, it should be soldered to the copper covering, just as if it were solid. The zinc stick forms the other pole of the battery, having its own wire as shown. The battery is filled three-quarters full with the following solution: Water 18 parts, sulphuric acid 4 parts, bichromate of potassium 3 parts. Before inserting

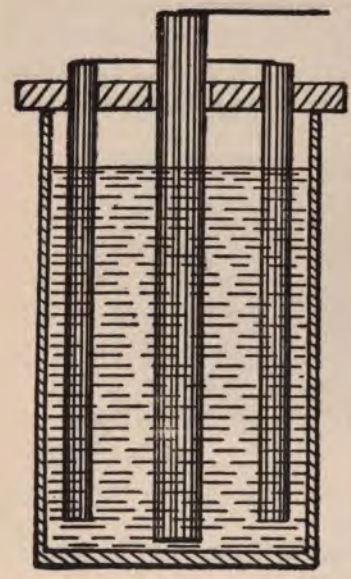


FIG. 96.

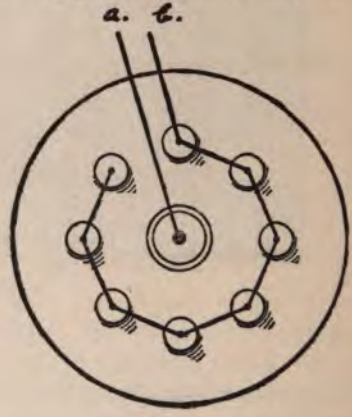


FIG. 97.

the zinc rod it should be amalgamated with mercury. To accomplish this the rod is dipped for a few seconds in the acid compound, and removed, being rubbed with a rag containing particles of mercury until the surface of the zinc shines brightly with a mercury coating. This amalgamation lengthens the "life" of the zinc rod when immersed *in the working* solution.

The battery is started by simply putting the zinc in place, a

strong current of electricity being delivered at the terminals, *a* and *b*, Fig. 97. These are directly connected to the screws *a*, *b* on our induction coil. When the coil is shut off the zinc should be withdrawn from the battery, thus stopping all action. The induction coil may be replaced by the plate machine, which gives even longer sparks and answers our purpose beautifully. The modern induction-plate machine will give the required discharge in almost any weather, while

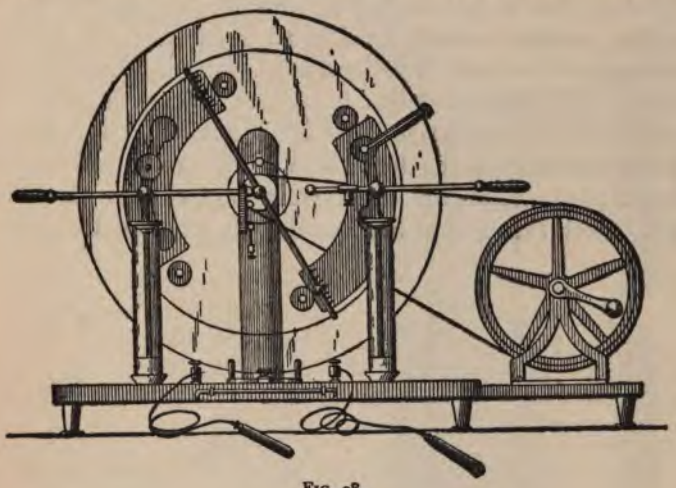


FIG. 98.

the old friction type acted indifferently in damp weather. The electricity from the plate machine furnishes current at a higher tension than the induction coil, requiring the utmost precautions in insulation. While the spark from the plate machine is much longer than that from the average induction coil, it is less painful if accidentally received. This seeming paradox is due to the fact that the induction coil produces a thicker and more intense spark, while that from the plate machine is very light, although longer.

Fig. 98 illustrates a modern plate machine as sold by the

leading dealers. Insulaters of porcelain may be had of very small size suitable for supporting our high-tension wires, which, as previously stated, must be rubber-covered. The higher the electric tension the longer the electric spark, and the difficulty in insulation increases in proportion.

Having learned the nature of high-tension currents the conjurer will have no difficulty in directing them wherever he wishes an electric spark to appear for whatever purpose. In closing, the writer wishes to impress the importance of handling a large induction coil with great care, as a shock from even a "one-half inch" coil is a very painful and serious matter. The plate machine is far less dangerous, although larger and more troublesome to transport. If the machine is to be carried about, the risk of breakage will be greatly reduced if the plates are made from hard rubber instead of glass. Both types, if of modern design, are equally good.

Soldered Joints.

So much depends upon the art of soldering, in producing the apparatus described in the preceding pages of this little book, that it is deemed desirable to give instructions leading to proficiency in the art. The following instructions are from the author's "Model Engines and Small Boats," and if carefully carried out the little science may soon be mastered. Select a bar of solder known as "half and half" (half lead and half tin) and melt it in a little iron pot. Fig. 99 illustrates a little furnace easily constructed from thin sheet iron or brass, similar to that used in one of our magical experiments, and proving very handy. This little furnace allows of the concentration of great heat if used with a large Bunsen burner. The holes for the escape of the gases can be drilled through after the furnace is made, or can be punched in the plate before the metal is rolled. The molten solder must now be cast in thin sticks, which may be accomplished by pouring into a wooden mould. This mould is quickly made from a block of wood by running a groove in the top with a gouge chisel; a section of the mould being given in **Fig. 100.** This may appear to be a good deal of trouble, but

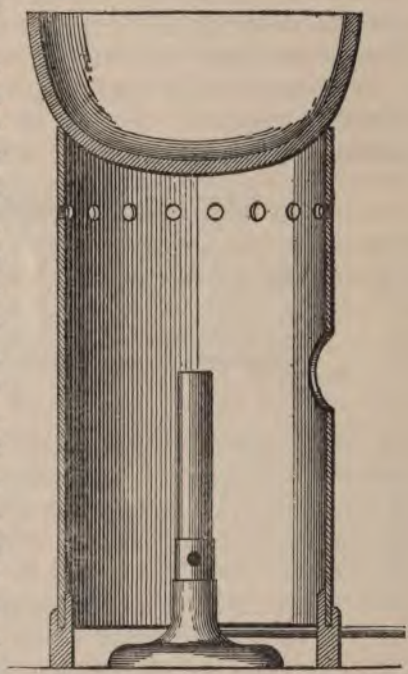


Fig. 99.

part of the secret in successful soldering lies in having small sticks, unless heavy roof soldering is to be done, with very large irons. The necessary articles for our work consist of the furnace and Bunsen burner, or if gas is not at hand a small charcoal fire, built in the bottom of the little furnace, supported on a piece of brick loosely fitting in the bottom, like a core. An air space must be left around this "hearth" and the soldering irons, which should be of two or three sizes, thrust into the little circular opening. The "head" of the smallest iron should be about one inch long by one-fourth inch square. The largest iron which we will require should be four times the size. The most satisfactory solder-

FIG. 100.

ing compound for general use is zinc chloride, which is readily made as follows: dissolve as many pieces as possible of scrap zinc in a bottle half filled with hydrochloric acid (muriatic acid). The bottle in the course of the acid's action on the zinc will get very hot, and should be put in a place where its accidental breakage will not cause damage.* Having added as much zinc as the acid will dissolve, the bottle is filled up with water, when it is ready for use. After soldering with zinc chloride the joint should be well washed in water, in order to prevent subsequent corrosion of the work. Before attempting to join two pieces of metal they must be brightened up with emery cloth, or, better still, a fine file. In order to solder, the material must be

* *The bottle may* be kept cool by submerging the lower part of it in *a can of water.*

bright on its surfaces, must be treated with zinc chloride or some substitute, and must be brought to a sufficiently high temperature. It would be useless to try to unite two large masses of metal by using a small soldering copper, no matter how hot the copper might be, unless the two pieces to be soldered were raised in temperature first by a flame or very large soldering copper. The heat from the small copper in this case is immediately dissipated throughout the large masses of metal, and the amount of heat that will raise a small piece of metal to a high temperature can only heat up a large mass very little. Remember this important point in soldering, and practise with scraps of brass or copper of different masses. Of course, in uniting small pieces of metal, a small soldering iron "holds enought heat" to do the work.

Do not be too discouraged at first by untidy appearances due to superfluous solder, for a file quickly takes it away and brings the surface down to a beautiful level, polished and neat in effect. Several files should be kept for use on solder, as it eventually fills up the cutting edges and cannot easily be removed. Keep the soldering coppers clean, and apply some of the zinc chloride to them occasionally, so that the copper will "pick up solder" after melting it off, in order to carry it to a joint. If the solder had not been cast into thin sticks it would be very hard to melt any off with the iron, and, by the time it did, the iron would have very little reserve heat for raising the temperature of the pieces to be joined. Never, under any circumstances, allow the copper to remain in the flame until it burns with a green color, for this indicates that it is "eating" or burning away the soldering instrument. The iron should always be bright with solder, rubbing it on a rag wetted with the zinc solution whenever it is necessary to apply a new coating of solder. By keeping the iron thus, and using small strips of solder, it will not only melt it off the bar, but carry a portion to the work and complete a satisfactory joint.

Screw-Cutting.

The art of screw-cutting is usually looked upon with awe by those ignorant of the process, and considered by many amateurs to be out of their reach, even when they are familiar with the tools. The writer remembers paying twenty-five cents apiece for six tiny brass nuts, which he required for a special purpose a number of years ago, which he undoubtedly could have made himself were he not "afraid" of buying the taps or dies and undertaking the work. There is nothing difficult about screw-cutting, and it will be found a most fascinating little art to the beginner, and one of incalculable value if he intends to go in for small shop work. Large screws, those over one inch in diameter, should invariably be made on a lathe, but all those ranging from one-thirty-second of an inch to one inch can be rapidly and accurately cut by means of a screw-cutting set. These screw-cutting sets were never especially cheap, but one having a range for rods from one-sixteenth to one-half inch, although costing a good deal in proportion to other tools, will prove an extremely valuable investment for the mechanical amateur. These sets come complete, ready for work, and all they require is a little oil when cutting, to serve as a lubricant and keep the temperature down. To work rapidly without oil tends to draw the temper of the tool because of heating up. Screw-cutting will require only a little practice in matching the proper-sized rod to be threaded to the cutting die in the screw set. If a rod to be cut with a thread is too large for a given tap, the threads will be so deep that they will weaken the work; if, on the other hand, the rod is too small for the die, the threads will not be deep enough to be of any use. This selection of rods *for different taps* in the screw-cutting set must be governed *by practice*, a small amount of which will lead to proficiency.

The very same choice, in regard to sizes, presents itself in drilling the holes in a metal plate, let us say, for the reception of a bolt, and the amateur as well as the professional should possess a full set of twist drills, ranging from at least one-sixteenth inch to one-fourth inch in diameter. It will be readily seen that the size of hole intended to receive inside threads must just suit the cutting die, or else the threads will be too shallow or tend to go too deep, which will result in the breaking of the die. The dies are of extremely hard steel, and consequently very brittle, necessitating some little care in handling and cutting. For example, let us say that we wish to cut a thread on a one-eighth inch brass rod, to make a little bolt for one of our pieces of apparatus. The rod is cut to a liberal length, and is placed in a horizontal position in the jaws of a vice. We can now practise with one or two of our taps by cutting five or six threads on the end, that is to say, cut up on the rod about one-fourth inch. The threads should be "V" shaped and sharp, which we should examine with a magnifying glass if they are very small. If they do not suit, being either too deep or too shallow, the rod can be sawn off with a file or hack saw, and the other sized dies tried. When the die of the proper size is found, the cutting may be carried on at quite a brisk rate if the cutter or tap is run by steps, so to speak, using oil applied by means of a slender oiler. By steps, or partial turns, it is meant that the cutter is turned to the right, clockwise, through an angular distance of about 90°, and then it is turned back to the left, counter-clockwise, through an angular distance of about 45°. In this manner, as will be readily seen, the die is revolved, advancing all the time, and is cutting on the thread, the backward movement allowing the cuttings, or minute particles of metal, to fall into the recess of the die and get out of the way. The same movement should be employed in cutting inside threads, as it produces better work, and keeps the die from undue strains, one-

heating, and possible breaking off, a very disagreeable thing to have happen, apart from the cost of the tool, as it is impossible to drill the piece of steel out, which often results in the ruin of the work which we are threading. In starting a tap or die on the end of a rod, it should be slowly revolved through a small distance at first with a strong and steady hand, applying a decided thrust to the cutter against the work, to make it "bite"; when it has once taken hold and started the threads, this thrust should be continued, but at greatly reduced pressure. For large screws, both wood and metal, the lathe must be employed, which can also be mastered with a little practice, although it is much more of a tool and will require practice in a number of ways. The lathe is undoubtedly the most universal and valuable tool the amateur can possibly invest in, and its acquirement is strongly recommended by the author to those who intend making mechanical devices of any kind.

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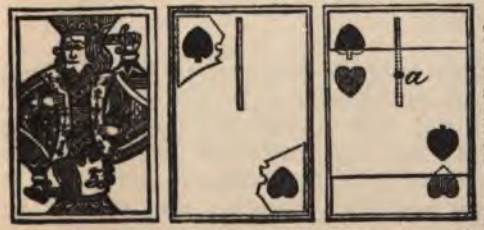

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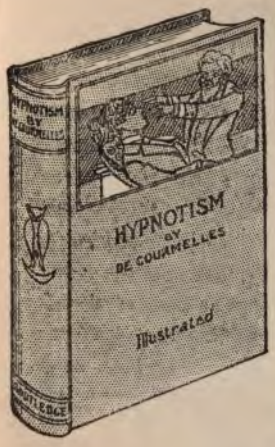

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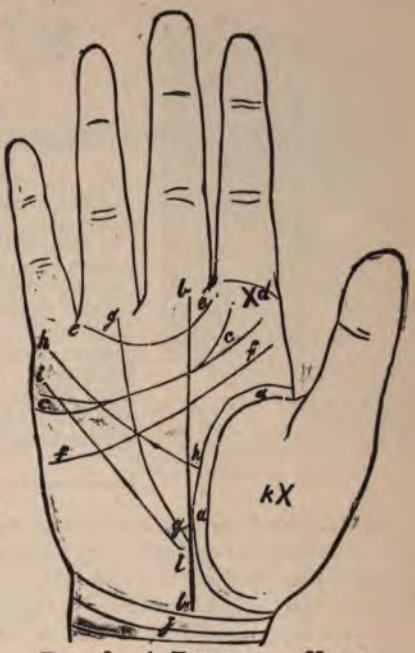

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