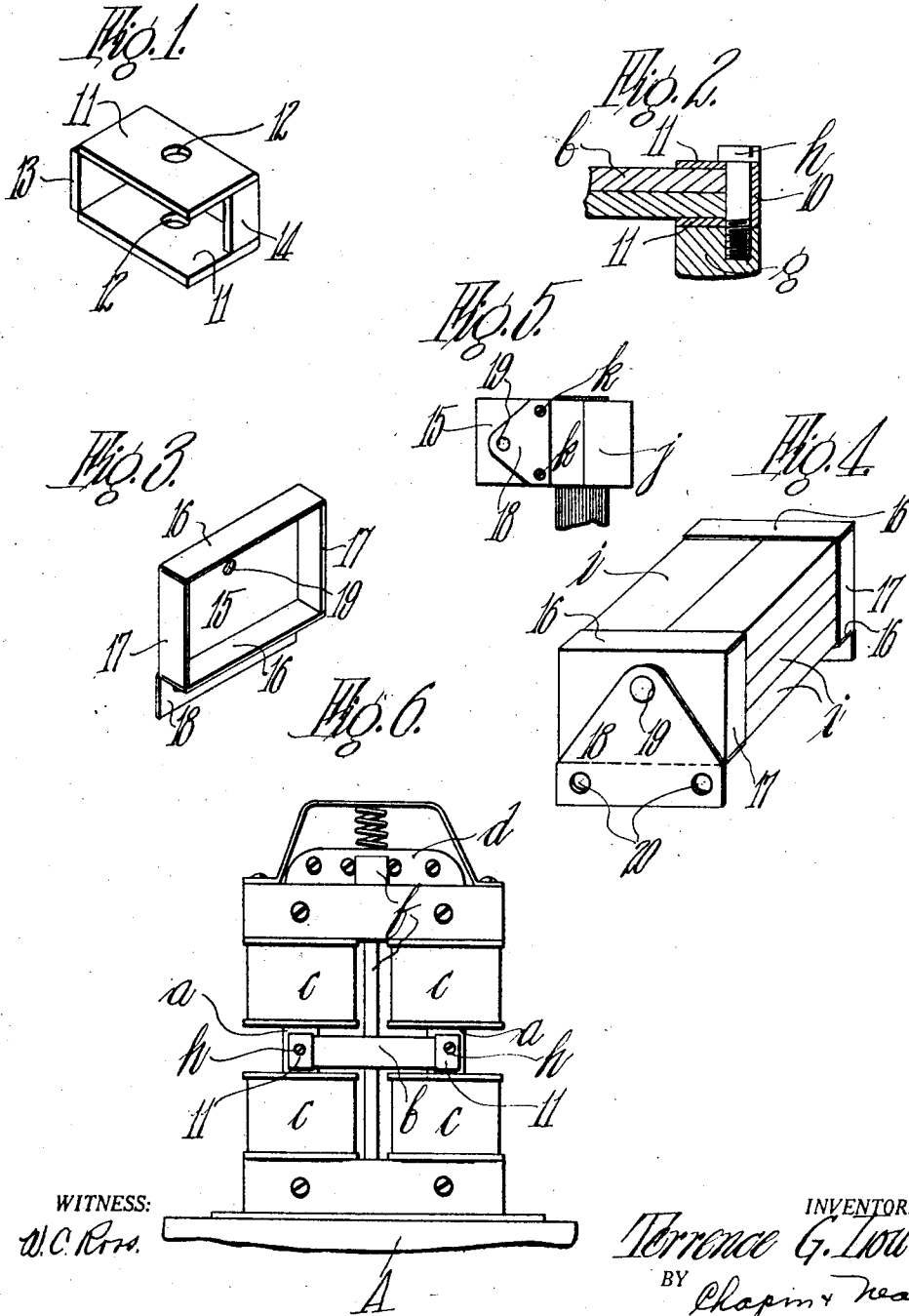


T. G. LOUIS.
HOLDING MEANS FOR MAGNETS.
APPLICATION FILED MAR. 26, 1919.

1,335,119.

Patented Mar. 30, 1920.



WITNESS:
W.C. Rrrr.

INVENTOR.
Terrence G. Louis
BY *Chapin & Neal*
ATTORNEYS.

UNITED STATES PATENT OFFICE.

TERRENCE G. LOUIS, OF SPRINGFIELD, MASSACHUSETTS, ASSIGNOR TO WITHERBEE
IGNITER COMPANY, OF SPRINGFIELD, MASSACHUSETTS, A CORPORATION OF
MASSACHUSETTS.

HOLDING MEANS FOR MAGNETS.

1,335,119.

Specification of Letters Patent. Patented Mar. 30, 1920.

Application filed March 26, 1919. Serial No. 285,323.

To all whom it may concern:

Be it known that I, TERRENCE G. LOUIS, a citizen of the United States of America, and residing at Springfield, in the county of Hampden and State of Massachusetts, have invented certain new and useful Improvements in Holding Means for Magnets, of which the following is a specification.

This invention relates to an improved fastening or holding means for permanent magnets and the like.

The attachment of permanent magnets to other parts, such as pole pieces and the like, presents considerable difficulty. Necessarily, the steel used for permanent magnets must be hard in order to retain the magnetism and, when hard, is not readily machinable. Heretofore, it has been common practice to drill holes through the magnets to receive retaining bolts or the like, but, in order to drill the magnets, the steel must be first annealed and, of course, a subsequent hardening of the steel is necessary.

Practical experience teaches that repeated annealing and hardening of steel has a detrimental effect on its magnetic retentivity. It is, therefore, desirable to avoid the process of annealing altogether, so far as the magnet manufacturer is concerned. Suitable steel, already hardened may be purchased and used for bar magnets without any machining operation other than a shearing operation. Steel of the proper width and thickness and already hardened may be cut up into the desired lengths by shearing, and the hardness of the steel is no detriment to the shearing operation.

Following the practice above outlined, special means are necessary for fastening the magnets, both to each other and to a third member, such as a pole piece, and this invention is concerned primarily with the provision of such special fastening means.

The invention has for an object to provide, in combination with a permanent magnet and a member to which it is to be secured, a clip having a forklike part which may be sprung over the end of the magnet and means for connecting the clip to said member, the arrangement being characterized in that the clip may be firmly fastened to the magnet without necessitating any machining thereof.

According to another feature of the invention, the clip is desirably made of mag-

netic material, and one is provided for each pole of the magnet to connect it mechanically and magnetically to the pole pieces.

According to a further feature of the invention, the magnet may be of the compound or laminated type, consisting of a plurality of independent bars, and the clip is so designed that its forklike jaws firmly press all the bars of the magnet into the desired close magnetic contact.

According to another feature of the invention, the clip may have two pairs of opposed jaws to engage and encompass all four sides of the magnet.

Other features and advantages will appear in the following description and in the illustrative embodiment of the invention in the accompanying drawings, in which:

Figure 1 is a perspective view of one form of clip embodying the invention;

Fig. 2 is a sectional elevation showing the manner in which the magnet is held to a third member by the clip;

Fig. 3 is a perspective view of a second form of clip;

Fig. 4 is a perspective view of a laminated magnet showing the manner of applying the clips, shown in Fig. 3, to the ends thereof;

Fig. 5 is a fragmentary elevational view showing the manner of fastening the magnet, shown in Fig. 4, to a third member; and

Fig. 6 is an elevational view of an igniter, the magnet of which is shown as held by clips of the form shown in Fig. 1.

While the invention is capable of application generally, wherever permanent magnets are to be held in place, it finds one advantageous use in connection with igniters or the like and will be herein described more or less in connection with igniters for illustrative purposes although, obviously, the invention is not restricted to this one particular use.

There is shown in Fig. 6, conventionally, one type of igniter which will be briefly described. This igniter includes two spaced cores *a* which are connected together intermediate their ends by a permanent magnet *b*. On each core *c*, above and below magnet *b*, is a generating coil *c*. An armature *d* is reciprocable to connect and disconnect the upper ends of cores *a* by mechanism, exemplified in part by the bar *f*. There is a

second armature to connect and disconnect the lower ends of cores *a*, but this armature is concealed within the base *A*, of the igniter. For present purposes, it will suffice to state that each armature serves to alternately make and break a magnetic circuit from the magnet *b* through a pair of coils *c*, as, with the armature *d*, a circuit through the upper two coils *c*.

The present invention is, however, concerned with the means for connecting the magnet *b* to the cores *a* or their equivalent, such as the pole pieces *g* shown in Fig. 2. In this connection, it should be noted that the invention is not restricted, according to all features thereof, to the attachment of the magnet to members which are also magnetic conductors although, according to other features of the invention, it is preferred so to do.

The magnet *b*, shown in Fig. 2, is a compound or laminated magnet consisting of two superposed flat bars. This magnet, or a single bar magnet or other types of laminated magnets, may be secured to a third member, such as the pole piece *g* for example, by the use of the clip shown in Fig. 1. Essentially this clip consists of a rather stiff piece of sheet metal bent into substantially U-form to afford the end or cross-bar portion 10 and the two spaced and substantially parallel jaw portions 11. Actually the latter are not exactly parallel in their original form, but rather converge to a slight degree away from the portion 10 so that, when the jaws are sprung apart slightly by the insertion of the end of the magnet therein, the jaws will then lie parallel and flatly against the opposed faces of the magnet in intimate and close magnetic contact therewith. The jaws 11 of the clip are made sufficiently sturdy (this may be controlled by the thickness of the jaws, the length thereof, or the character of the metal used) so that the constituent bars of magnet *b* are also pressed into close contact.

The jaws 11 are provided with alined openings therein, as the holes 12, which are arranged adjacent the end portion 10. The magnet *b* is not pressed into the clip far enough to cover holes 12, and consequently a retaining means, as the screw *h*, may be passed through the holes and threaded into the pole piece *g*. The screw *h*, however, merely firmly binds the clip to the pole piece and is not relied upon to force the jaws 11 against the magnet *b*.

Preferably, although not necessarily, the clip has other portions at right angles to the jaws 11. Thus, integral extensions 13 and 14 of the end member 10 are provided, which extensions are disposed at right angles to both the parts 10 and 11. One of these extensions 13 is substantially coextensive in length with the jaws 11 while the other 14 is,

as shown of less length and has its outer face disposed in the plane of the side edges of the portions 11. The end of the portion 14 furnishes a stop against which the end of magnet *b* may abut to limit its inward travel between the jaws 11 and maintain the holes 12 uncovered for the reception of the screws *h*.

As shown in Fig. 6, one clip is applied to each pole of magnet *b*, and the clips are made of magnetic material to magnetically connect such poles to the cores *a*.

There is shown in Fig. 3 a slightly modified form of clip, which, however, is constructed generally along the same lines as the clip just described. This modified form of clip is of generally box-like form, having an end wall 15 and two pairs of opposed walls 16 and 17. The magnet (in this instance one involving laminations consisting of two sets of four superposed bars *i*) is applied to the clip in the same manner as already described except that the sides of the magnets are engaged by the jaws 17 as well as the top and bottom by the jaws 16.

The clip shown in Fig. 3, however, is adapted to be fastened to a third member, as the pole piece *j* (Fig. 5), by different means, which consist of a plate 18 preferably swiveled to the end member 15 by suitable means, such as the rivet 19, so that it can swing in a plane parallel to the member. The plate 18, pivoted to the member 15, as shown, is arranged so that its free end projects beyond the jaws 16 and 17. In such projecting end portion are suitable holes 20 to receive retaining devices as the screws *k* (Fig. 5). Thus, each clip may be held to one face of a pole piece *j* by means secured to a second and right angularly disposed face.

The pivotal connection of plate 18 to member 15 is desirable since the plate may be swung out of the way of any one jaw if it is necessary to finish such jaw, as by smoothing it up to insure a flat and close engagement with the pole piece *j*. Such pivotal connection may prove otherwise desirable and convenient and is, therefore, preferred although it is within the scope of the present invention to fixedly attach the plate 18 to member 15 or to apply to the latter other suitable means to permit its attachment.

It will thus be seen that a holding means has been provided for effectively attaching permanent magnets to other parts and that such holding means are adapted as well to act as magnetic conductors between the magnets and the pole pieces. Particularly, when magnets are disposed in groups, the clips provide means of relatively high permeability for conducting the flux from the units of the group to the members to which they are secured. The holding means described is adapted for effectively accom-

plishing its purpose without necessitating any machining operations on the magnets, such as require an annealing of the steel and thus a detrimental effect on the retentivity of the magnet. The clip, of either type, is simple, and adapted for quantity production at low cost. The clips may be readily formed from sheet metal by simple stamping and bending operations. These clips, aside from their simplicity and low cost of manufacture, are very important to the trade since they greatly reduce the cost of fastening the magnets in place by eliminating the time and expense of annealing and machining operations.

The clips are also advantageous for other reasons. For example, the magnets frequently spring or warp during the hardening operation and if such sprung or warped magnets are then screwed down hard against the pole pieces or against each other, they will sooner or later become broken by snapping under the effects of vibration. The clips effectually guard against this possibility and they also eliminate the grinding or otherwise finishing, of the several units of a laminated magnet and the fitting of them one to the other. The magnets are simply forced into the clips and these, being readily machinable, may be readily dressed up along one side to closely fit the pole pieces. The clips are especially desirable with laminated magnets since they bind the constituent magnet units into a group which does not need to be taken apart for charging. This avoids the danger of reversing certain units relatively to others, which is a real danger when the laminated magnet is so fastened that when removed from the pole piece it immediately becomes separated into individual units. With the clips, the laminated magnet does not become separated into individual units when removed from the pole pieces and there is little, if any, likelihood of the units becoming reversed. The invention has been disclosed herein in a preferred embodiment, with detailed variations, for the purposes of illustration. It is understood, however, that modifications may be made in the invention as disclosed herein, having for their object the use of the invention in a form differing from that disclosed, and it is, therefore, desired to have the scope of the invention defined by the appended claims interpreted by the spirit of the present disclosure rather than by the letter of the exact form disclosed.

What I claim is—

1. The combination with a permanent magnet and a magnetic member to which it is adapted to be attached, of a clip of magnetic material having forklike portions between which a portion of the magnet is received and held, and means provided in connection with the clip to permit its attachment to said member.

2. The combination with a permanent magnet, of a box-like member of pressed magnetic metal into which an end of the magnet is adapted to be pressed and firmly held, and means provided in connection with said member to permit its attachment to a second magnetic member.

3. The combination with a permanent magnet, of an open boxlike member of magnetic material arranged to be forced onto each end of the magnet to encompass the four faces of the magnet and hold the latter by frictional engagement, a pole piece for each end of the magnet, and means to connect each member to its pole piece.

4. The combination with a permanent magnet, of a clip of magnetic material having two spaced jaws adapted to be sprung over an end of the magnet, and a part pivotally connected to the clip and arranged for attaching the magnet to a pole piece.

5. The combination with a permanent magnet and a pole piece to which it is to be attached, of a clip of magnetic material having forklike portions between which a pole of the magnet is received and held, and means provided in connection with the clip to permit its attachment to said pole piece.

6. The combination with a permanent magnet and a pole piece to which it is to be attached, of an open box like member of magnetic material arranged to be forced onto each end of the magnet to encompass the four faces of the magnet and hold the latter by frictional engagement, and attaching means to hold each member to its pole piece and including a pivotal connection with the member.

7. The combination with a permanent magnet and the pole pieces to which its ends are to be attached, of clips of magnetic material one for each end of said magnet, each clip having fork-like portions between which the end of the magnet is received, and means provided in connection with each clip to permit its attachment to its pole piece.

TERRENCE G. LOUIS.