G. G. PRAGST.

MAGNETIC CHUCK.

APPLICATION FILED NOV. 9, 1914.

1,212,555.

Patented Jan. 16, 1917.

2 SHEETS—SHEET 1.

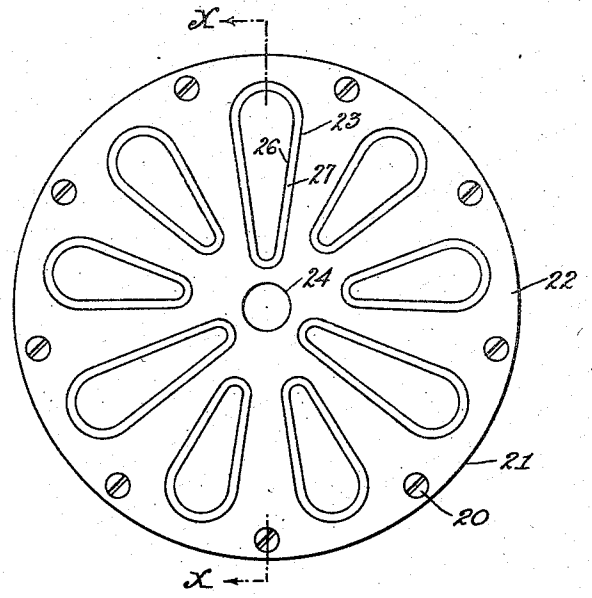

Fig. 1.

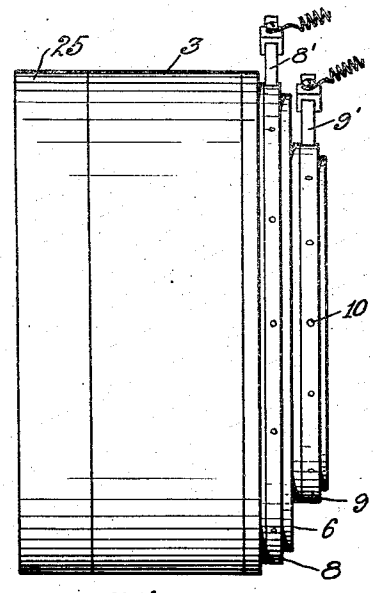

Fig. 2.

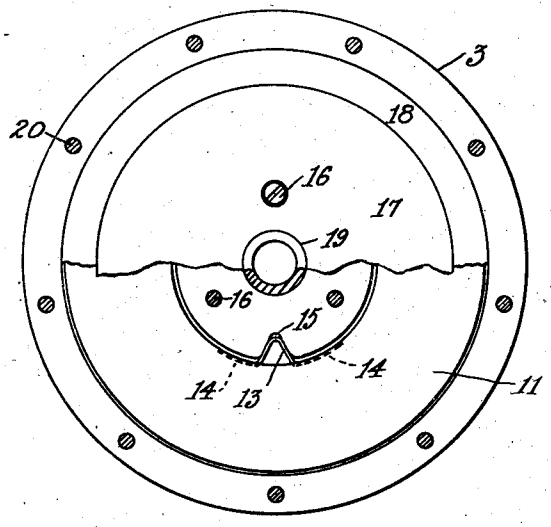

Fig. 3.

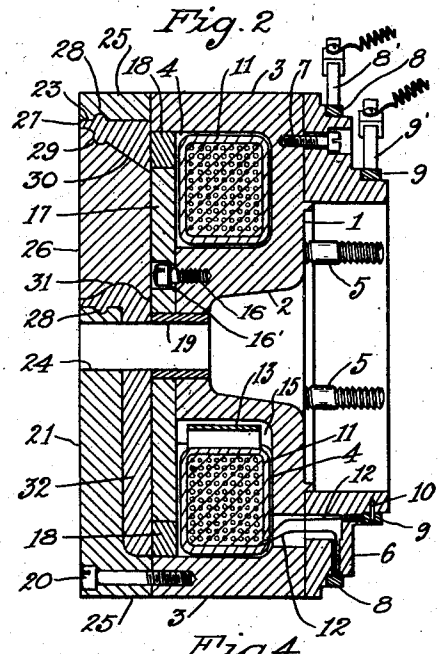

Fig. 4.

Witnesses.

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2 SHEETS—SHEET 2.

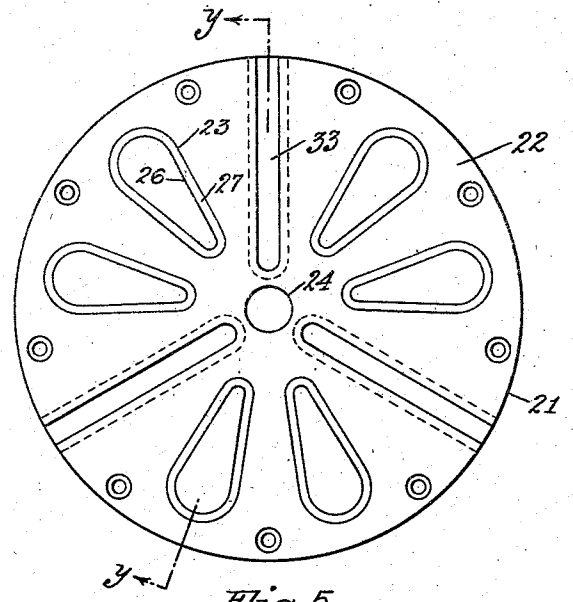

Fig. 5.

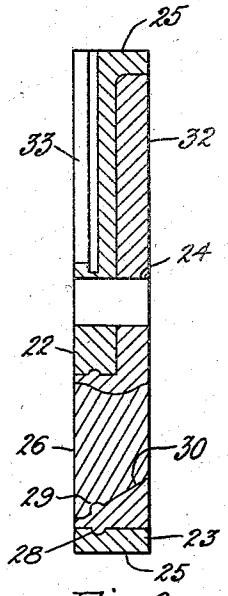

Fig. 6.

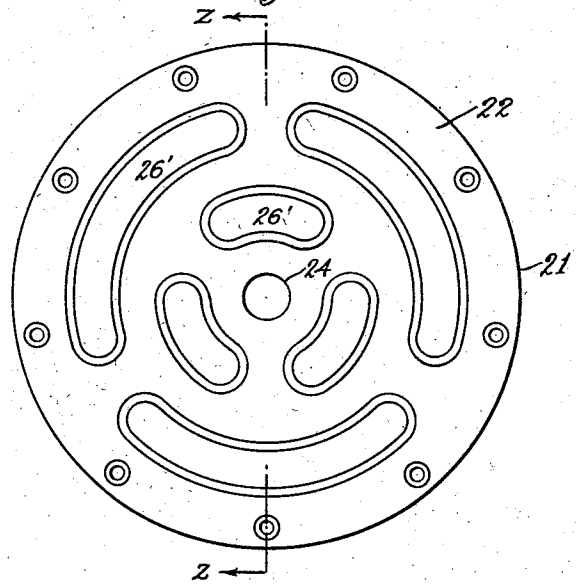

Fig. 7.

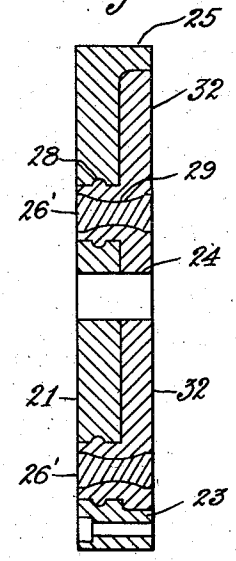

Fig. 8.

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UNITED STATES PATENT OFFICE.

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MAGNETIC CHUCK.

1,212,555. Specification of Letters Patent. Patented Jan. 16, 1917.

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To all whom it may concern:

Be it known that I, GEORGE G. PRAGST, of the city and county of Providence and State of Rhode Island, have invented certain new and useful Improvements in Magnetic Chucks; and I do hereby declare the following specification, taken in connection with the accompanying drawings, forming a part of the same, to be a full, clear, and exact description thereof.

The invention relates to improvements in magnetic chucks and has for its primary object to provide means whereby face plates having any desired design of polar surface may be employed.

Another object of the invention is to provide means whereby the leakage in the flow of the magnetic lines is materially lessened and an increased flow of the magnetic flux through the work is effected.

Another object of the invention is to greatly simplify and thereby cheapen the cost of manufacturing the chuck, as well as to increase its efficiency.

To these ends the invention consists in the novel construction, combination and arrangement of parts hereinafter described and more particularly set forth in the claims.

While my improvements are applicable to magnetic chucks in general, they will be described in connection with a rotary magnetic chuck.

In describing the invention in detail reference will be made to the accompanying drawings, in which—

Figure 1 is a plan view of the face of my improved chuck with face-plate attached. Fig. 2 is a side view of the same. Fig. 3 is a plan view of the chuck with face-plate removed and a portion of the center-plate broken away. Fig. 4 is a longitudinal section on line *x*, *x*, Fig. 1. Fig. 5 is a plan view of a modified form of face-plate. Fig. 6 is a sectional view on line *y*, *y*, Fig. 5. Fig. 7 is a plan view of another modified form of face-plate. Fig. 8 is a longitudinal section on line *z*, *z*, Fig. 7.

Referring to the drawings, 1 represents the shell or casing of the chuck which is preferably formed from cast-iron and provided with an inwardly extending hollow hub or central projection 2 and an external annular flange 3 extending toward the face of the chuck and forming an annular recess 4 between said hub and flange, as shown in Fig. 4. Secured to or cast upon the rear of the shell 1 is a series of threaded studs 5 upon which a back-plate may be secured for attaching the chuck to the spindle of a machine. A stepped ring of insulating material 6 is secured to the rear face of the shell 1 by means of one or more screws 7 and collector-rings 8 and 9 of copper or other conducting material are mounted on ring 6 and held in position thereon by means of escutcheon-pins 10. The collector-rings 8 and 9 receive the electric current from a suitable source through brushes 8′ and 9′ and deliver the same to a magnet-coil 11 through the magnet-coil leads 12, 12.

The magnet-coil 11 is annular in shape and is located in the annular recess 4, where it is held against revolution in the shell by means of a stop 13 which projects from the inner periphery of the coil and is secured to said coil by winding the tape covering of said coil over the legs 14 of the stop. Said stop 13 is arranged to engage a slot or recess 15 upon the outer surface of the hub 2, as shown in Figs. 3 and 4. Secured upon the free end of the hub 2 by means of screws 16 is a circular steel plate 17 carrying upon its periphery a brass ring 18, which is preferably forced thereon by hydraulic pressure. The screws 16 are provided with lead washers 16′.

The outer periphery of the brass ring 18 is arranged to engage the inner periphery of the flange 3 and the outer face of said ring 18 is arranged flush with the free end of said flange 3, as shown in Fig. 4. A brass bushing 19 is forced into a central opening in the plate 17 and into the central opening in the hub 2 to prevent access of liquids to the magnetic coil.

Secured to the free end of the flange 3 by means of screws 20 is a face plate or work-holding plate 21, which comprises a body portion 22 provided with a series of radially arranged pear-shaped or wedge-shaped openings 23, shown in Fig. 1 as nine in num-

ber, which are arranged with their narrow ends extending toward the center of the plate. It is preferred to have a certain number of the openings 23 extend in close proximity to the center of the plate 21 and to provide said plate with a central hole or opening 24, which furnishes means for centering the work. Extending around the periphery of the face-plate 21 is an inwardly extending flange 25 which corresponds in circumference and has its free end adapted to register with the free end of flange 3.

Mounted in each of the pear-shaped openings 23 is a pear-shaped pole piece 26 which corresponds in outline with the opening 23, but is smaller for the purpose of providing an opening around each pole piece which is filled with nonmagnetic material 27. This material may be of any non-magnetic metal or alloy, such as bronze, brass or solder. The periphery of each of the pear-shaped openings 23 is provided with a groove or channel 28, which is semi-circular in cross-section, and the periphery of each of the pole pieces 26 is provided with a corresponding oppositely disposed groove or channel 29, as shown in Fig. 4. The pole pieces 26 extend inwardly so as to be flush with the free end of the flange 25 and are each provided with an undercut end portion 30. The inner end of each of the pole pieces 26 is provided with an enlarged channel or concaved portion 31.

In assembling the pole pieces 26 in the openings 23, the face-plate is laid face downward, the pole pieces inserted in the openings 23 and the non-magnetic material is poured into the openings surrounding the pole pieces in a molten state from the rear side of the face-plate. By reason of the fact that the pole pieces are provided with the undercut end portion 30, the openings surrounding the pole pieces are wider upon the rear side of the face-plate and thus greatly facilitate the insertion of non-magnetic material. It will be seen that the non-magnetic material will enter the grooves 28 and 29 and thereby lock the pole pieces in engagement with the body portion of the face-plate. It will also be seen that a sufficient amount of the non-magnetic material 27 is poured into the rear side of the face-plate to fill up the body portion flush with the free end of flange 25, thereby providing non-magnetic sections 32 between the pole pieces. When the face-plate 21 is secured to the flange 3 of the chuck, it will be seen that the pole pieces 26 engage the steel plate 17 and that the non-magnetic material 27 will register with the brass ring 18 throughout the entire surface of its outer face.

With the face-plate secured in position upon the chuck, the magnetic coil energized, and a piece of work applied to the face-plate so as to bridge across the non-magnetic material surrounding the pole-pieces, the magnetic flux will flow through the plate 17, pole pieces 26, work piece, not shown, flange 25 of face-plate 21, flange 3, shell 1 and hub 2 back to plate 17.

With the above construction, it will be seen that the plate 17 constitutes a single pole piece with which a plurality of extension pole pieces 26 may register and that the flange 3 constitutes a single opposite pole. It will also be seen that the single brass ring 18 which separates said poles is constructed and arranged to increase the width and decrease the length of the non-magnetic material, of which said ring is composed, thereby greatly decreasing the liability of leakage at this point. It will also be seen that by making the width of the non-magnetic material 27 surrounding extension pole pieces 26 wider at the rear of the face-plate, liability of leakage at this point is greatly decreased and an increased flow of magnetic flux through the work will be effected. It will also be seen that with a single pole piece 17, which extends throughout the entire area of that portion of the chuck between the central opening and the inner periphery of the brass ring 18, face plates may be employed having an almost unlimited number of designs of polar surface, and two such different designs are shown in Figs. 5 and 7.

Fig. 5 shows a modified form of face-plate which is provided with a series of radially extending T-slots 33, which are adapted to receive means for holding and centering the work.

Fig. 7 shows another modified form of face-plate, in which the pole pieces 26′ are arranged concentrically around the face-plate instead of radially. It is evident that any desired design of face-plate may be employed depending upon the character of the work to be held upon the chuck, it simply being necessary that the pole pieces rest upon the pole-plate 17 and that the body portion of the face-plate contact only with the flange 3 on the shell 1. Thus it will be seen that no registering means are necessary to insure the proper registry of the pole pieces of the face-plate with the poles of the chuck-body and that no care need be used in applying the face-plate or in substituting one face-plate for another.

What I claim as my invention and desire to secure by Letters Patent is:

1. An article of the character described, comprising a shell having an inwardly extending hollow hub, an inwardly extending peripheral flange and an annular recess between said hub and flange, a magnet-coil in said recess, a pole-plate secured upon the free end of said hub and having a central opening and a strip of non-magnetic material secured upon the periphery and arranged to engage the inner periphery of the

flange, and a bushing extending through the central opening in said pole-plate and hollow hub.

2. A work-holding plate for a magnetic chuck, comprising a plate of magnetic material having a series of openings therein and an inwardly extending peripheral flange, pole pieces in said openings having their inner faces flush with the free end of said flange and held in said openings by non-magnetic material.

3. A work-holding plate for a magnetic chuck, comprising a plate of magnetic material having a series of openings therein and an inwardly extending peripheral flange, pole pieces in said openings having their inner faces flush with the free end of said flange and a seam of non-magnetic material interposed between the pole pieces and the plate and filling the interior of the plate surrounding the pole pieces flush with said free end of the flange.

4. A magnetic chuck comprising a single pole of one polarity and a single pole of the opposite polarity, and a work-holding plate having a plurality of pole pieces mounted therein and adapted to contact with one of said poles and a portion adapted to contact with the other pole.

5. A magnetic chuck comprising a single pole of one polarity and a single pole of the opposite polarity, and a work-holding plate having a plurality of pole-pieces adapted to contact with one of said poles and a portion adapted to contact with the other pole, with non-magnetic material located between said work-holding plate and said first-mentioned pole.

6. A magnetic chuck comprising a central pole-plate of one polarity and a peripheral pole-piece of the opposite polarity, non-magnetic material between the same, and a work-holding plate having a plurality of pole-pieces all contacting with said central pole-plate, a portion of the work-holding plate contacting with said peripheral pole-piece, and non-magnetic material between said work-holding plate and said central pole-plate.

7. A magnetic chuck comprising a shell provided with a single magnetizing coil and a single pole-plate, and a work-holding plate having a plurality of pole-pieces all contacting with said single pole-plate, a portion of the work-holding plate contacting with said shell, and non-magnetic material interposed between the plurality of pole-pieces and the work-holding plate and between the work-holding plate and said single pole-plate.

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Witnesses:
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