Jan. 9, 1945. F. MARTINDELL 2,366,976

COMPRESSING APPARATUS

Filed Jan. 1, 1942 4 Sheets-Sheet 1

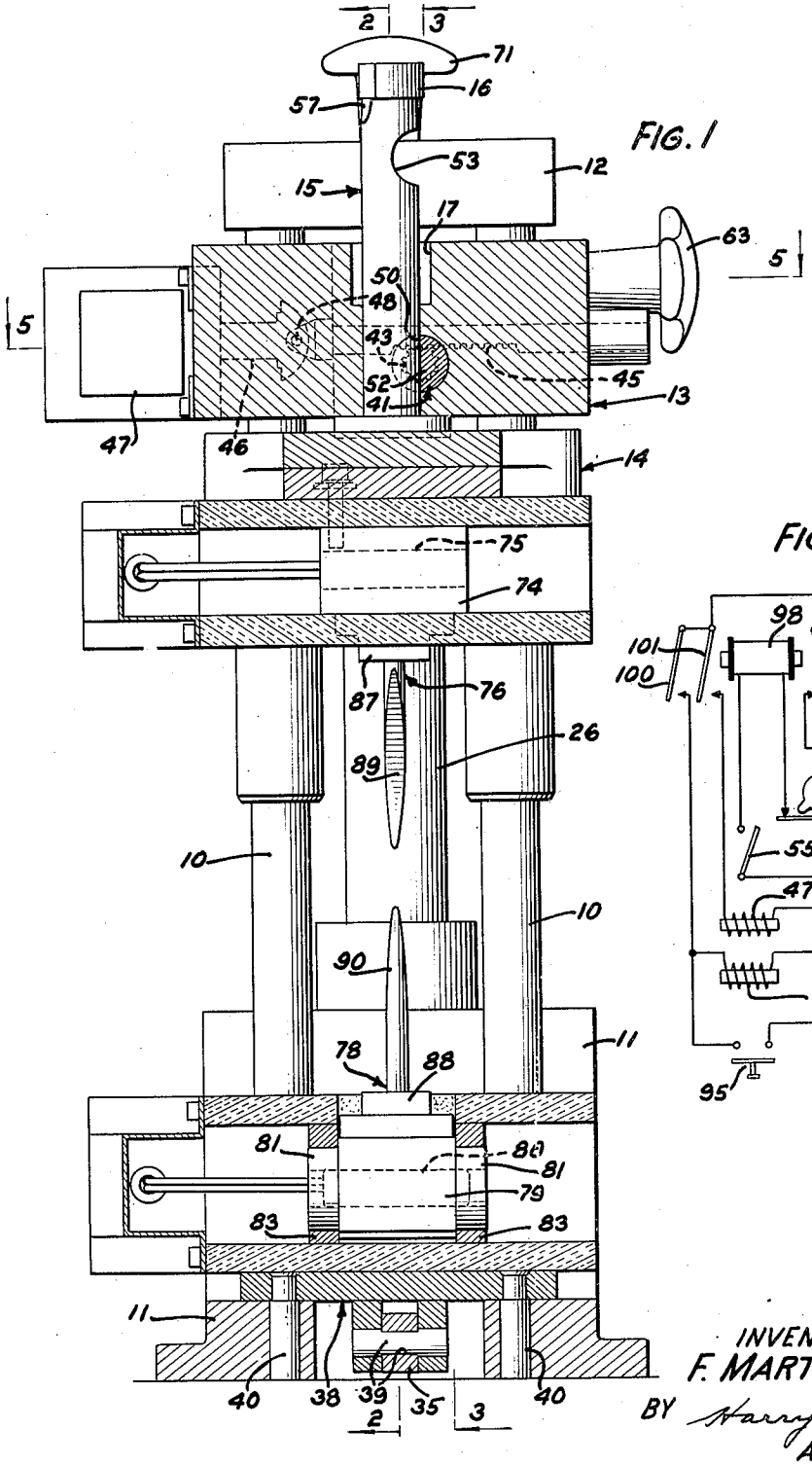


FIG. 1

FIG. 6

INVENTOR
F. MARTINDELL
BY Harry C. Duff
ATTORNEY

Jan. 9, 1945. F. MARTINDELL 2,366,976

COMPRESSING APPARATUS

Filed Jan. 1, 1942 4 Sheets-Sheet 2

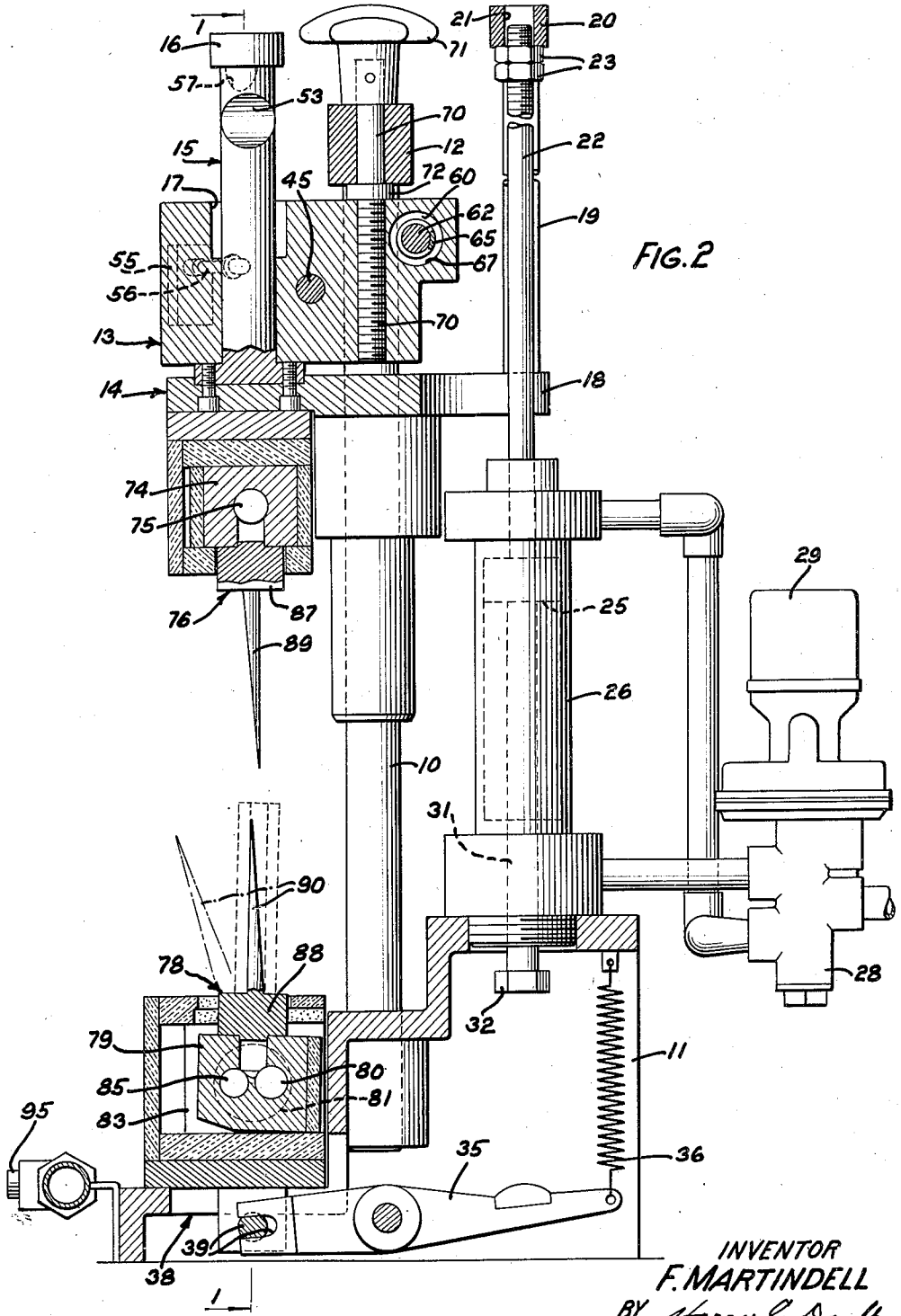


FIG. 2

INVENTOR
F. MARTINDELL
BY Harry C. Swift
ATTORNEY

Jan. 9, 1945. F. MARTINDELL 2,366,976

COMPRESSING APPARATUS

Filed Jan. 1, 1942 4 Sheets-Sheet 3

FIG. 3

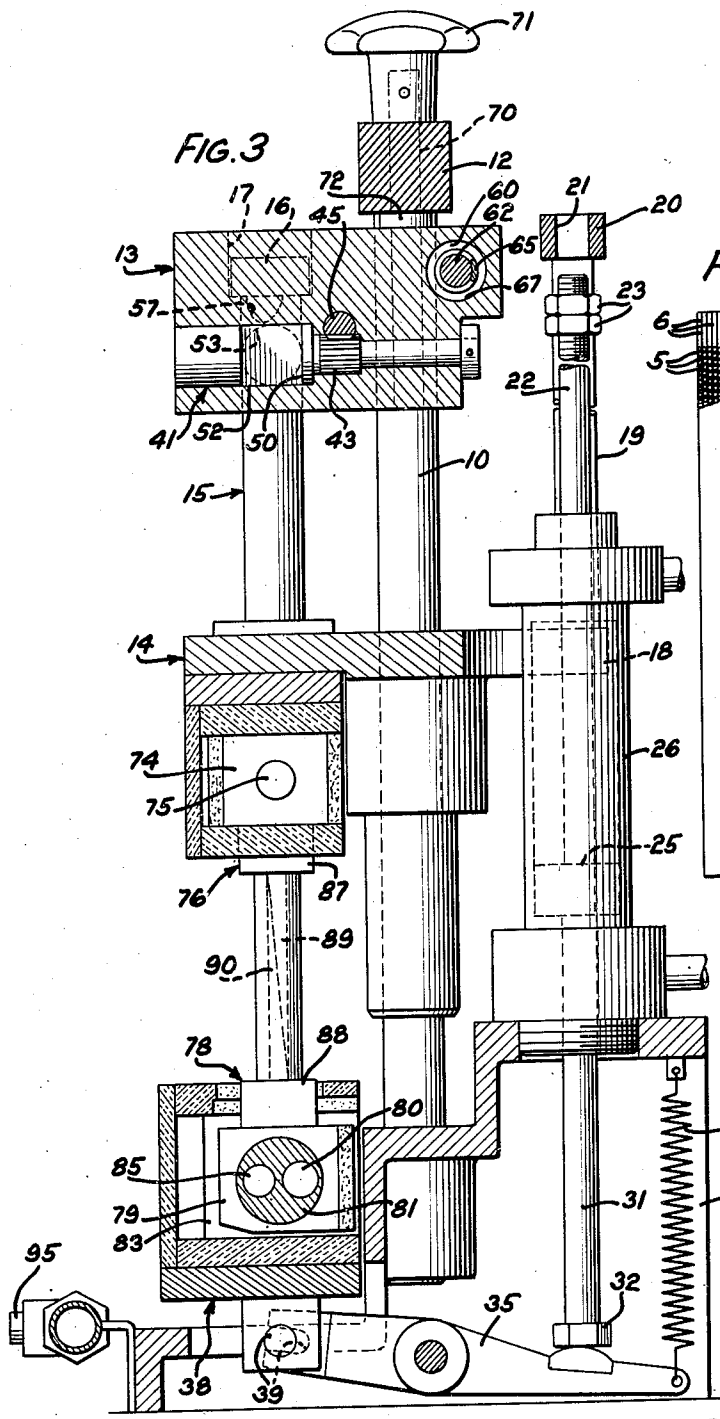


FIG. 7

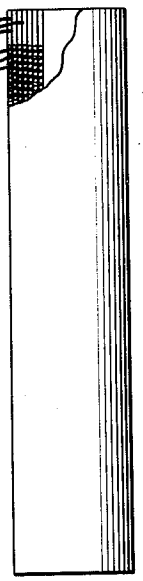
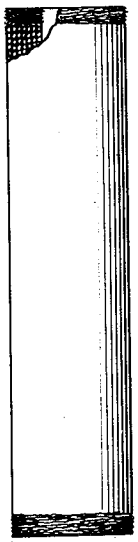


FIG. 8



INVENTOR
F. MARTINDELL
BY Harry L. Duft
ATTORNEY

Jan. 9, 1945. F. MARTINDELL 2,366,976

COMPRESSING APPARATUS

Filed Jan. 1, 1942 4 Sheets-Sheet 4

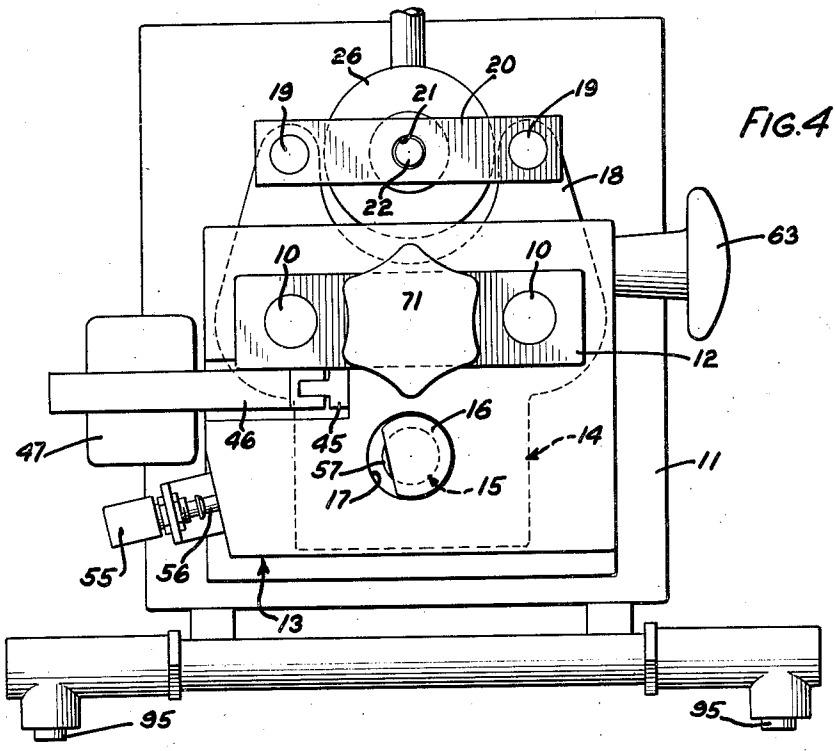


FIG. 4

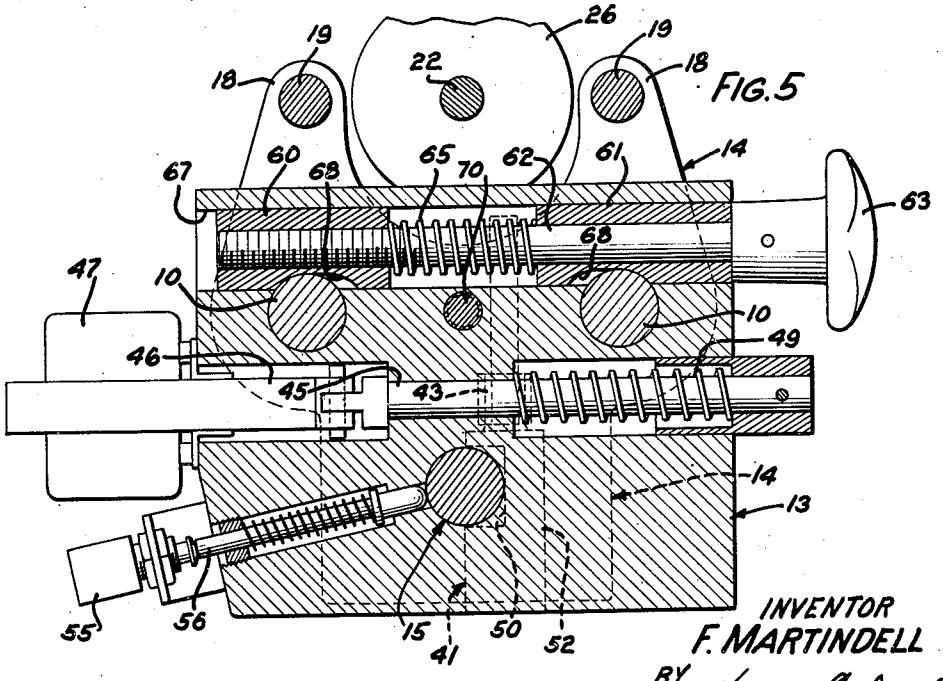


FIG. 5

INVENTOR
F. MARTINDELL
BY Harry C. Duffy
ATTORNEY

Patented Jan. 9, 1945 2,366,976

UNITED STATES PATENT OFFICE

2,366,976

COMPRESSING APPARATUS

Frank Martindell, Western Springs, Ill., assignor to Western Electric Company, Incorporated, New York, N. Y., a corporation of New York

Application January 1, 1942, Serial No. 425,373

9 Claims. (Cl. 18—16)

This invention relates to compressing apparatus, and more particularly to a sizing press for "filled" coils.

An object of the invention is to provide a simple, inexpensive and efficient apparatus for compressing articles, such as "filled" electrical coils, to a predetermined size.

In accordance with one embodiment of the invention, there is provided a sizing press for electrical coils, wherein cooperating upper and lower heated plungers are passed through the center of a coil to size the aperture through the coil and also the length of the coil, the upper plunger being lowered by gravity and then locked in position as the lower plunger is forced upwardly by pneumatic means to complete the sizing of the coil.

A complete understanding of the invention will be had from the following detailed description when read in conjunction with the accompanying drawings, in which

Fig. 1 is a front sectional view of a coil sizing press embodying the features of the invention, the section being taken on line 1—1 of Fig. 2;

Fig. 2 is a vertical sectional view taken on line 2—2 of Fig. 1;

Fig. 3 is a vertical sectional view taken on line 3—3 of Fig. 1, with the upper and lower plungers of the press shown in compressing positions;

Fig. 4 is a plan view of the press;

Fig. 5 is a plan sectional view taken on line 5—5 of Fig. 1;

Fig. 6 is a diagram of an electrical controlled circuit for the press;

Fig. 7 is a side elevational view, partly in section, of a "filled" coil of the type adapted to be sized by the press, and

Fig. 8 is a similar view of the coil after it has been sized by the press.

The so-called "filled" coil illustrated in Figs. 7 and 8 comprises a plurality of layers 5, 5 of wire which are separated and insulated from each other by interleaving sheets 6, 6 of cellulose acetate or other suitable insulating material. It is common practice to wind a series of such coils simultaneously on separated zones of a winding arbor. Usually, the interleaving sheets are of a sufficient width to embrace all of the coils. After the winding operation has been completed, the so-called "stick" of coils is removed from the winding arbor and is separated into individual coils by severing the interleaving sheets midway between adjacent coils.

Electrical coils of the type referred to are sometimes employed in the manufacture of relays or the like and, in such instances, it is necessary that the length of the coil, as well as the diameter of its core receiving aperture conform accurately to the length and diameter of the core that is subsequently inserted into the coil. Also, before inserting the core into the coil, it is sometimes advantageous, if not necessary, to consolidate the end portions of the interleaving sheets of the coil into a substantially solid, integral mass, as shown in Fig. 8.

The coil sizing press illustrated in Figs. 1 to 5, inclusive, of the drawings is capable of consolidating the end portions of the interleaving sheets as it sizes the length and core receiving aperture of a coil. As shown in the drawings, the press comprises a supporting frame composed of two vertical posts 10—10 which are rigidly anchored at their lower ends to a hollow pedestal or base 11. A horizontal tie bar 12 rigidly interconnects the upper ends of the two vertical posts, and a vertically adjustable crosshead 13 is clamped to the posts near the upper ends thereof.

Vertically slidable on the posts 10 is an upper platen 14, and secured to and projecting upwardly from this platen is a cylindrical post 15 which is slidable in the crosshead 13. An enlarged head 16 on the upper end of the post is adapted to engage the bottom of a recess 17 in the crosshead to limit the downward movement of the platen. The platen 14 is formed with two spaced rearwardly extending ears or projections 18—18 (Fig. 5) and secured at their lower ends to these projections are a pair of vertical rods 19—19, the upper ends of which are rigidly inter-connected by a horizontal cross bar 20. Intermediate its ends the cross bar 20 is provided with an aperture 21 for receiving the upper end of a piston rod 22. A pair of nuts 23 are adjustably threaded on the upper end of the piston rod to serve as a rest for the cross bar 20 so that the upper platen assembly is adapted to be elevated by the piston rod and is permitted to move downwardly by gravity when the piston rod is retracted. The lower end of the piston rod is connected to an air operated piston 25 of a vertical air cylinder 26 mounted upon the base 11. The piston is adapted to be reciprocated in the cylinder by compressed air which is supplied to the cylinder under the control of a valve 28 operated by a solenoid 29 (Fig. 2).

The piston has a second piston rod 31 connected thereto which extends downwardly through the lower head of the air cylinder and into the hollow base 11, and is provided at its lower end with an enlarged head or nut 32. Dur-

ing the final portion of the downward movement of the piston, the headed lower end of piston rod 31 strikes one end of a lever 35 and rocks the lever in a clockwise direction (Fig. 2) against the opposing force of a coil spring 36. At its opposite end, the lever 35 is operatively connected to a lower platen 38 through a pin and slot connection 39, so that when the lever is rocked in a clockwise direction, the lower platen is elevated from the position shown in Fig. 2 to the position shown in Fig. 3. The lower platen is guided by a pair of liner pins 40—40 (Fig. 1) which are slidable in the base 11.

Mechanism is provided for automatically locking the upper platen 14 to the stationary crosshead 13 upon downward movement of the platen by gravity to its lowermost position. This mechanism comprises a horizontal lock bolt 41 (Figs. 1, 3 and 5) which is rotatably journalled in the crosshead adjacent vertical post 15 of the platen. To this lock bolt there is attached a pinion 43 which is geared to a rack bar 45. A plunger 46 of an electrical solenoid 47 is pivotally connected at 48 to one end of the rack bar for moving the rack bar in one direction against the opposing force of a coil spring 49, as best shown in Fig. 5. The lock bolt has a notch 50 intermediate its ends which, in the normal position of the lock bolt, permits the post 15 to slide freely in the crosshead. However, upon rotation of the lock bolt through 180° after the upper platen has moved downwardly to its lowermost position, as shown in Fig. 3, the half round section 52 opposite the notch 50 of the lock bolt enters a notch 53 in the post to lock the upper platen in its lowermost position.

For rotating the lock bolt to its locking position, the rack bar is shifted by the solenoid 47, which is energized by the closing of a switch 55 (Figs. 2, 5 and 6). This switch is normally held open by a plunger 56 which is slidable in the crosshead 13. One end of this plunger bears against the operating button of the switch and the opposite end of the plunger is spring pressed against the vertical post 15 of the upper platen. The post has a notch 57 near its upper end (Figs. 1 and 2) into which the plunger recedes when the upper platen arrives at its lowermost position. As the plunger recedes into this notch it permits the switch 55 to close and thereby complete the energizing circuit for the solenoid 47, whereupon the solenoid operates the rack bar to rotate the lock bolt into locking engagement with the post 15 of the upper platen. The upper platen is thus locked to the stationary crosshead 13.

As mentioned above, the crosshead 13 is clamped to the vertical guide posts 10 of the press. Any suitable clamping means may be employed for this purpose, and in the illustrated embodiment of the invention, this clamping means comprises a pair of clamping blocks 60 and 61 (Fig. 5) which are mounted on a horizontal shaft 62 that is provided at one end with an operating knob 63. The shaft is threaded at its opposite end in the clamping block 60, while clamping block 61 is slidable on the unthreaded portion of the shaft adjacent the operating knob. A coil spring 65 is interposed between the two clamping blocks so as to press them away from each other.

The clamping blocks are slidable in a horizontal bore 67 in the crosshead 13. It will be noted that portions of the guide posts 10 protrude into the bore 67 so that they are engageable by the clamping blocks, each of which has a notch 68 in the side thereof adjacent the guide posts. These notches are designed so that upon movement of the two clamping blocks toward each other by turning knob 63 in one direction, the blocks are firmly clamped to the guide posts, whereby the crosshead 13 is also clamped to the posts. By turning the knob in the opposite direction, the clamping blocks are released from the guide posts so that the crosshead may be raised or lowered to different positions on the guide posts.

For vertically adjusting the crosshead on the guide posts, a vertical adjusting screw 70 is provided which is rotatably journaled intermediate its ends in the stationary tie bar 12. An operating knob 71 is provided on the upper end of the adjusting screw and the lower end thereof has a screw thread operating connection with the crosshead. The adjusting screw is formed with a collar 72 intermediate its ends which cooperates with the knob 71 to prevent endwise or vertical movement of the screw. Thus, by manually rotating the adjusting screw after the clamping blocks 60 and 61 have been released, the crosshead may be raised or lowered on the guide posts 10 to vary the distance between the upper and lower platens of the press.

To the upper platen of the press there is attached an electrically heated copper block 74 having a cartridge type electrical heating element 75 embedded therein. An upper coil sizing plunger 76 is removably attached to the heated block 74 and is adapted to cooperate with a lower coil sizing plunger 78 which is removably attached to an electrically heated copper block 79 having a cartridge type electrical heating element 80 embedded therein. The block 79 is provided with trunnions 81—81, whereby it is pivotally mounted in spaced vertical plates 83—83 secured to and projecting upwardly from the lower platen 38. Thus, when the press is open, the lower coil sizing plunger may be tilted manually to the position indicated in broken lines in Fig. 2, to facilitate the insertion and removal of the coils.

The upper and lower coil sizing plungers are heated by the electrically heated blocks to which they are directly attached, and in order to maintain the temperature of the plungers substantially constant, a bulb type thermostat 85 (Figs. 2 and 3) is mounted in the lower plunger mounting block and is arranged to control both the upper and the lower plunger heating elements. As shown in the drawings, the plunger mounting blocks are encased in a suitable heat insulating material, such as asbestos board or the like.

In the illustrated embodiment of the invention, the upper coil sizing plunger comprises a base portion 87 and an integral spindle portion 89. The lower plunger likewise comprises a base portion 88 and an integral spindle portion 90. The spindle portions of the two plungers are complementary sections of a cylinder whose diameter corresponds to the diameter of the core receiving opening of the coil to be sized. It will be noted that the spindle portions of the plungers are tapered to facilitate their entrance into the core receiving opening of the coil.

Mounted on the front side of the base 11 of the press are two push button switches 95 and 96, both of which are required to be depressed in order to initiate a cycle of operation of the press. It will be noted that these starting switches are positioned so as to require the operator to use both hands to close both switches at the same time. This prevents the operator from acci-

dentally placing his hands between the plungers during the closing of the press.

As shown schematically in Fig. 6, the two starting switches 95 and 96 control the air valve operating solenoids 29. Also shown schematically in Fig. 6 is a relay 98 which is under the joint control of a normally closed switch 99 and the normally open switch 55, the latter switch being under the control of the upper platen of the press, as described above. Upon being energized, relay 98 closes three normally open switches 100, 101 and 103. The closing of switch 100 completes a holding circuit for the air valve operating solenoid 29; the closing of switch 101 completes an energizing circuit for the lock bolt operating solenoid 47; and the closing of switch 103 starts a timer motor 104. The timer motor drives a cam 105 which is adapted to open switch 99 after a predetermined time interval. The opening of switch 99 de-energizes relay 98, whereupon the switches 100, 101 and 103 open and thus cause the stopping of the timer motor and the de-energization of solenoids 29 and 47.

In the operation of the press, a coil to be sized is placed on the spindle portion 90 of the lower plunger 78, which is then manually tilted to the position shown in full lines in Fig. 2. The operator then depresses both starting switches 95 and 96, thus energizing the air valve operating solenoid 29 which, in turn, operates air valve 28 to admit compressed air into the upper end of air cylinder 26. The air piston is thus caused to descend, carrying with it the upper and lower piston rods 22 and 31, respectively. As the upper piston rod descends with the piston, the upper platen 14 together with the upper coil sizing plunger descends by gravity to its lowermost position, as shown in Fig. 3, whereupon the switch 55 automatically closes, as explained above. The closing of switch 55 energizes relay 98 which, in turn, closes switches 100, 101 and 103. The closing of these switches completes a holding circuit for the air valve operating solenoid 29, completes the energizing circuit for lock bolt operating solenoid 47, and starts timer motor 104. Solenoid 47 rotates lock bolt 41 through 180°, thus locking the upper platen to the stationary crosshead 13. After the upper platen has been locked in position, the air piston continues to descend to the bottom of the air cylinder, and during this final portion of the downward movement of the air piston, the lower piston rod 31 rocks lever 35 in a clockwise direction, thus elevating the lower platen together with the lower coil sizing plunger to the position shown in Fig. 3. The coil is thus sized to the required length by being compressed longitudinally between the base portions of the upper and lower plungers, and simultaneously therewith, the spindle portions of the plungers cooperate to size the core receiving opening of the coil.

After a predetermined time interval, during which the heat of the plungers serves to consolidate the ends of the interleaving sheets of the coil, the timer cam 105 (Fig. 6) opens switch 99, thus de-energizing relay 98, whereupon switches 100, 101 and 103 automatically open. The opening of switch 101 deenergizes lock bolt operating solenoid 47, whereupon the lock bolt is spring returned to its normal position. The opening of switch 100 de-energizes air valve operating solenoid 29, whereupon the air valve is operated to admit compressed air into the lower end of the air cylinder and thus force the air piston upwardly. The upper platen is thus elevated by upper piston rod 22 to its retracted position, while the lower platen is spring returned to its retracted position. As the upper platen rises, switch 55 is opened by plunger 56. Meanwhile, the timer motor having been de-energized by the opening of switch 103, the timer cam 105 is returned to its starting position, thus completing an operating cycle of the press. The operator then tilts the lower spindle 90 forwardly to the position indicated in broken lines in Fig. 2, after which the sized coil is removed from the lower spindle and the latter is then tilted backwardly by the operator to the position indicated in full lines in Fig. 2.

It should be understood that the invention is not limited to the particular embodiments thereof herein illustrated and described, except in so far as is defined by the appended claims.

What is claimed is:

1. A coil sizing apparatus comprising cooperating upper and lower plungers for compressing a coil therebetween to size the length of the coil, said upper plunger being gravity lowered to a coil sizing position, means for locking said upper plunger in said position, and means for thereafter elevating the lower plunger to complete the sizing of the coil.

2. A coil sizing press comprising a reciprocatory upper plunger adapted to be lowered by gravity to a coil sizing position, means rendered effective automatically upon movement of said plunger to said position for locking said plunger in said position, a reciprocatory lower plunger adapted to be elevated to a coil sizing position, pneumatic means movable in one direction to first permit the lowering of the upper plunger to its coil sizing position and then elevate the lower plunger to its coil sizing position, a valve for controlling said pneumatic means, and a timer for controlling said valve.

3. A compressing apparatus, comprising vertically reciprocable upper and lower platens, a vertically reciprocable piston for supporting the upper platen so that said platen is adapted to move downwardly by gravity to its compressing position upon movement of said piston in a downward direction, means for locking said upper platen in its compressing position, and means actuated by said piston upon further movement thereof in said direction for elevating the lower platen to its compressing position.

4. A compressing apparatus, comprising a fixed supporting frame, a reciprocatory platen having an extension slidable in said frame, a latch receiving notch in said extension, a rotary latch in said frame having a portion receivable in said notch for locking said platen in its compressing position, a reciprocatory rack bar for rotating said latch, and means under the control of the platen for actuating said rack bar.

5. A coil sizing press, comprising a supporting frame, a vertical guide post secured to and extending upwardly from said frame, a cross head adjustably secured to the upper end of said post, a reciprocatory platen slidable on said post and having a cylindrical extension slidable in said cross head, a rotary latch bar in said cross head for cooperating with said extension for locking said platen in its compressing position, and means under the control of said platen for rotating said latch bar to its locking position.

6. A coil sizing press, comprising cooperating vertically reciprocable upper and lower plungers for compressing a coil endwise therebetween, a vertically reciprocable piston for supporting the

upper plunger for movement by gravity to its compressing position, means under the control of said upper plunger for locking said plunger in said position, a piston rod extending downwardly from said piston for elevating the lower plunger to its compressing position, and a lost motion device between said piston rod and said lower plunger, whereby said upper plunger is caused to drop to its compressing position before said lower plunger is elevated to its compressing position.

7. In a compressing apparatus, a reciprocatory means mounted to reciprocate vertically, an upper vertically reciprocable platen member, means attached to the upper platen member and extending over the reciprocatory means for positively moving the platen member upwardly, said platen member and means being constructed and arranged to follow the reciprocatory means and move downwardly by gravity, means for retaining the upper platen member in its lower position, a lower platen member movable upwardly to cooperate with the upper platen member in compressing an article, and means connected to the lower platen member and extending beneath the reciprocatory means for engagement and movement thereby to move the lower platen member upwardly when said reciprocatory means moves downwardly.

8. In a compressing apparatus, a reciprocatory means, a first reciprocable platen member, means for interconnecting the platen member and the reciprocatory means during movement of the reciprocatory means in one direction for moving said platen member in said one direction, means for locking the first platen member in a predetermined position, a second platen member movable toward the first platen member to cooperate therewith in compressing an article, and means actuated by said reciprocatory means in moving in the reverse direction for moving the second platen member toward the first platen member.

9. In a compressing apparatus, a reciprocatory operating means, a first vertically reciprocable platen member, means driven by the reciprocatory means during its movement in one direction for moving the first platen member upwardly and for permitting it to move downwardly by gravity upon movement of the reciprocatory means in the reverse direction, means operable under control of said first platen member for holding it in a predetermined position after its movement a predetermined distance downwardly, a second platen member, and means actuated by said reciprocatory means after the first platen member has moved to said predetermined position for moving the second platen member toward the first platen member to compress an article.

FRANK MARTINDELL.