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W. F. WAGNER.

ELECTRIC HAMMER.

APPLICATION FILED JULY 11, 1904.

NO MODEL.

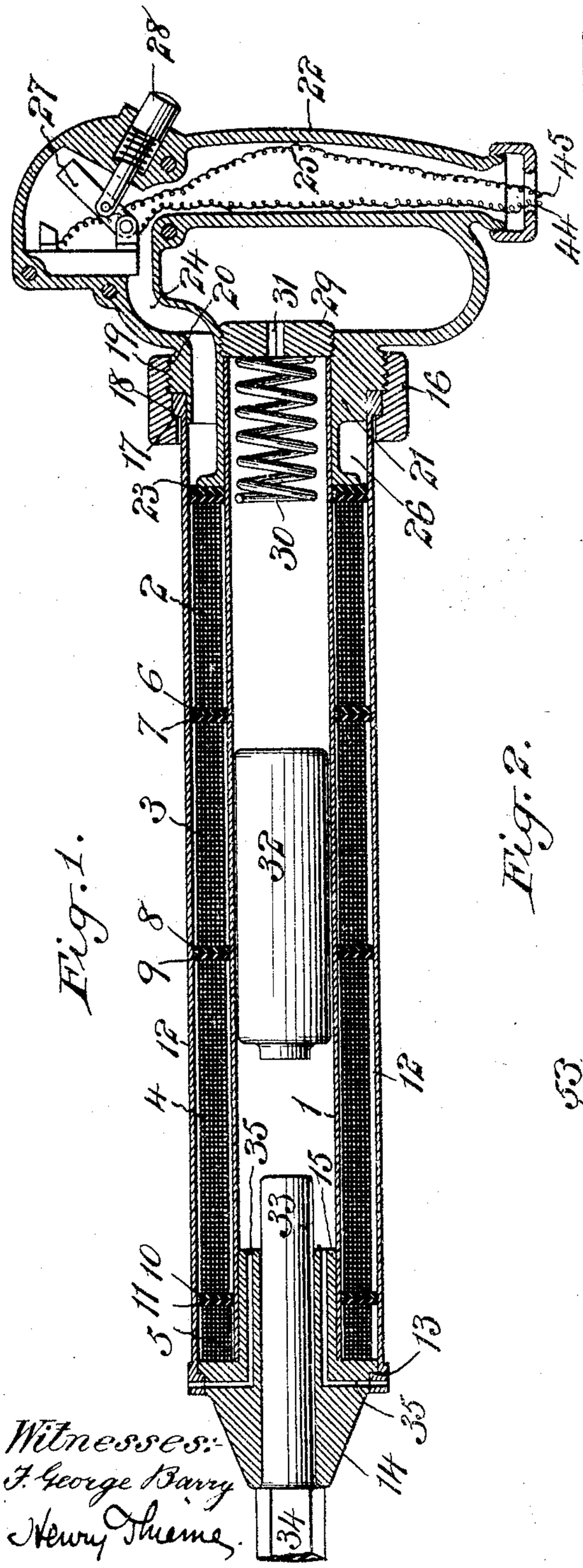

Fig. 1.

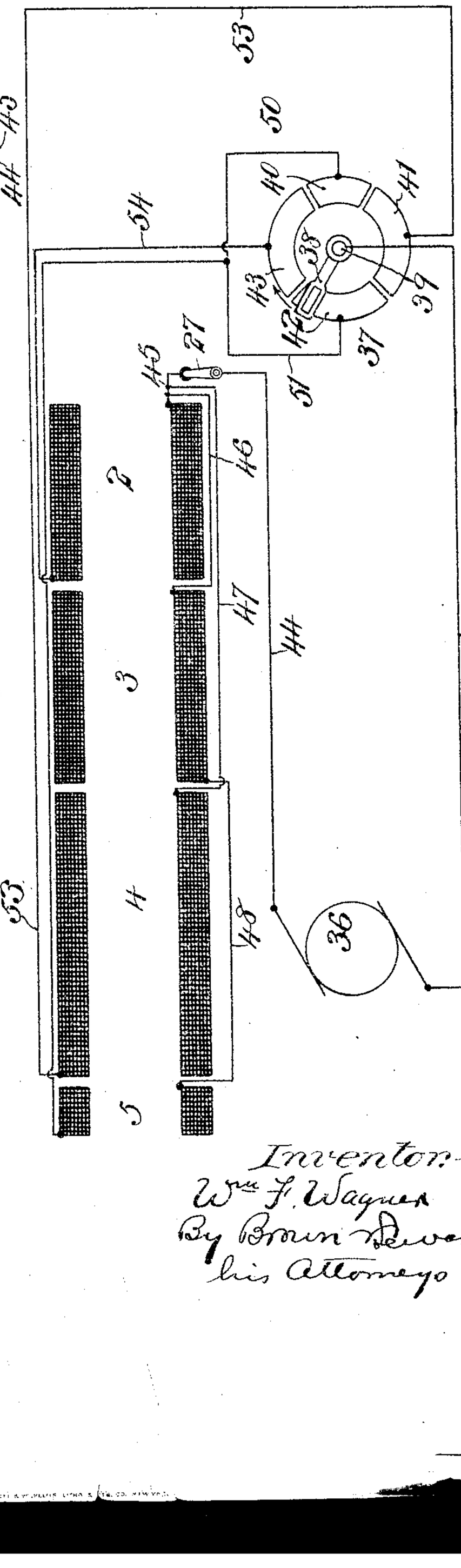

Fig. 2.

Witnesses:-
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Wm F. Wagner
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his Attorneys

No. 778,206. Patented December 20, 1904.

UNITED STATES PATENT OFFICE.

WILLIAM F. WAGNER, OF NEW YORK, N. Y.

ELECTRIC HAMMER.

SPECIFICATION forming part of Letters Patent No. 778,206, dated December 20, 1904.

Application filed July 11, 1904. Serial No. 216,099.

To all whom it may concern:

Be it known that I, WILLIAM F. WAGNER, a citizen of the United States, and a resident of the borough of Manhattan, in the city and State of New York, have invented a new and useful Electric Hammer, of which the following is a specification.

My invention relates to electric hammers, with the object in view of providing an efficient machine of this character for general use.

In the accompanying drawings, Figure 1 is a view of the machine in longitudinal section; and Fig. 2 is a diagrammatical view of the same, showing the connections of the electric conductors.

The machine consists of a central tube 1, preferably of brass, surrounded by a plurality of coils, in the present instance four, (denoted by 2, 3, 4, and 5, respectively.) The coils 2, 3, and 4 are wound in one direction, and the coil 5, which I term the "demagnetizing-coil," in the reverse direction. The coil 2 is separated from the coil 3 at its end by interposed washers 6 7, the coil 3 from the coil 4 by interposed washers 8 9, and the coil 4 from the coil 5 by interposed washers 10 11. The several coils are covered by an exterior casing 12, preferably of steel, which, by means of an internal shoulder 13, holds the chuck 14 in position with its shank 15 within the central tube 1, while the exterior casing 12 is itself held in position by a coupling-sleeve 16. The coupling-sleeve 16 has an internal shoulder 17, which engages an external shoulder 18 on the casing 12, while a screw-thread 19 on the interior of the coupling-sleeve engages an exterior screw-thread 20 on the shank 21 of the handle 22. The inner end of the shank 21 presses against a washer 23 at the end of the coil 2, thus serving to hold the several coils crowded together end to end between the chuck and handle. A conduit 24 in the handle and its shank connects the interior space 25 of the hollow handle with an annular recess 26 on the shank for the passage of the wires which connect the coils with the commutator and source of electric energy, and it is intended that the wires leading to the several coils shall pass along exterior to the coils, between them and the interior of the casing 12, to the annular recess 26 and along it to the conduit 24. A switch 27, located within the front portion of the handle, may be operated by a spring-actuated plunger 28, so mounted in the handle as to bring it within convenient reach of the thumb of the operator when the hand grasps the handle.

A head-block 29 has a screw-threaded engagement with the interior of the shank 21 and has attached to its inner face a cushion-spring 30. The block 29 and spring 30 may be removed at pleasure by unscrewing the block 29, a hole 31 angular in cross-section being provided in the block for that purpose. The hole 31 also serves to admit air to and permit its escape from the interior of the tube 1 as the hammer reciprocates. The block 29 also serves to hold the tube 1 snugly between it and the chuck.

Within the tube 1 a hammer 32, subject to become magnetized by a current of electricity through the coils, after the manner of the well-known solenoid, reciprocates between the spring-cushion 30 and the shank 33 of the tool 34, inserted in the chuck. Air is permitted to escape freely from in front of the hammer as it advances toward the shank of the tool by air-passages 35 extending along within the wall of tho chuck-shank and thence outwardly through the casing 12.

The manner of connecting the wires with the several coils, commutator, and electric generator is clearly shown in Fig. 2, in which the electric generator is denoted conventionally at 36 and the commutator at 37. The brush 38 of the commutator is assumed to rotate on an axis 39 to make electric contact with the several segments, in the present instance four, of the commutator, and these segments (denoted by 40, 41, 42, and 43) are so constructed that the time of transit across the segment 40 will be materially less than across the subsequent segments for reasons which will appear later on. One pole of the generator 36 is connected by a wire 44 with the inner ends of the coils 2, 3, 4, and 5, as follows: The wire 44 leads to one binding-post of the switch 27, and from the other binding-post of said switch a wire 45 leads to the inner

end of the coil 2, while branch wires 46 and 47 lead from the wire 45 to the inner ends of the coils 3 and 4, respectively, and a wire 48 connects the outer end of the coil 3 with the inner end of the coil 5. The other pole of the generator 36 is connected by a wire 49 with the brush 38 on the commutator. A wire 50 connects the segment 40 of the commutator with the outer end of the coil 5 and a branch wire 51 also connects the outer end of the coil 5 with the segment 42 of the commutator. The segment 41 of the commutator is connected by a wire 53 with the outer end of the coil 4, and a wire 54 connects the segment 43 of the commutator with the outer end of the coil 2.

Assuming the brush 38 to be in the position shown in Fig. 2 and to be traveling in the direction indicated by the arrow, the hammer 32 will have been withdrawn from the tool by the energizing of the coil 3 and the simultaneous demagnetizing of the tool-shank 33 by the reverse current in the coil 5, which current is established whenever the coil 3 is energized, because of the connections 48 and 50, hereinabove explained. As the brush 38 leaves the segment 42, which should take place just before the hammer reaches the midway position with respect to the coil 3, the coil 2 will become energized through the segment 43 and its connections and the hammer will be drawn outwardly against the spring-cushion 30. The return action of the cushion 30 is made to correspond as nearly as may be with the passing of the brush 38 from the segment 43 onto the segment 40, and the consequent energizing of the coil 3. The stroke of the hammer toward the tool is further powerfully augmented by the passing of the brush 38 from the segment 40 onto the segment 41, which energizes the coil 4, while at the same time it deënergizes the coil 3, thereby removing any retarding influence. The said augmenting of the stroke is produced by making the coil 4 of higher inductive power than the coils 3 and 2, in the present instance by increasing the number of turns or convolutions of the wire which comaposes it, so that as the hammer in its movement toward the tool comes within the influence of the coil 3 it will be drawn with increased power toward the tool up to the instant of impact. Just as soon as the impact of the hammer on the tool has taken place the brush 38 has passed onto the segment 42, and the coil 3 has become energized at the same time with the demagnetizing effect of the coil 5 and the hammer starts on its return movement. The segment 40 is of less breadth than the other segments, and the time required for the brush to traverse it is therefore less, so that the advance stroke of the hammer is not retarded by the influence of the coil 3, while the return stroke because of the breadth of the segment 42 may be retarded and the pounding against the hand of the operator thereby materially modified. The position of the end of the tool-shank with respect to the coil 4 and the hammer is such that if from any cause the tool and its shank be withdrawn or slipped out of place to such an extent as to bring the impact end of its shank outwardly beyond the inner end of the chuck then the hammer 32 will pass within the coil 4 out of the influence of the coil 3 and will be held by the coil 4 against a reciprocatory movement, thus obviating the hammering action of the hammer on the inner end of the chuck.

What I claim is—

1. An electric hammer comprising a suitable casing, a hammer proper, arranged to reciprocate within the casing, electromagnet-coils for operating the hammer and a demagnetizing-coil for releasing the hammer.

2. An electric hammer comprising a suitable casing, a tool-holding chuck at one end of the casing, a hammer proper arranged to reciprocate within the casing, electromagnet-coils for operating the hammer and a demagnetizing-coil surrounding the position which the shank of the tool is intended to occupy for releasing the hammer from the tool.

3. An electric hammer comprising a suitable casing, a hammer proper, arranged to reciprocate within the casing, electromagnet-coils for operating the hammer and means for varying the duration of the energization of a coil for the advance and return strokes of the hammer.

4. An electric hammer comprising a suitable casing, a hammer proper arranged to reciprocate within the casing, electromagnet-coils for operating the hammer including a coil of higher inductive power near the end of the casing where the hammer is intended to strike the tool, a coil of less inductive power farther from said end of the casing and a demagnetizing-coil nearer the said end of the casing.

5. The combination with the hammer proper and coils, one at the limit of its advance and one at the limit of its return stroke for actuating the hammer, of an intermediate coil arranged to act upon the hammer both during a part of its advance and during a part of its return stroke and means for energizing and deënergizing said intermediate coil at each stroke of the hammer.

6. The combination with the hammer proper and coils, one at the limit of its advance and one at the limit of its return stroke for actuating the hammer, of an intermediate coil for acting upon the hammer during a part of its advance and during a part of its return stroke, and a demagnetizing-coil arranged to be energized simultaneously with the said intermediate coil.

7. The combination with the casing comprising a central brass tube, an exterior steel tube, a tool-chuck forming a closure for the

tubes at one end and a handle and cushion-supporting block forming a closure for the tubes at the opposite end, of a series of coils interposed between the tubes, a hammer proper free to reciprocate within the central tube, a spring-actuated circuit maker and breaker under the control of the hand of the operator and means for supplying and regulating electric energy to the coils.

8. The combination with the reciprocating hammer and the electromagnet-coils for operating the hammer, of the central casing within which the hammer operates, the said central casing being provided at its tool end with an air-passage opening communication between its interior and the outer air.

9. The combination with the reciprocating hammer and the electromagnets for operating it, of the casing comprising an inner tube, an outer tube, a chuck and handle, the said chuck being provided with air-passages which register with air-passages in the wall of the outer casing and open communication between the interior of the inner tube and the outer air.

10. The combination with the casing, a hammer arranged to reciprocate within the casing and electromagnetic coils for operating the hammer, of a tool-holding chuck having its inner end in proximity to one coil and so spaced from an adjacent coil as to permit the hammer to remain free from the influence of said adjacent coil when in contact with the end of the chuck.

In testimony that I claim the foregoing as my invention I have signed my name, in presence of two witnesses, this 8th day of July, 1904.

WILLIAM F. WAGNER.

Witnesses:
FREDK. HAYNES,
HENRY THIEME.