No. 884,151. PATENTED APR. 7, 1908.

M. HARDSOCG.

PNEUMATIC HAMMER.

APPLICATION FILED MAR. 8, 1907.

Fig. 1.

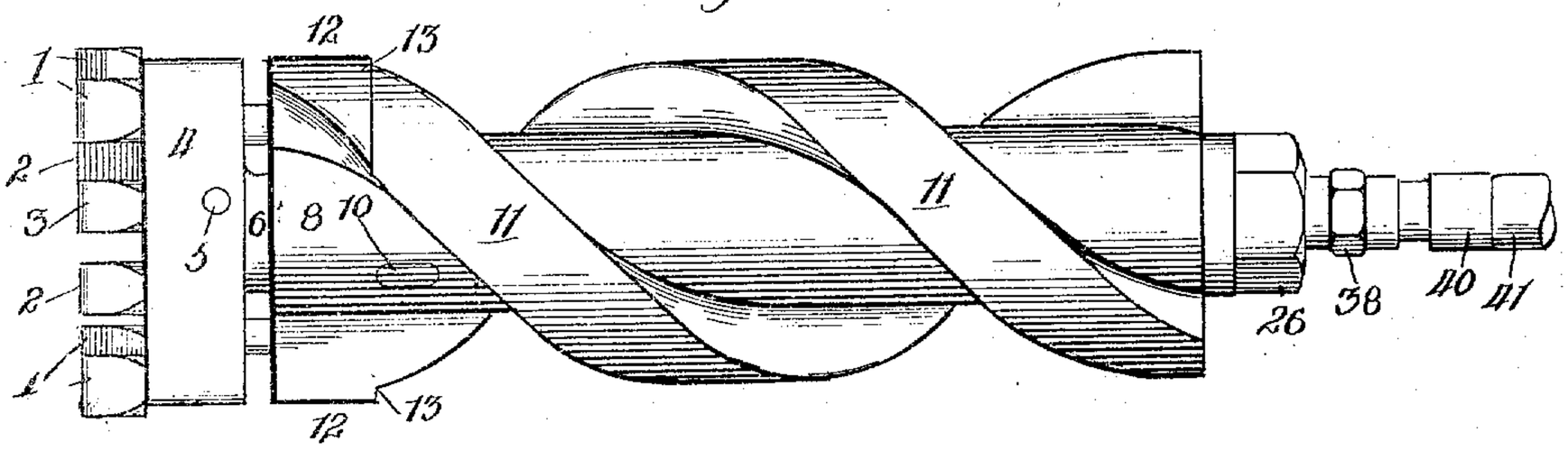


Fig. 2.

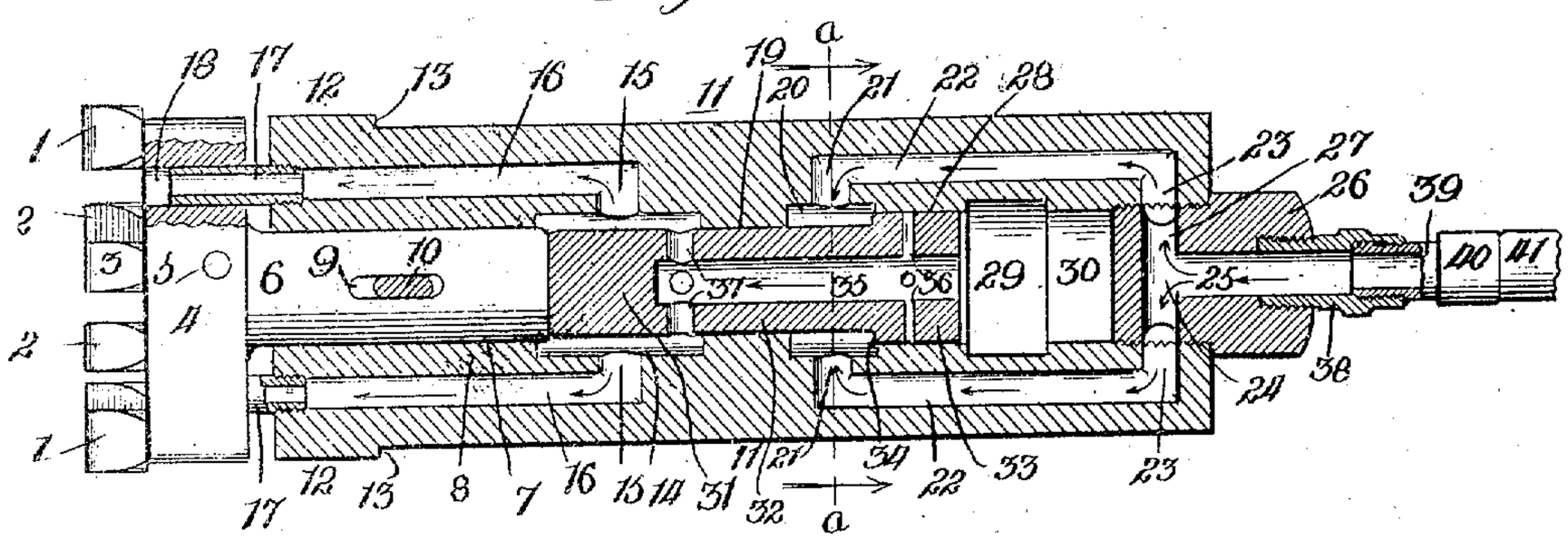


Fig. 3.

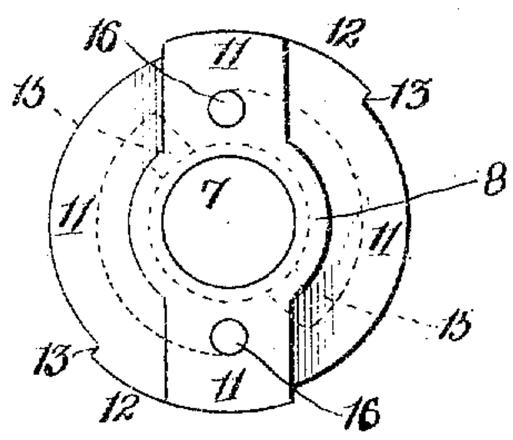
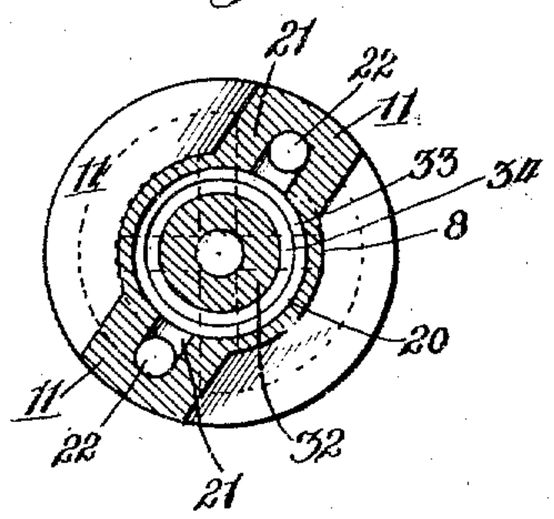


Fig. 4.



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PNEUMATIC HAMMER.

No. 884,151. Specification of Letters Patent. Patented April 7, 1908.

Application filed March 8, 1907. Serial No. 361,295.

To all whom it may concern:

Be it known that I, MARTIN HARDSOCG, a citizen of the United States, residing at Ottumwa, in the county of Wapello and State of Iowa, have invented certain new and useful Improvements in Pneumatic Hammers, of which the following is a specification.

The present invention relates more particularly to the construction and arrangement of the frame and its relation to the head carrying the operating tool, such as the bits or cutters of a pneumatic drill, and is especially designed for the use of penumatic drills and other cutting instruments or tools in deep drilling or boring or cutting, but can be used in drilling, boring, or cutting generally.

The objects of the invention are to improve the construction of the frame of a pneumatic hammer, so as to enable air, or other medium under pressure, to act and operate the hammer, and to be discharged at the bits or cutters and have the discharged air, or other medium under pressure, in connection with the formation of the frame, furnish a reliable and effective means for removing the cuttings, dust and particles produced in the operation of the drill or tool; to construct the frame, so as to provide a barrel with a chamber for the hammer and for the shank of the tool head, and with passages for admitting air or other medium under pressure, to reciprocate the hammer and after driving the hammer forward, be discharged at the bits or cutters of the tool; to construct a frame, having a central straight barrel with a hammer therein, and having exteriorly on the barrel oppositely running spiral flanges, with passages and ports in the flanges for admitting compressed air, or other medium under pressure, to the hammer chamber, and for discharging the air, or other medium under pressure, at the bits or cutters from the hammer chamber; to furnish the frame with a central chamber with ports leading therefrom, for the ports to cooperate with side passages and ports in the spiral flanges for admitting and discharging compressed air, or other medium under pressure, into and from the chamber; to furnish a frame, having a straight central chamber to coact with induction and eduction passages in the spiral flanges around the chamber, and a plug having an induction passage in communication with the induction passages of the spiral flanges, and also closing the end of the chamber, for admitting compressed air or other pressure to the chamber; to furnish a connection, between the discharge or eduction passages of the spiral flanges of the frame and the tool head, for discharging compressed air, or other medium under pressure, at the bits or cutters; to furnish, by the spiral flanges, a screw around the barrel of the frame for positively and effectually removing the cuttings, dust and fine particles, produced by the operation or action of the bits or cutters or other tools; and to improve generally the construction and operation of the frame and the spiral screw, with the correlated parts entering into the formation of the tool as a whole.

The invention consists in the features of construction and combination of parts hereinafter described and claimed.

In the drawings Figure 1 is a side elevation of the frame, showing the spiral flanges around the barrel, and showing the supply pipe for compressed air or other medium under pressure broken off, and showing a drill head with bits or cutters connected with the frame; Fig. 2 a sectional elevation of the frame and spiral flanges, showing the construction as if the flanges were unfolded, in order to illustrate clearly the induction and eduction passages in the spiral flanges; Fig. 3 an end elevation of the frame; and Fig. 4 a cross section on line *a*—*a* of Fig. 2.

The drill shown has a head with a plurality of bits or cutters, but other forms of bits or cutters could be used, and other forms of tools or instruments than drills are capable of use with the frame. The arrangement shown has, at each end of the drill head, an outer or end bit or cutter 1 and intermediate bits or cutters 2 and 3, so that the head has a plurality of bits or cutters. The head 4 is of a shape, as to length and width, to receive the bits or cutters; and, as shown, the head has a cross hole 5 to facilitate the removal from the head of the bit or cutter in line with the shank of the head.

The head has a shank 6 to enter the chamber 7 of the barrel 8 of the frame, which shank constitutes a driven stem; and as shown, the shank or stem has a slot 9 through which passes a bar 10, secured in the wall of the barrel, and by which slot and bar the

head has a limited end movement for operating the bits or cutters.

The frame has circumferentially extending therearound two spiral flanges 11, with the run of the spiral in opposite directions, so as to furnish a spiral pathway of travel around the barrel; and each spiral flange 11, at the forward end of the frame, has a projection 12, which forms a shoulder 13, which shoulder furnishes a rest for an encircling tube, not shown. The chamber 7 terminates in a chamber 14 of a greater diameter in cross section than the chamber 7, and from this chamber 14, on opposite sides, a port 15 leads. Each port 15 communicates with a longitudinal spiral passage 16, formed in each spiral flange 11, and opening through the front end of each flange; and each passage 16, at its mouth or front end, has entered thereinto a tube 17, which extends into a hole 18 in the head so as to, in effect, continue the passage 16 through the bit or cutter head, as shown in Fig. 2.

The barrel 8 has an interior circumferential wall 19, located between the chamber 14 and a chamber 20, and from the chamber 20, on each side, a port 21 leads. Each port 21 is in communication with a longitudinal spiral passage 22 formed in each spiral flange 11, and each spiral passage 22, at its rear or receiving end, has a port 23 leading inwardly therefrom.

The ports 23 each communicate with a cross passage 24, with which a longitudinal passage 25 communicates; and the cross passage 24 and longitudinal passages 25 are formed in a head 26, having a neck 27 with an exterior screw thread for entering the neck into the end wall of the frame and barrel, as shown in Fig. 2, so as to furnish a conduit or passage for supplying compressed air, or other medium under pressure, to the spiral side passages 22 of the frame. The barrel has an interior circumferential wall 28, located between the chamber 20 and a chamber 29, which chamber 29 is continued as a chamber or hole 30, which receives the neck 27 of the closing plug, as shown in Fig. 2, so that the chamber of the barrel, as a whole, is closed at the outer or rear end by the plug.

The barrel has located therein, rearward of the shank or driven stem 6, a hammer having a driving end or head 31, continued as a body 32, guided and held between the circumferential wall 19 and terminating at its rear end with an enlarged portion or head 33, guided and held in the circumferential wall 28, and forming an abutment or face 34, against which the compressed air, or other medium under pressure, admitted to the chamber 20 from the spiral passages 22 through the ports 21, acts to recede or force back the hammer as a whole. The body 32 of the hammer has a central passage 35 extending longitudinally therein and opening at its rear end through the head 33, from which passage 35 lateral ports or passages 36 lead through the head 33, so that, when the hammer is receded, communication is established with the chamber 29, admitting compressed air, or other medium under pressure, to the passage, 35 for the air, or other medium under pressure, to act and thrust or drive forward the hammer as a whole. The passage 35, adjacent to its forward end, has leading therefrom lateral passages or ports 37 to furnish communication between the passage 35 and the chamber 14, for compressed air, or other medium under pressure, to flow from the passage 35 through the ports 15 into the spiral passages 16 and be discharged, through the tubes 17 and passages 18, at the acting end of the head around the bits or cutters.

The head or plug 26 has a screw threaded hole, in line with the passage 25, which receives a tube 38, and the tube 38 has entered thereinto a coupling tube 39 on which is threaded a coupling ring 40 of a supply tube 41, leading from a source of compressed air, or other medium under pressure, so as to supply the compressed air, or other medium under pressure, to the passage 25, for the air or other medium under pressure, to enter the spiral side passages 22 through the ports 23 and be discharged into the chamber 20 through the ports 21 to act against the abutment or face 34 of the hammer and force back or recede the hammer as a whole.

The parts are assembled by inserting the tubes 17 into the front ends or mouths of the spiral side passages 16 and entering the tubes 17 into the passages 18 of the head, and entering the stem 6 into the chamber 7 of the barrel 8, and securing the shank or stem 6 and the head 4, with the bits or cutters thereon, against dropping out from the chamber by passing the bar or key 10 through the wall of the barrel 8 and the slot 9 of the stem or shank. The hammer, as a whole, is entered into the chamber of the barrel rearward of the stem 6 of the head, and after the hammer is entered the plug or head 26 is entered into the end of the frame and the barrel so as to close the chamber of the hammer and have the port or passage 24 in communication with the ports 23, as shown in Fig. 2. The tube 38 and the coupling tube 39 are entered into position, so as to have the coupling tube 39 receive the coupling ring 40 of the supply tube or pipe 41, completing the connection of the frame, with the source of supply for the compressed air, or other medium under pressure, ready for use or operation of the drill or tool.

In operation, the compressed air, or other medium under pressure, flows through the passage 25 into the cross passage 24 and enters the spiral side passages 22 through the

ports 23 to flow through the ports 21 into the chamber 20 and act against the abutment or face 34 to force back or recede the hammer as a whole into striking or driving position. The hammer, as a whole, is receded a sufficient distance to carry the end face 34 beyond the rear face of the wall 28, so that fluid can enter the chamber 29 and flow from such chamber through the lateral passages or ports 36 into the central passage 35 and act against the rear face of the hammer and the front end face of the passage 35 and overcome the pressure of the fluid against the abutment or end face 34 and drive forward the hammer as a whole, and in such driving forward of the hammer the admitted fluid cannot escape from the passage 35 owing to the closing of the lateral passages or ports 37, with the passing of such passages within the circumferential wall 19, by the recession or forcing back of the hammer as a whole. The forward drive or thrust of the hammer, as a whole, causes its acting end or head 31 to contact the end of the driven stem 6 and drive forward the stem, and with it the head 4 and the bits or cutters or other tool carried thereby, causing the bits or cutters or other tool to act and perform the cutting or drilling operation. The forward throw or thrust of the hammer as a whole, closes the ports or passages 36 by the wall 28 and opens the ports or passages 37 for communication between the passage 35 and the chamber 14, admitting fluid to the chamber 14 for the fluid to flow through the ports 15 and spiral passages 16 and through the tubes 17 and passages 18 to the front of the head 4, around the bits or cutters carried by the head. The compressed air or other medium under pressure, discharged at the front of the head 4 around the bits or cutters, has a free passage back through the spiral pathway around the barrel formed by the spiral flanges 11, which encircle the barrel 8 in opposite directions. The discharged compressed air, or other medium under pressure, carries back with it the cuttings, dust and fine particles, produced by the cutting or boring operation, into the spiral pathways of the spiral flanges, so that the pathways and flange will act to carry rearward the cuttings, dust and fine particles from in front of the bit or cutter head, clearing the bits or cutters from the cuttings, dust and fine particles and preventing any accumulation of the cuttings, dust and fine particles that would interfere with the operation of the drill or other tool, and this for the reason that the cuttings, dust and fine particles are positively and effectually removed through the action of the blast of discharged air, or other medium under pressure, and the spiral of the frame, and such removal will be had as fast as the cuttings, dust and fine particles are produced.

The frame of the present invention, with its straight barrel and exterior spiral flanges, is especially adapted for use in deep drilling or boring, as the spirals of the frame will operate to carry upward or rearward of the cutter head all the cuttings, dust and fine particles; and such carrying upward or rearward of the cuttings, dust and fine particles, is facilitated and insured by the blast of compressed air, or other medium under pressure, discharged at the front of the head around the bits or cutters, or other tools; and while the pneumatic hammer is shown in connection with a tool head carrying drill bits or cutters, it is to be understood that the hammer, with its straight barrel and spiral exterior flanges for the frame, is intended for use, and can be used, with a tool head of other formation than the one shown, and for other purposes than deep drilling or boring; and that one spiral flange only can have the induction and eduction passages, or one spiral flange can have the induction passage leading to the chamber 20 and the other spiral flange can have the eduction passage leading from the chamber 14, so long as the flanges have induction and eduction passages for operating the hammer and discharging the compressed air, or other medium, at the front of the tool head.

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

1. In a pneumatic hammer, a frame consisting of a straight central barrel, and spiral flanges encircling the barrel and running in opposite directions on the barrel, the barrel having a central chamber to receive the hammer and the spiral flanges having spiral passages for inducting and educting fluid with the spiral passages in communication with the chamber of the barrel, substantially as described.

2. In a pneumatic hammer, a frame consisting of a straight central barrel, and spiral flanges encircling the barrel and running in opposite directions on the barrel, the barrel having a central chamber divided into sections, one section to receive a driven stem and another section to receive the driving hammer, each spiral flange having a spiral induction passage and a spiral eduction passage for fluid, with the spiral induction passages in communication with the chamber of the barrel for admitting fluid to operate the hammer, and with the spiral eduction passages opening through the discharge end of the frame, substantially as described.

3. In a pneumatic hammer, a frame consisting of a straight central barrel, and spiral flanges encircling the barrel and running in opposite directions on the barrel and provided with induction and eduction passages for fluid, the barrel having a central chamber, with a fluid induction section in com-

munication with the induction passages of the flanges, and a fluid eduction section in communication with the eduction passages of the flanges for fluid to act and recede and drive forward the hammer, substantially as described.

4. In a pneumatic hammer, a frame consisting of a straight central barrel, and spiral flanges encircling the barrel and running in opposite directions on the barrel, the barrel having a central chamber, with a fluid induction section and a fluid eduction section for fluid to act and recede and drive forward the hammer, and each spiral flange having a spiral induction passage for fluid in communication with the fluid induction section of the barrel chamber, and a spiral eduction passage for fluid opening through the forward end of the flange and in communication with the fluid eduction section of the barrel chamber, substantially as described.

5. In a pneumatic hammer, a frame consisting of a straight central barrel having a central longitudinal chamber, and spiral flanges encircling the barrel and running in opposite directions on the barrel, and provided with induction and eduction passages for fluid, both passages in communication with the central chamber of the barrel, and a driving hammer entered into the chamber of the barrel and against which admitted fluid from the induction passages of the flanges acts to recede and drive forward the hammer, substantially as described.

6. In a pneumatic hammer, a frame consisting of a straight central barrel, and spiral flanges encircling the barrel and running in opposite directions on the barrel and provided with induction and eduction passages, the barrel having a central chamber for receiving a driving hammer, a tool head having passages in its body, and tubes connecting each passage of the tool head with a spiral eduction passage of the frame for discharging pressure in advance of the tool head, substantially as described.

7. In a pneumatic hammer, a frame consisting of a straight central barrel and spiral flanges encircling the barrel and running in opposite directions on the barrel, the barrel having a central chamber to receive a hammer, and one of the spiral flanges having spiral passages for inducting and educting fluid, with the passages in communication with the chamber of the barrel, substantially as described.

8. In a pneumatic hammer, a frame consisting of a central barrel and spiral flanges encircling the barrel and running in opposite directions on the barrel, the barrel having a central chamber divided into sections, one section to receive a driven stem and another section to receive a driving hammer, and one of the spiral flanges having a spiral induction passage for inducting fluid to operate the hammer and a spiral eduction passage for educting fluid after operating the hammer, each passage in communication with the chamber of the barrel and the eduction passage opening through the forward end of the flange, substantially as described.

9. In a pneumatic hammer, a frame consisting of a straight central barrel and spiral flanges encircling the barrel and running in opposite directions on the barrel, the barrel having a central chamber, and one of the spiral flanges having an induction passage and an eduction passage for fluid, both passages in communication with the chamber of the barrel, a driven stem operative in the chamber of the barrel, a driving hammer operative in the chamber of the barrel and actuated by fluid admitted through the induction passage of the spiral flange, substantially as described.

10. In a pneumatic hammer, a frame consisting of a straight central barrel and spiral flanges encircling the barrel and running in opposite directions on the barrel, the barrel having a central chamber, and one of the spiral flanges having an induction passage and an eduction passage for fluid, both in communication with the chamber of the barrel, a driven stem operative in the chamber of the barrel, a driving hammer in the chamber of the barrel and actuated by fluid admitted through the induction passage of the spiral flange, a closing plug for the rear end of the frame and chamber, the plug having a longitudinal passage and a cross passage in its body for admitting fluid to the induction passage of the spiral flange, and a tool head connected with the stem and having a passage through its body in communication with the eduction passage of the spiral flange for discharging fluid in advance of the head, substantially as described.

11. In a pneumatic hammer, a frame consisting of a straight central barrel and spiral flanges encircling the barrel and running in opposite directions on the barrel, the barrel having a central chamber, and one of the spiral flanges having an induction passage and an eduction passage for fluid, both in communication with the chamber of the barrel, a driven stem operative in the chamber of the barrel, a driving hammer operative in the chamber of the barrel and actuated by fluid admitted through the induction passage of the spiral flange, a closing plug for the rear end of the frame and chamber, the plug having a longitudinal passage and a cross passage in its body for admitting fluid to the induction passage of the spiral flange, a tool head connected with the stem and having a passage through its body, and a tube connecting the passage of the tool head with the eduction passage of the spiral flange for discharging fluid in advance of the tool head, substantially as described.

12. In a pneumatic hammer, a frame con-

sisting of a straight central barrel and spiral flanges encircling the barrel and running in opposite directions on the barrel and provided with induction and eduction passages, the barrel having a central chamber for receiving a driving hammer, and a tool head having passages through its body in communication with the spiral eduction passages of the frame for discharging fluid in advance of the head, substantially as described.

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