(No Model.) 4 Sheets—Sheet 1.

R. J. GATLING.

MOLD CORE.

No. 423,045. Patented Mar. 11, 1890.

Fig. 1

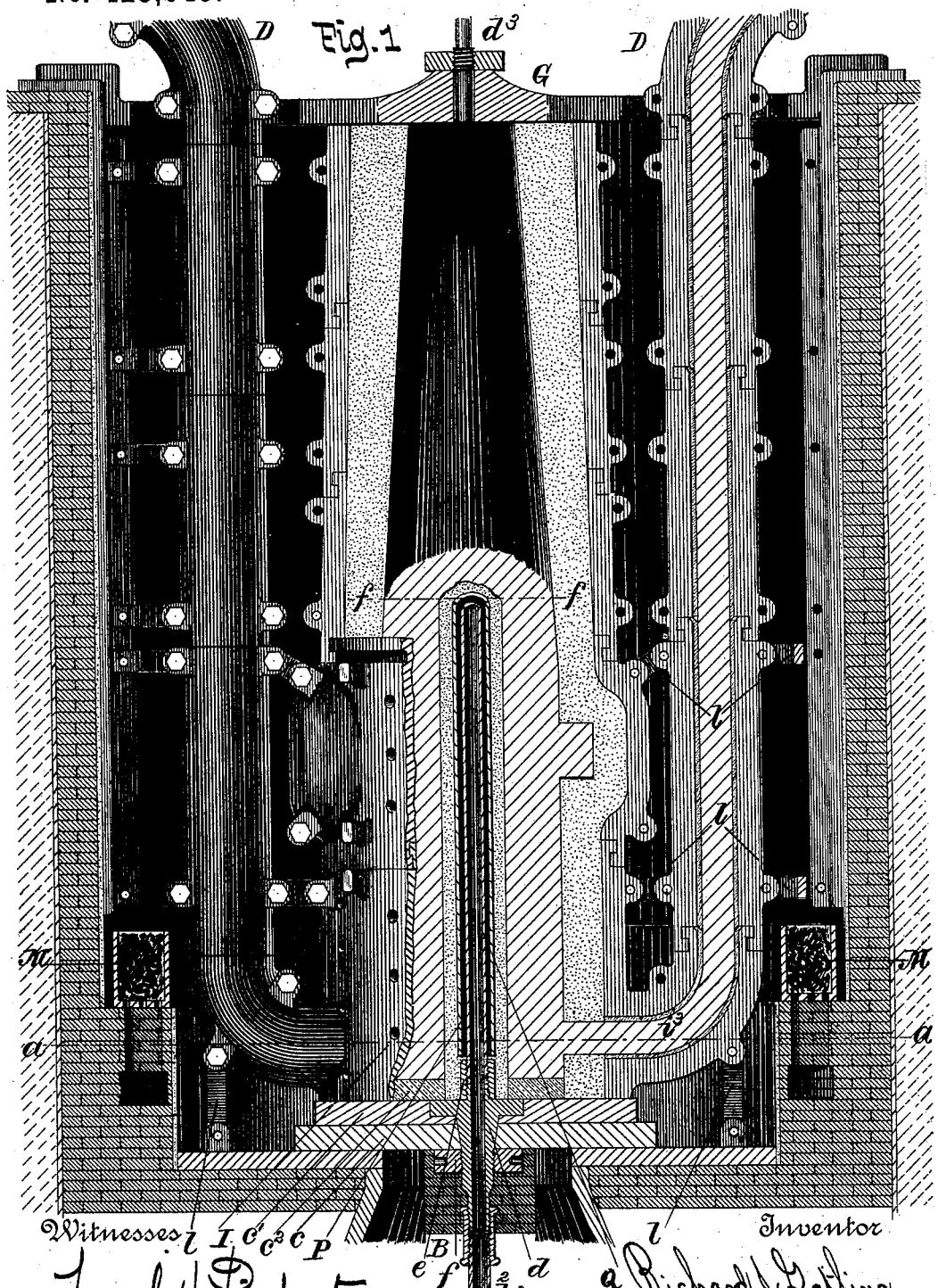

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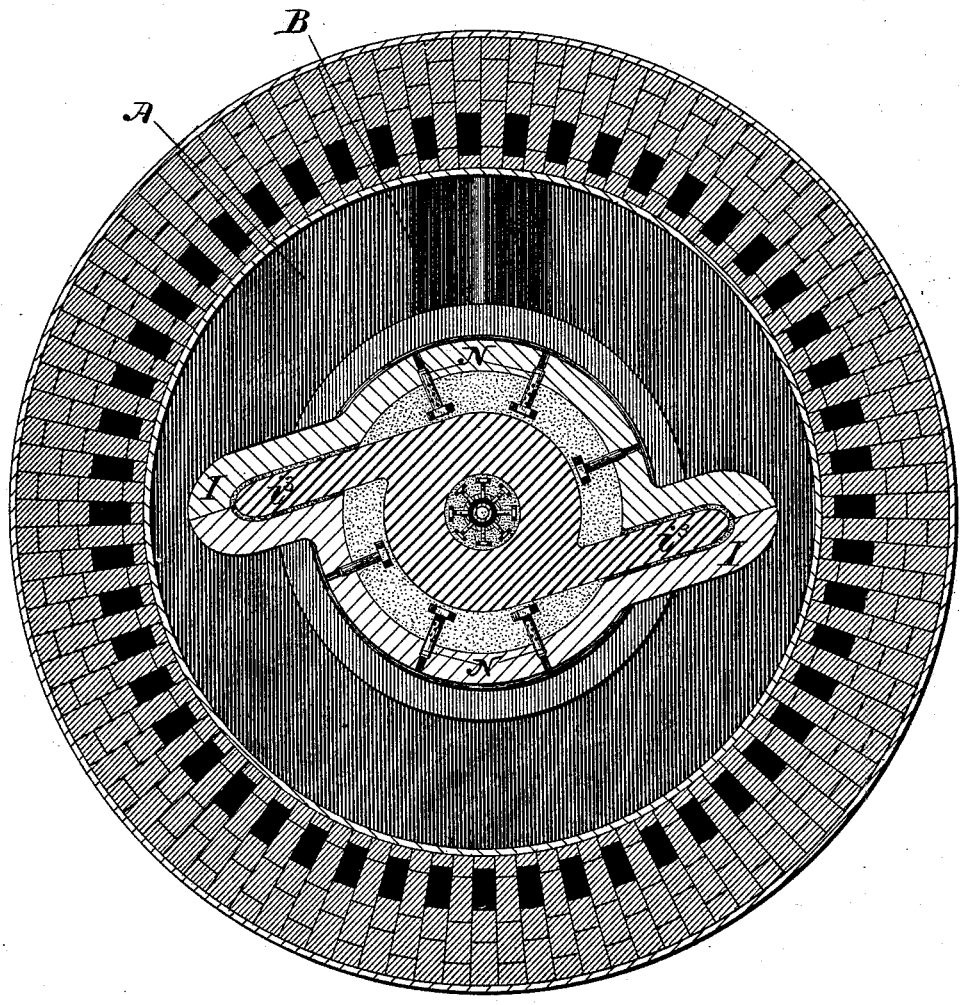
Fig. 2



Witnesses
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(No Model.) 4 Sheets—Sheet 3.

R. J. GATLING.

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Fig. 3

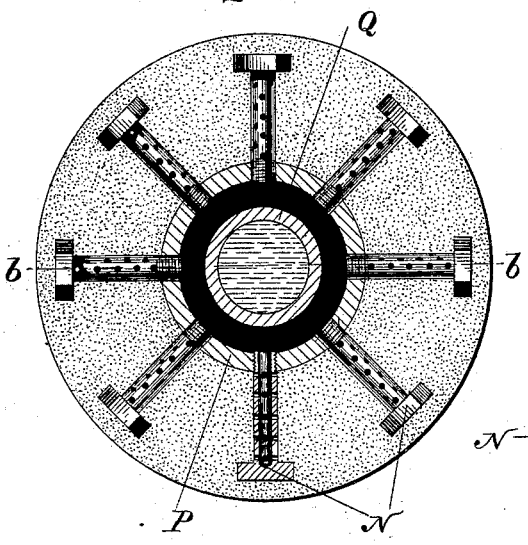


Fig. 4

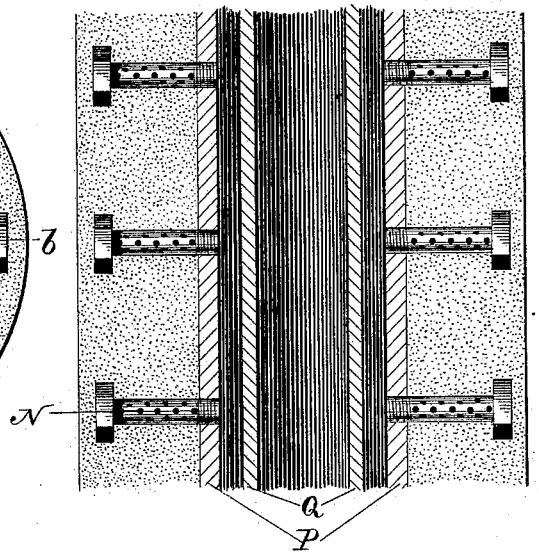


Fig. 5

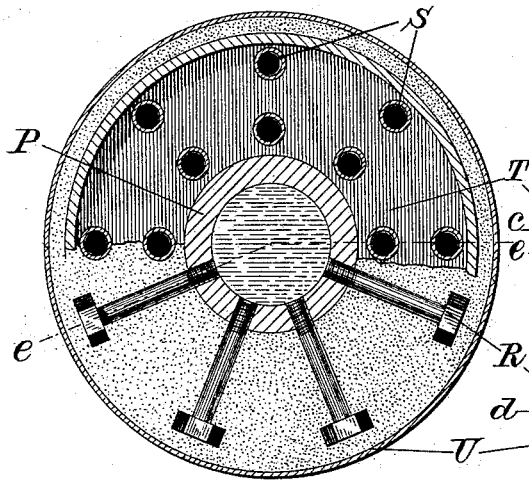


Fig. 6

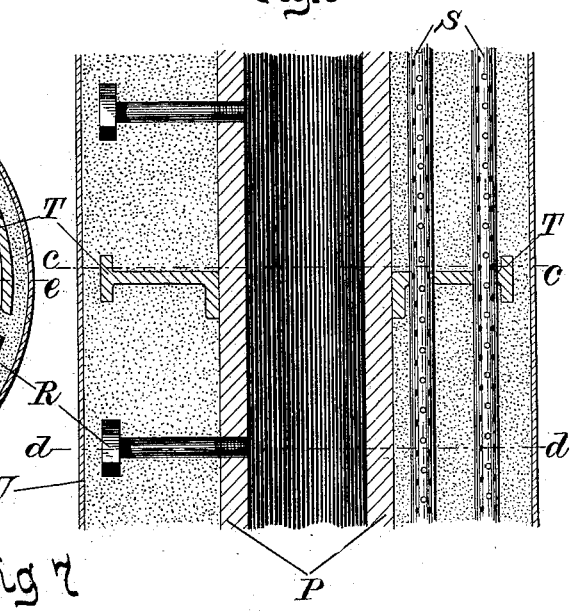
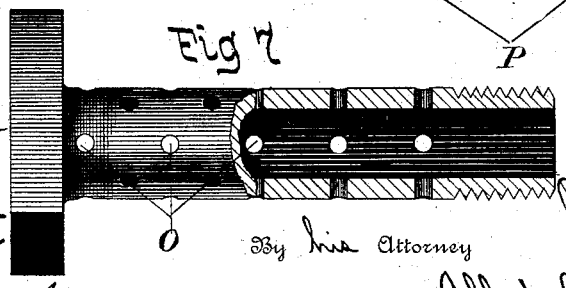


Fig 7



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(No Model.) 4 Sheets—Sheet 4.

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Fig. 8.

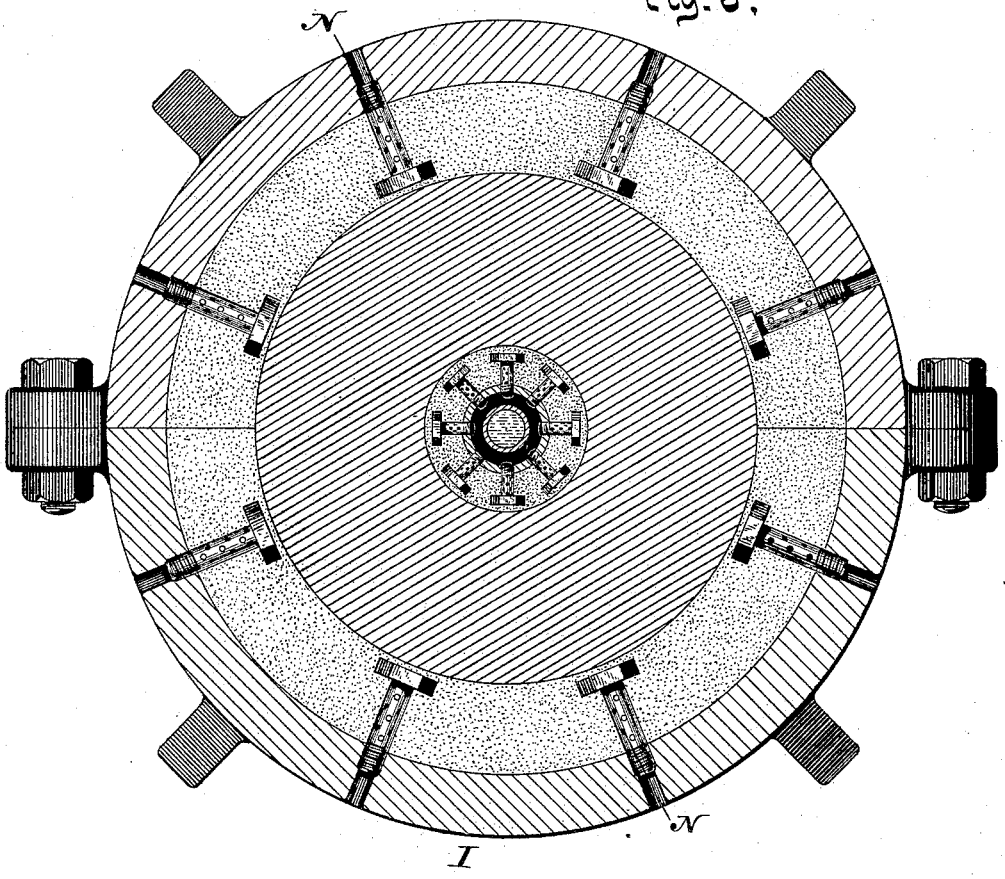
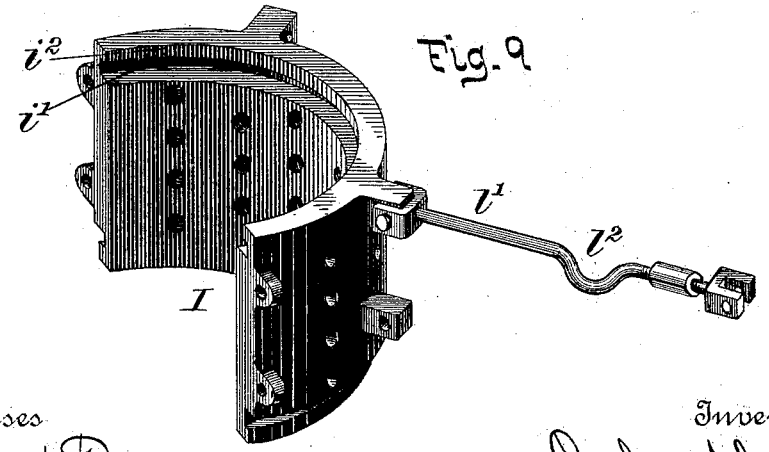


Fig. 9.



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UNITED STATES PATENT OFFICE.

RICHARD J. GATLING, OF HARTFORD, CONNECTICUT.

MOLD-CORE.

SPECIFICATION forming part of Letters Patent No. 423,045, dated March 11, 1890.

Application filed August 20, 1887. Serial No. 247,411. (No model.)

To all whom it may concern:

Be it known that I, RICHARD J. GATLING, of Hartford, Connecticut, have invented a certain new and useful Mold-Core, of which the following description and claim constitute the specification, and which is illustrated by the accompanying four sheets of drawings.

This invention is a mold-core which is particularly suitable for casting breech-loading cannons, and it is so made as to collect and conduct away the gases generated by the heat from the melted metal in the fire-clay, sand, silicon, tile, or other refractory substance of which the mold is mainly composed, to the end that those gases may not enter the molten metal in the mold and produce blow-holes and other faults in the cannon being cast.

Other parts and features of the apparatus shown in the drawings are also shown and described in Letters Patent of the United States, No. 380,756, granted to me April 10, 1888, on an apparatus for casting ordnance.

Figure 1 of the drawings is mainly a vertical diametric section of the new mold placed upright in a pit and provided with runways for the entrance of molten metal into the mold and with pipes for the passage of water, oil, air, or other heat-absorbing fluid to and away from the core of the mold; but this figure is partly an elevation of the parts it portrays, in that it shows one of the runways and part of the lower two sections of the flask in full view. Fig. 2 is a horizontal section of the apparatus on the line *a a* of Fig. 1. Fig. 3 is an enlarged horizontal section of one form of the core of the mold, while Fig. 4 is a vertical section of the same on the line *b b* of Fig 3. Fig. 5 is an enlarged horizontal section of another form of the core, the upper part of it being on the line *c c* and the lower part being on the line *d d* of Fig. 6, while Fig. 6 is a vertical section of the same on the angular line *e e* of Fig. 5. Fig. 7 is a longitudinal view, partly in section, of one of the hollow bolts used in the exterior mold and also in the core. Fig. 8 is a horizontal section of the mold and core on the line *f f* of Fig. 1. Fig. 9 is a perspective view, upside down, of one of the semi-cylindrical sections of the flask which composes the outside of the exterior mold.

The letter A indicates the gun-pit, sheathed with brick-work and iron plates and made water-tight.

B is a chamber directly under the mold. Access may be had to that chamber through any suitable passage, and in it is placed the pipe, through which the cooling-fluid passes to the interior of the core of the mold. A strong base-plate *c* is placed on the floor of the pit over the chamber B, and a bearer-plate *c'*, surmounted by a flat circular tile c^2, is placed on the base-plate, the two plates being provided with central openings occupied by the hollow stud *d*. On the upper end of this stud is screwed a collar *e* for the reception of the lower end of the inner tube of the core of the mold, and the middle part of the stud is tapped through the nut *f*, thus locking it with the base-plate and the bearer-plate, while its lower end is coupled with the fluid-supply pipe d^2.

The flask I is composed of several tiers of semi-cylindrical sections, one of which sections is shown in Fig. 9, and each of which is joined to the one below it by the annular groove *i'* and the annular tongue i^2 in its concavity, uniting with a corresponding tongue and groove in the periphery of the section below it. The pairs of sections which compose each tier are fastened together by bolts passing through ears with which those sections are provided, adjacent to their junctions, as shown in Fig. 9. The lower sections are respectively provided with hollow projections to which the lower ends of the runways D are connected, respectively, and through these runways and hollow projections the molten metal is poured into the mold. The inlets i^3 through these projections are located tangentially to the annular interior of the mold, so that the molten metal, as it enters the mold from opposite sides, will take a rotary or spiral motion about the core. The runways are built up in sections in the same way as the flask, and they are held in position by the braces *l*, that extend from the runways to the flask and to the bottom and the sides of the pit at suitable places and intervals, while the flask is supported by the braces *l'*, extending from ears cast on the outsides of its several sections to the sides of the pit, and provided

with bends l^2 to take up the expansion of the flask and the braces caused by the heat in the pit when molten metal is poured into the mold. Additional runways may also be made to discharge into the mold between its bottom and its top; but if they are employed the molten metal should not be poured through them till the metal in the mold has reached the level of their respective outlets, and such runways may also be placed at the top of the mold.

The gun-pit may be provided near its bottom with the annular fire-box M, and combustion may be sustained therein by air admitted through tubes from outside the pit, or the pit and the mold may be heated, preparatory to casting a cannon, by gas-jets, instead of with fuel in the fire-box.

Each section of the flask is perforated at frequent intervals, and each of those perforations is supplied with a hollow bolt N, the walls of which are pierced by the openings O, and the length of which extends inward from the concave sides of the flask, as shown in Fig. 8.

The core of the mold is built upon the core-tube P, the walls of which are perforated at frequent intervals, and provided in each of those perforations with a hollow bolt N, extending outward therefrom, as shown in Fig. 3. The fluid-pipe Q passes through the interior of the core-tube with an annular space between its outside and the inside of the core-tube, and that fluid-tube is coupled at its lower end to the hollow-stud d and at its upper end to the discharge-pipe d^3.

The modified core of Figs. 5 and 6 differs from that of Figs. 3 and 4 in having solid bolts R, instead of hollow bolts N, and in using its core-tube for a fluid-pipe, also, and in having vertical pipes S, perforated at frequent intervals, arranged around the core-tube, supported by the annular shelf T, and extending upward and open at the top of the mold, and also differs in having the sheet-metal jacket U inclosing the refractory substance of which it is mainly composed. The lower end of the inner tube of the core is firmly held on the upper end of the hollow stud d by means of the collar e, while its upper end passes through a central opening in the brace G, which extends across the mouth of the pit and holds the core in the axial center of the mold. The interior of the flask is heavily plastered with fire-clay, sand, silicon, or other refractory substance held in place by the help of bolts N, and the core-tube is likewise provided with refractory coating held in place by bolts N or R, as the case may be. Where the hollow bolts N are used in the core, they collect the gases generated in the mass of sand or other refractory substance of the core by the intense heat of the molten metal and convey those gases into the annular space between the core-tube P and the fluid-pipe Q, whence they pass upward and out of the end of the core-tube, and when the solid bolts R are used the gases are collected and conveyed away by the pipes S. The hollow bolts N in the exterior of the mold collect the gases generated in the adjacent sand or other similar substance and convey those gases through the walls of the flask into the body of the pit, whence they escape out of its mouth.

The forcing of water, oil, air, or other heat-absorbing fluid through the axis of the core while the cannon is being cast or cooled is set forth in my aforesaid other application for Letters Patent of the United States, and therefore needs not to be more minutely described.

When the modified core of Figs. 5 and 6 is used and the flow of cooling-fluid through its axis is omitted, that axis may be a rod, instead of a tube, and the fluid-tube of Figs. 3 and 4 may also be omitted from the form of core shown in those figures when no flow of cooling-fluid is required.

This invention is applicable not only to casting cannons, but also to other massive cylinders or columns.

I claim as my invention—

A core for a mold, consisting of a tube provided with outwardly-projecting hollow bolts at suitable intervals for supporting the fire-clay, sand, silicon, or other refractory substance with which the tube is coated and for collecting and removing from that substance the gases generated therein by the heat from the molten metal in the mold, and consisting, also, of a second tube within the other for the passage of water, oil, air, or other cooling fluid through the length of the core and affording an air-space between the two tubes for the egress of said gases, all substantially as described.

RICHARD J. GATLING.

Witnesses:
ALBERT H. WALKER,
FRANK H. PIERPONT.