

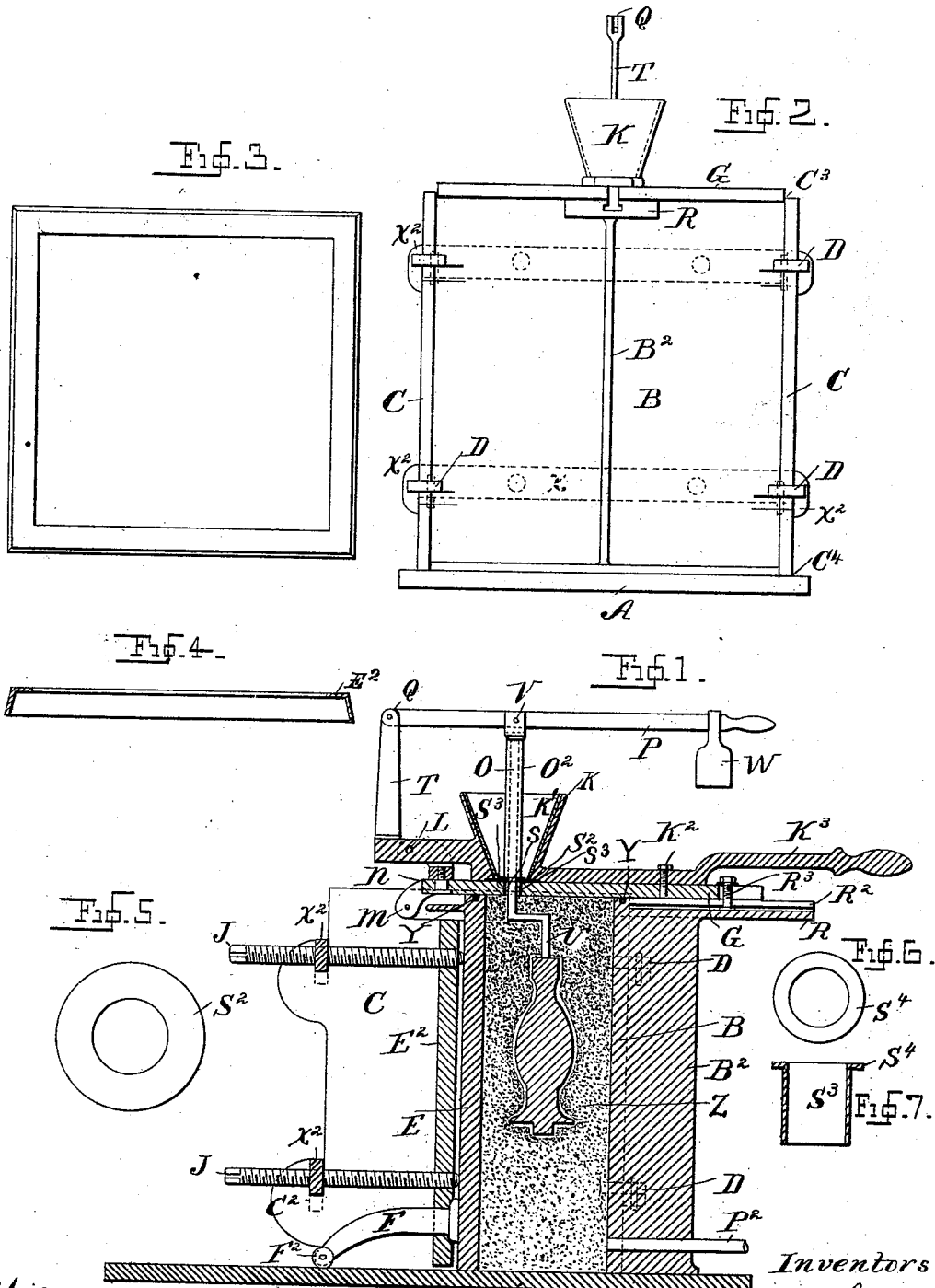
(No Model.)

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APPARATUS FOR CASTING METALS UNDER PNEUMATIC PRESSURE.

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APPARATUS FOR CASTING METALS UNDER PNEUMATIC PRESSURE.

SPECIFICATION forming part of Letters Patent No. 526,874, dated October 2, 1894.

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To all whom it may concern:

Be it known that we, JOHN JOSEPH CHARLES SMITH, residing at Passaic, county of Passaic, State of New Jersey, and EUGENE C. SMITH, residing at Providence, county of Providence, State of Rhode Island, citizens of the United States, have invented certain new and useful Improvements in Apparatus for Casting Metals under Pneumatic Pressure, of which the following is a specification.

The object of the invention is the construction of a practical apparatus into which molds that are to be filled with metal may be inclosed hermetically and air tight so that a high vacuum may be obtained in the molds and so as not to involve waste of time and labor.

In making our apparatus we reflected particularly on a new, useful and practical combination and arrangement of the different parts so as to serve their functions to the best advantage, save labor and produce results to a certainty.

Experience gained by long and practical use of casting machines constructed differently from our new one has shown us many great deficiencies in them. Casting apparatus by means of which mechanical pressure is applied to the fluid metal to force it in the molds, require very dense and strong molds and even with such the molds crack from the sudden heat and force of the metal which only too often will show objectionable fins or seams on the casting if the casting is not spoiled altogether. Furthermore, such former casting machines have been constructed to receive a number of molds for every casting operation because the charging, closing and the getting of the machine ready for a casting, take so much labor on account of the wrong combinations of the different parts. To fill a number of molds, each probably containing five to ten pieces, generally results in a loss of several pieces—sometimes half of them. Furthermore, when a number of molds, say only two, are placed for one charge in the machine, it very often happens that the fluid metal will force or bend one mold into the hollow part of the other, which increases the thickness of one casting and diminishes the other opposite one. This is a

very objectionable feature especially on light and very thin articles. Therefore, we aimed in the construction of our new machine to arrange every part so that the machine can be charged, closed, and discharged in the least time possible, so that we need not cast or fill more than one mold at every operation and can do so with comparatively little work or loss of time.

Practice in casting "by means of machines made for application of mechanical pressure" has taught that if molds are made of a material which has not enough density to resist the pressure of the fluid metal, the castings will not present such a smooth surface and such sharpness of lines as the mold really presents. Our new casting apparatus is designed to use to better advantage molds which can be made by the method, and of the composition described in application of Eugene C. Smith, Serial No. 456,915, filed December 31, 1892. Molds made by that method are very perfect but the strength of the material is not great enough to resist the mechanical pressure applied to the fluid metal.

Mechanical pressure cannot be regulated to a nicety on account of the friction in the cylinder but atmospheric pressure can be regulated to the exact required pressure to be exercised on the metal. To obtain a perfectly sharp and smooth casting by a vacuum only requires a fine but very porous mold.

Referring to the accompanying drawings which form a part of this specification:—Figure I represents a vertical longitudinal section of the machine through the center. Fig. II is an elevation of the front. Figs. III and IV are respectively plan and sectional views of an angular rubber rim used as an air-tight packing on a part of the machine. Fig. V is a plan of an asbestos washer also used as a fireproof packing. Figs. VI and VII are respectively a vertical section and a plan of an asbestos tube, washer or ring used to line the main gate.

With a base or platform A is firmly connected an upright plate B at right angles. The plate B is provided in the center with a rib B² to impart stiffness to the plate. On the top of plate B is a horizontal extension R. This extension is provided with a dove-tail

or T-slot R² in its center to receive a sliding bolt R³. To the plate B, two side plates C are connected by means of hinges D so that the side plates will open or close like doors. 5 Each of said two plates has angular extensions at the loose edge slotted to form hooks C². With an upright movable plate E, the base A, the upright B and the two side plates C, a box or case is formed which has a given height 10 and width. By moving the plate E either forward or backward the depth of the box may be increased or diminished. The adjustment of the plate E is facilitated by the attachment of an arm F which has a roller F² at the end, 15 the same resting on the base A. The arm F prevents also the falling of plate E. The top or cover of this box is formed by a plate G which is hinged at M to the upper end of plate E. The plate G reaches over the horizontal 20 extension R. By means of the slot bolt R³, the top plate G can be fastened to the extension R at any desired place. As the plate G is fastened to plate E by means of hinge M, it is evident that the depth of the box (*i. e.*, 25 the distance between plates B and E) can be increased or diminished as it may be required according to the thickness of the mold to be placed in the box for casting. The plate G can also be thrown back on its hinge so as 30 to open the box on top.

When a mold Z is placed in the box to be filled with metal it is placed against the plate B. The plate E is then moved against the mold and by means of the screws J which 35 have their fulcrum in two removable cross bars X, the mold can be held together firmly.

The cross bars X are provided with angular hooks X² at the end and serve also by means of the hooks X² to hold or lock the 40 sides C firmly to the edges of plate E.

By the arrangement and combination of the parts so far described a firm case or mold box is formed which can be opened and closed in less than a minute. On top of the plate G 45 is a funnel-shaped metal receptacle K. It is attached to the plate G by means of a swivel bolt N and a lock bolt K². This metal receptacle has an arm or extension K³ on one side and a hinge joint L on the other. One part 50 of the hinge joint L is formed by an attachment to the swivel joint N. At the end of the hinge joint L is an upright post T to which a cross bar or lever P is hinged at Q, forming a joint at that point. At the center 55 point where the lever P crosses the metal receptacle K is a vertical stem O, jointed to lever P at that place. This vertical stem O is almost seven-eighths of an inch thick and has an asbestos covering O². The metal receptacle, when thrown upward on its hinge L, is 60 open at the narrow end. The receptacle is provided with an asbestos lining K⁴ on the inside. The bottom of the receptacle is formed by plate G when the receptacle is 65 resting thereon.

By means of a hole S through the plate G, at the center of the receptacle communica-

tion is established from the receptacle to the interior of the case and molds inclosed therein for casting. The diameter of the hole S is 70 almost one-eighth of an inch smaller than the diameter of the stem O so that the stem will fully cover the hole when resting on it, and for centering the stem it may have a slight boss at its lower end to enter the hole 75 S. An asbestos washer S² almost one-sixteenth of an inch thick and about one-twelfth larger than the inside of the receptacle at its narrow end is interposed between the plate G and the edge of the narrow end of the re- 80 ceptacle. The hole in said washer is of the same size as the hole S in plate G. When the washer is in position, the hole in it must coincide with the hole S in plate G. The hole S is lined with a short tube or ring S³ of 85 asbestos of the shape shown in Fig. VII. One edge of said ring has a little flange S⁴ to prevent it from slipping through the hole. The flange of short tube S³ serves also as a good air tight junction with the hole in the 90 washer, when the stem O rests over it.

We have to describe how we render the case perfectly air tight so that the required vacuum can be created in the molds inclosed in the case. On the three (top and side) 95 edges of the upright plate B we embed a narrow rubber packing strip Y (a little more than semi-circular in cross-section). The flat surface of the packing strip projects about one-sixteenth of an inch over the sur- 100 face of the edges of the plate. A similar packing strip Y is also embedded on the top edge of the plate E but not at the side edges or the bottom edge of said plate. Those three edges are provided with a different 105 style of packing which is done as will now be described. To the outer surface of plate E we attach near the edges a rubber rim of the angular shape shown by plan and cross-section in Figs. III and IV. This rubber pack- 110 ing rim E² is of the exact size of plate E but the angular edges flare out a little as shown by the drawings. The side plates or doors C being hinged to upright plate B, if closed, will press against the rubber packing at the 115 edges of plate B and when locked by the cross bars X press also against the flaring flanges of the rubber rim E². The lower flange of rubber rim E² forms a good junction with the platform or base A. The adoption of this 120 peculiar shaped packing rim E² is for this reason. The plate E has to be moved a little forward yet by means of screws J after the sides C are locked so as to press the two halves of the mold firmly together, but if a 125 similar packing to that on the edges of plate B were used the plate E could not be moved after the box is locked. When a vacuum is created in the case the pressure of the atmosphere will act on the flanges of the rim and 130 close the corners hermetically. When the top plate G is brought down to close the top the case is already firmly locked and no further moving of the lower parts takes place.

Therefore the top edges of plates E and B are also closed air tight by the packing at those two edges. So far the hermetical closing of the mold case is automatic and requires no special time or labor. Only the top and bottom edges of the two side plates or doors C remain to be sealed which we prefer to do at every operation of casting by luting those joints with plastic clay or soft putty as we have found in practice that rubber packings at those junctures are not very reliable. This luting up is done very quickly and effectively. It is shown that the base A is a little wider than the body of the machine and when the doors C are closed a sharp corner C⁴ is formed which is quickly sealed by smearing a little clay or putty in that corner. A similar corner C³ is formed by the edges of the plate G and the upper edges of the plates C which is also luted in the same manner.

The hole S in the top plate G is hermetically closed by the stem O resting over said hole on top of the flange of the lining ring S². The lower edge of the metal receptacle finds an air tight packing by pressing on the outer edge of the washer S³. A weight W at the end of lever P holds the valve stem down firmly.

From the description so far given our new apparatus presents a series of novel and useful combinations for the purpose of saving labor and time.

First. The case or box for receiving the molds is so constructed that by the novel combination of the different and required parts, it may be closed hermetically with the greatest facility and effect, so that a good vacuum can be produced in the molds.

Second. The upper part of the apparatus consisting of the metal receptacle with its closing valve is so constructed by a new combination of the required parts that it can be quickly adjusted to receive a charge of metal and hold the same against the suction of the vacuum until the proper moment when the metal is allowed to flow into the molds. After a cast is made the receptacle can be detached easily and quickly from the casting and the remaining surplus of metal discharged.

The apparatus is operated as follows: The molds that we use are made of the composition and in the manner described in the specification of Eugene C. Smith's application above cited. The molds are made of the exact size of the inside of the case in height and width. The thickness or depth of the mold however depends on the shape of the casting to be made. As stated, the back plate E is movable to adjust it to the thickness of the mold. The mold is provided with a vertical main entrance gate U, the position of which has to correspond with the hole S in plate G. From the main gate one or more smaller branches run to the different articles formed in the mold.

The proper manner of cutting the gates required is well known to artisans in the line of cutting. The molds must be perfectly dry if good, sharp castings are wanted. The mold is placed vertically in the apparatus against the plate B; then plate E is pushed forward against the mold; then the side plates are closed and locked by the cross screw bars X and then the mold is firmly closed together by bringing the screws J to act against plate E. After this, the top plate G is brought down and fastened by the sliding bolt R³. The next step is to bring the metal receptacle in position. The description and drawings show that the receptacle is connected to plate G by means of the swivel bolt and its hinge at point L which permits the raising of the receptacle and the laying of it back. It can also be turned sidewise on the swivel bolt. It is desirable, as will be shown, that the receptacle have both these motions.

By raising the receptacle the hole S is free so that the asbestos washer S² may be placed on the plate G in such a way that the hole in washer corresponds to the hole S in plate G. Then the asbestos tube or ring S³ is slipped into the hole S so that the flange on the ring will rest on the edge of the hole in the washer. This done, the receptacle is brought down and fastened by bolt K². The receptacle is lined with a non-conductor of heat, to which the washer forms a non-heat conducting bottom. The washer serves also as a fireproof packing at the joints of the receptacle with the plate G. The hole S lined as aforesaid forms the inlet of the fluid metal to the molds. This inlet is closed by resting the stem O over it. It is held down air-tight by the weight W acting on the lever P. The corners C⁴ and C³ are next luted as described before which makes the apparatus ready for casting.

Shortly before filling the metal receptacle with fluid metal, the air is well exhausted out of the mold by means of a good vacuum pump attached to the pipe P² which enters the case near the bottom of plate B. The air finds an easy passage through the pores of the mold to the pipe P². The working of the pump is kept up during the act of filling the receptacle, also until the metal has filled the mold and has become fully set.

When the metal receptacle has received sufficient metal to fill the mold with a surplus for a head, then the valve stem O is lifted only about one inch when the pressure of the atmosphere will quickly force the metal into the mold and fill every cavity of it. The valve stem O should never be raised too much or out of the metal until the mold is filled or else the air will rush into the mold with the metal and spoil the casting.

As soon as the surplus of metal left in the receptacle has become set, the receptacle must be quickly detached so that the gate may be easily broken before the metal cools suffi-

ciently to attain its full strength. To detach the receptacle we loosen the lock bolt K², then turn the receptacle sidewise on its swivel bolt N by means of lever K³, so that the gate is sheered off and then lift the lever and throw the receptacle back on its hinge. The stem O must be drawn and before the surplus metal left in the receptacle shrinks on to it. After this the mold and castings are removed from the case.

Having thus described our invention, the following is what we claim as new therein and desire to secure by Letters Patent:

1. The combination of the base plate A, the upright plate B fixed thereto, the hinged side plates C, the adjustable plate E, the hinged top plate G, the edges of plates B, C and E being suitably channeled or grooved to receive packing, substantially as and for the purposes set forth.

2. The combination of the base plate A, the fixed and adjustable plates B, E, the side plates C, and the flanged air tight packing plate E² arranged and adapted to operate substantially as set forth.

3. The combination of the base plate A, fixed upright plate B, hinged side plates C having hooks C², adjustable upright plate E, screws J and cross bars X, arranged and adapted to operate, substantially as set forth.

4. The combination of the base plate A, upright plate B, side plates C, adjustable upright plate E having arm F provided with

roller F², substantially as and for the purposes set forth.

5. The combination of the base plate A, upright plate B, suitable side plates, adjustable upright plate E and top plate G hinged to said plate E, movable therewith and carrying on itself the hinged and pivoted lever K³ with its receptacle K, rod O, lever P, support T and weight W all adapted to be removed by lifting the lever K³, substantially as and for the purposes set forth.

6. The combination in a casting apparatus with a suitable mold casing, of a movable top plate, a metal receptacle and its lever connected to said plate by a hinge and swivel, an upright arm T on said lever, valve stem O, cross lever P and weight W, substantially as and for the purposes set forth.

7. In a casting apparatus, the combination of the top plate G, having an opening S the asbestos tube or ring S³, fitting said opening in plate G, the asbestos washer S² and the metal receptacle hinged to said top plate, substantially as set forth.

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