No. 841,279. PATENTED JAN. 15, 1907.

C. S. SZÉKELY, Sr.

ART OF CASTING METALS.

APPLICATION FILED DEC. 14, 1903. RENEWED APR. 25, 1906.

4 SHEETS—SHEET 1.

Fig. 1.

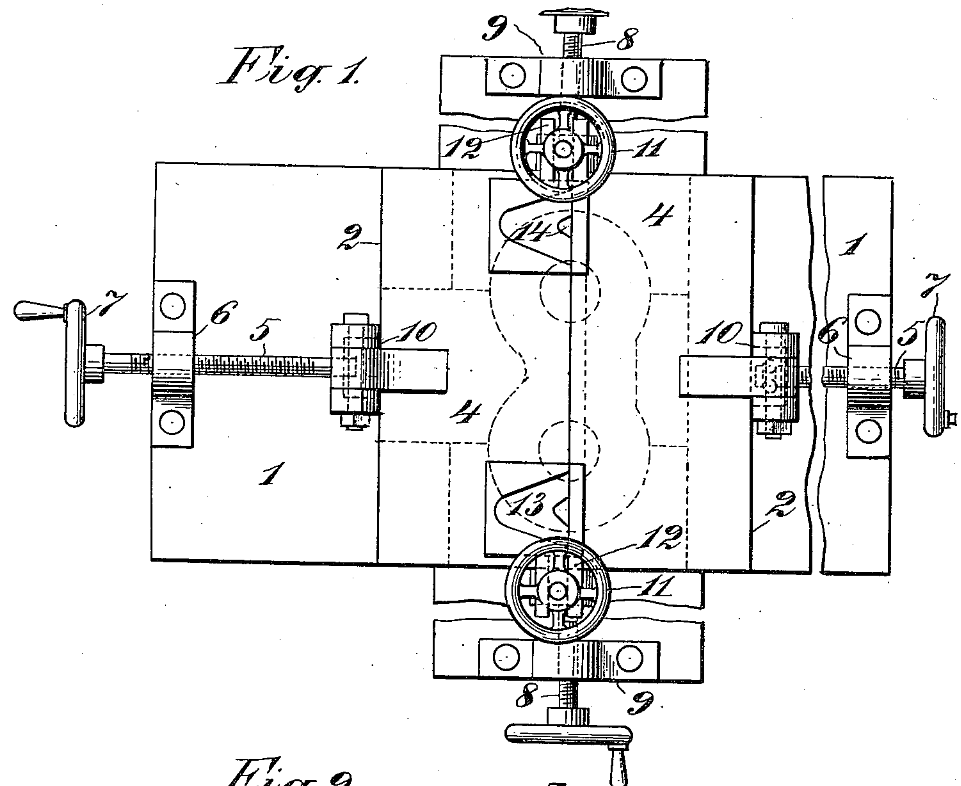
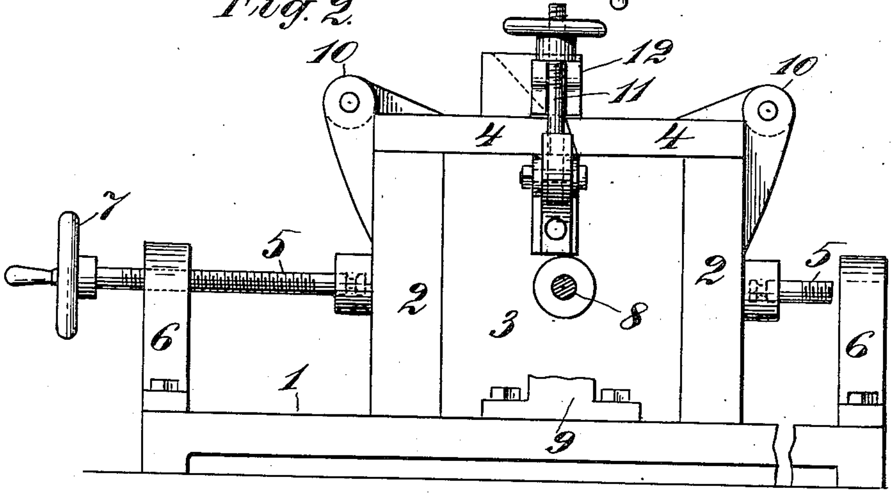


Fig. 2.



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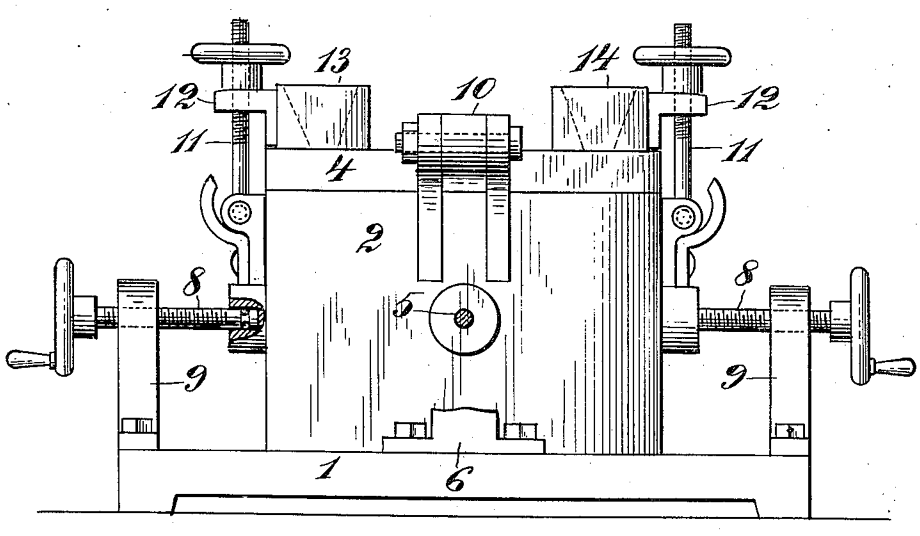
4 SHEETS—SHEET 2.

Fig. 3.



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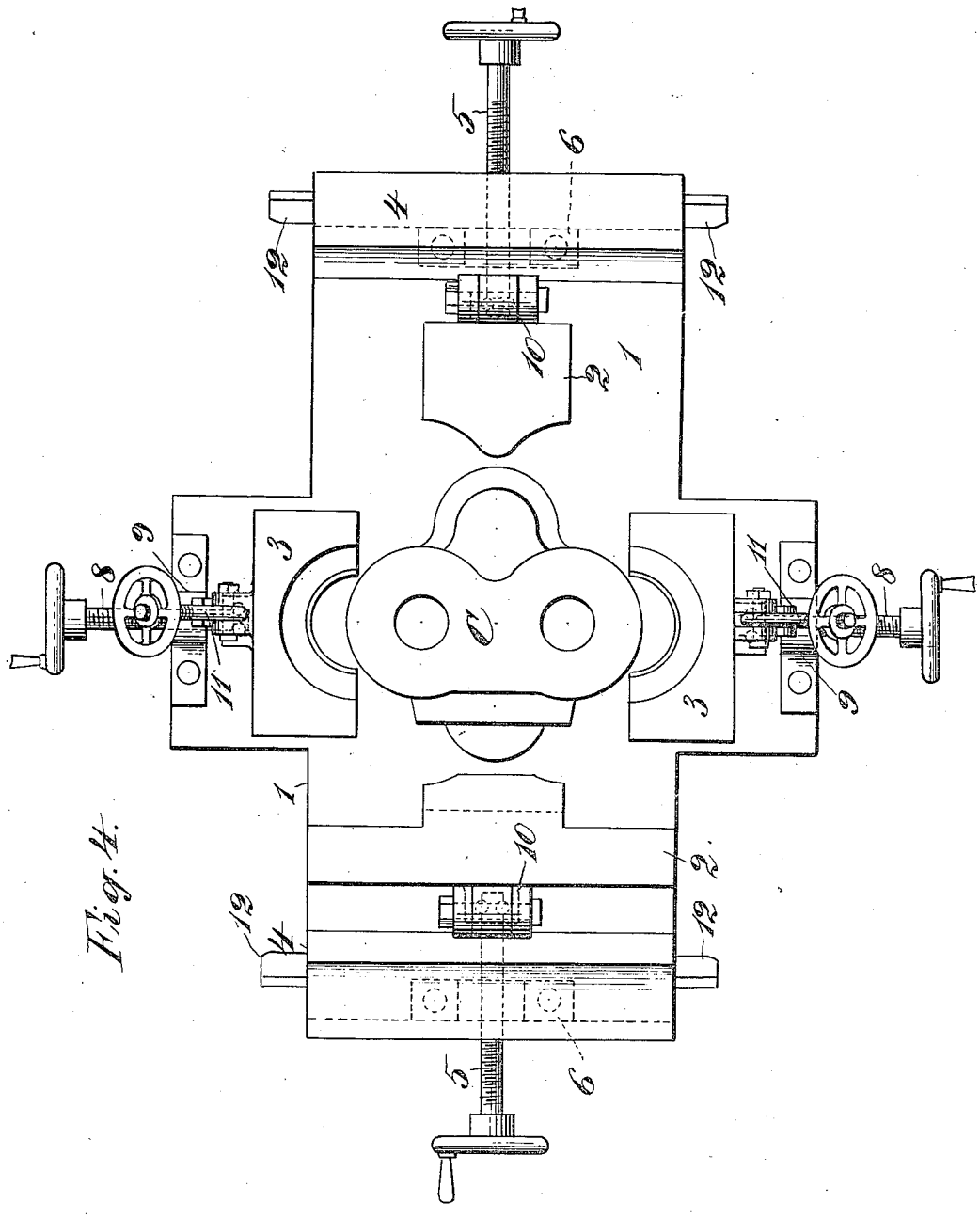

Fig. 4.

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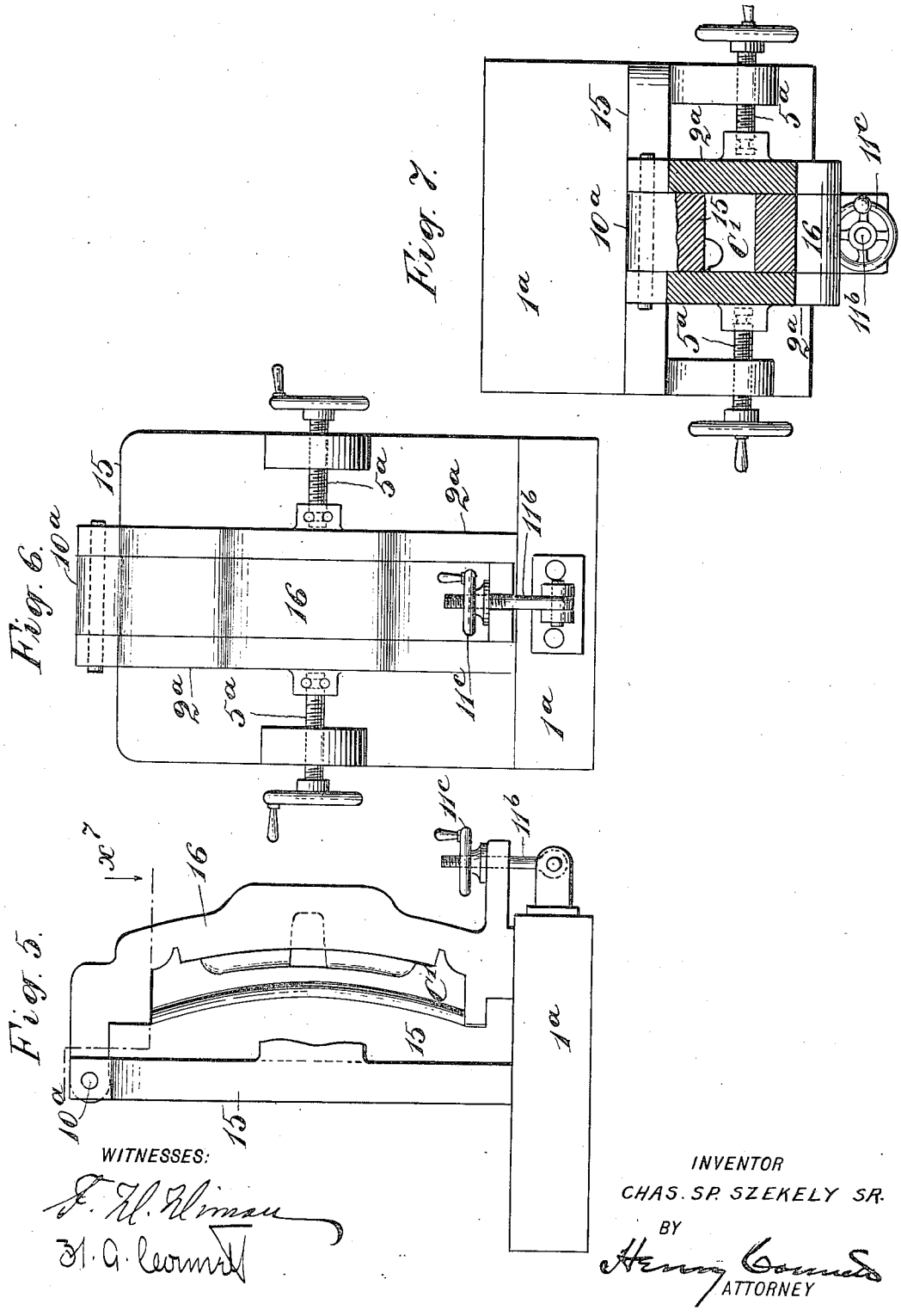

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UNITED STATES PATENT OFFICE.

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ART OF CASTING METAL.

No. 841,279. Specification of Letters Patent. Patented Jan. 15, 1907.

Application filed December 14, 1903. Renewed April 25, 1906. Serial No. 313,679.

To all whom it may concern:

Be it known that I, CHARLES SP. SZEKELY, Sr., a subject of the Emperor of Austria-Hungary, residing in the borough of Manhattan, in the city, county, and State of New York, have invented certain new and useful Improvements in the Art of Casting Metals, of which the following is a specification.

This invention relates to the art of casting metals in metal molds; and it has for its object to produce a casting from metals that expand with heat and shrink on cooling, and particularly from iron and steel, which shall be when cool of the exact predetermined dimensions, and will therefore require little or no dressing or finishing in order to adapt them to the uses intended.

It is well known that in the art of casting iron in sand molds the pattern-maker employs what is known as a "shrinkage-rule," the pattern being in every dimension larger than the casting to be produced. In withdrawing the pattern from the sand the mold is further enlarged in order to free the pattern. When the molten metal is poured in, it is permitted to expand and cool in the sand or to become very much reduced in temperature while therein. The result of this method of casting is that little reliance can be placed on producing a casting having accurate predetermined dimensions. It is well known that some metals, and particularly iron and steel, expand while solidifying and subsequently contract or shrink on cooling. Casting these metals in iron molds is not new; but prior to my improvements in the art, so far as I am aware, castings of iron or steel made in metal molds have had chilled surfaces and other imperfections, which my improvements overcome.

The molds according to my invention are made of the exact size and shape of the casting desired, and before the molten metal is poured in the interior surfaces of the molds are coated with a compound such as that described in my application Serial No. 160,888. The mold being of metal prevents the natural expansion of the metal of the casting from taking place until the mold is opened, and this is effected as soon as the outer surface of the casting has become sufficiently firm to retain its shape. This period of time varies somewhat with the size and form of the casting; but usually about twenty seconds will suffice. Immediately the mold is thrown open the natural expansion of the cast metal takes place, and then almost simultaneously the cooling of the casting by contact with the air causes the natural shrinkage to begin. By the peculiar construction of the mold, the employment of the coating, the external pressure produced by the rigid mold, and the quick release, which allows expansion, the consequent shrinking action of the casting in cooling is exactly counterbalanced and a casting results having not only the exact dimensions of the mold, but also a soft or non-chilled surface, and owing to the rapid strain of the molten metal toward the surfaces of the casting and subsequently the flow by shrinkage toward the center a more uniform texture of the casting is obtained throughout the whole mass thereof than is obtainable in sand or in a metal mold without these conditions.

An important feature of my invention is the opening of the mold at the proper time. This prevents the pressure exerted by the natural expansion of solidification from making the casting adhere to the mold, and also prolongs the life of the mold and prevents its warping and distortion from becoming too hot and cooling off too rapidly.

In carrying out my process I produce a sectional metal mold of the exact size desired for the finished casting when cold—that is to say, the mold will have the dimensions which it is required that the iron or steel casting shall have. This mold is so constructed that when the metal has been poured therein and has become set, so that it will retain the form of the mold, which only requires a fraction of a minute, the mold is thrown open by moving apart its several sections, so that no confining pressure on the casting remains. This permits the casting to expand freely, and when cool it will have shrunk or come back to its original dimensions.

Obviously the metal molds used will vary somewhat in construction and in the number of sections of which they are composed, according to the shape and form of the casting to be produced and whether it is cored or plain work.

In the accompanying drawings two forms of molds are shown, one adapted for producing a rather irregular, intricate, and hollow

pump-section and the other for producing a brake-shoe of more simple form.

In the drawings, Figure 1 is a plan of the closed mold, which is made up of seven parts. Fig. 2 is an end view of the same. Fig. 3 is a front elevation as seen from the left in Fig. 2. Fig. 4 is a plan showing the mold thrown open. Figs. 5, 6, and 7 illustrate a simpler form of mold consisting of but four parts. Fig. 5 is a side elevation with the near side section omitted. Fig. 6 is a front elevation of the mold; and Fig. 7 is a horizontal section or sectional plan, the plane of the section being indicated by line x^7 in Fig. 5.

Referring to Figs. 1 to 4, the mold may be described. C in Fig. 4 designates the casting produced in the mold. The mold itself consists of a base 1, movable sides 2 2, movable ends 3 3, and movable top plates 4 4. The mold sides 2 are slidable on the base and are moved thereon by screws 5, rotatable in nut-bearings 6 on the base and having crank-wheels 7. The mold ends 3 are also slidable on the base and are operated by screws 8, rotating in nut-bearings 9 on the base. The top plates 4 are hinged at 10 to the respective sides 2 and turn about these hinges, which connect the top plates to the respective mold sides 2. When the top plates are down in place, they are locked by means of swing-bolts 11, which are hinged to the respective mold ends 3 and engage slotted lugs 12 on one of the plates 4. The swing-bolts have each a wheel-nut 11^a. In one of the top plates is an inlet 13 for the molten metal and an outlet 14 for the gases from the mold. Suitable core-recesses are provided in the mold to suit the particular object to be cast.

In the operation of casting, the sections of the mold being separated, the cores are set and the interior surfaces of the mold coated with a suitable wash. The mold-sections are now brought together and secured by the screws, as in Fig. 1, and the molten metal poured into the inlet 13 until it appears at the outlet 14. After the metal of the casting shall have had time to set or solidify sufficiently to take the form of the mold the mold is thrown open. Twenty seconds will usually suffice for the metal to harden sufficiently to take and retain the shape of the mold, and this time may be utilized in preparing to open the mold, which latter is effected by first releasing the top plates 4 and turning them back on their hinges and then running back the mold sides 2 and mold ends 3 by means of their respective screws. This is the position of the parts seen in Fig. 4, and it leaves the casting C free from all confining pressure or contact with the mold on all sides and at the top. The casting now expands and afterward in cooling comes back by shrinkage to the proportions and dimensions of the mold.

The mold illustrated in Figs. 5, 6, and 7 is somewhat simpler than that described and is designed for casting a brake-shoe. In this construction 1^a is a base or bed plate on which is fixed an upright section 15 of the mold. The sides 2^a 2^a of the mold slide on the base and are operated by screws 5^a, as in the construction previously described. The section 16 of the mold is hinged at 10^a to the top of the section 15, and when closed it is secured by a swing-bolt 11^b and nut 11^c. The inlet for the molten metal and the outlet for the gases from the mold are formed in the tops of the respective sides 2^a. The mode of casting with this mold is the same as with the mold first described; but this mold consists only of four sections, the base or bed plate forming only a support for the mold-sections. The sides 2^a are moved outward in opening the mold, and the section 16 is unlocked and turned back on its hinge 10^a, thus freeing the casting from all confining pressure. In Figs. 5 and 7, C′ designates the matrix to be filled by the molten metal.

I am aware that in making steel castings in metal molds it has been the practice or been proposed to open the mold after the hot metal has expanded therein in order to prevent the shrinkage from cracking the casting, especially where portions of same are undercut. This I do not do. In my process it is essential in order to get the result desired to open the mold and remove the pressure from the casting before the expansion of the latter, so that the casting expands and contracts freely. This is necessary in order to maintain the proper dimensions of the casting, as hereinbefore explained.

Having thus described my invention, I claim—

1. The herein-described improvement in the art of casting metal in metal molds, which consists in first pouring the molten metal into the closed mold until the latter is full, then, as soon as the surface of the casting shall have solidified sufficiently to enable the casting to retain the shape of the mold, and before the casting shall have reached its maximum expansion, removing all confining pressure from the surface of the casting so that it may first expand and then contract to the exact size of the mold.

2. The herein-described improvement in the art of casting in an iron mold a metal which contracts in cooling, which consists in first coating the inner surface of the said mold with a suitable wash, then closing the mold, then pouring the molten metal therein, and then, as soon as the surface of the casting shall have solidified sufficiently to enable the casting to retain its shape and before the casting shall have reached its maximum expansion removing all confining pressure from the surface of the casting so that it may first expand and then contract to the exact size of the mold.

3. The herein-described improvement in the art of producing from iron and steel, castings of the exact size of the mold, which consists in removing from the surface of the casting at the moment said surface shall have become solidified by cooling and before the casting shall have reached its maximum expansion, all confining pressure, whereby the subsequent expansion and contraction of the casting will be exactly counterbalanced.

4. The process of casting metal in metal molds which consists in relieving the pressure of the mold upon the metal, after the pouring and before the expansion of solidification is complete, substantially as described.

5. The process of casting metal in metal molds which consists first in coating the inner surface of the mold with a suitable wash that adheres to the mold both when cold and hot, then closing the mold, then pouring the metal therein, and then removing all confining pressure from the casting before the expansion of solidification is complete, substantially as described.

6. The process of making iron and steel castings of the exact size of the mold, which consists in removing from the casting the confining pressure of the mold before the casting shall have reached its maximum expansion, substantially as described.

In witness whereof I have hereunto signed my name, this 11th day of December, 1903, in the presence of two subscribing witnesses.

CHARLES SP. SZEKELY, Sr.

Witnesses:
HENRY CONNETT,
H. A. CONNETT.