No. 664,438. Patented Dec. 25, 1900.

W. D. SARGENT.

COMPOSITE METAL CASTING.

(Application filed Nov. 22, 1897.)

(No Model.)

Fig. 1

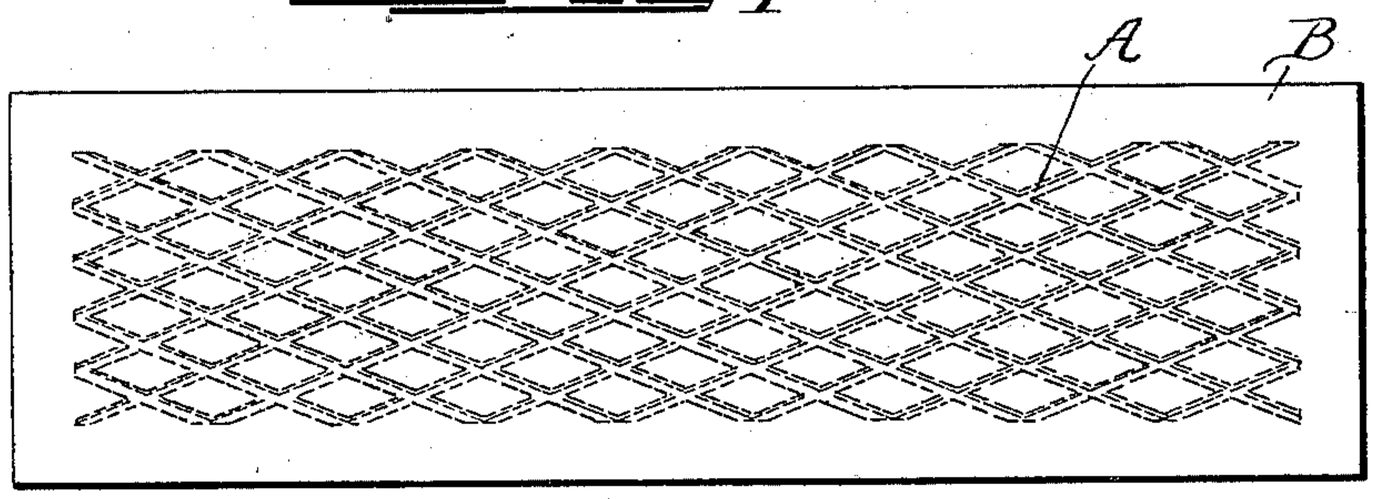


Fig. 2

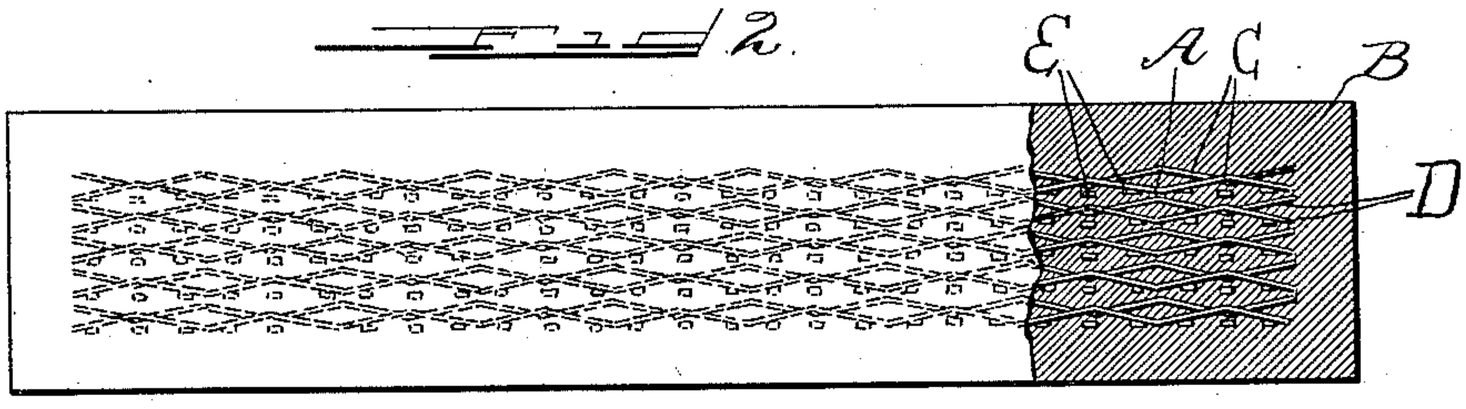


Fig. 3

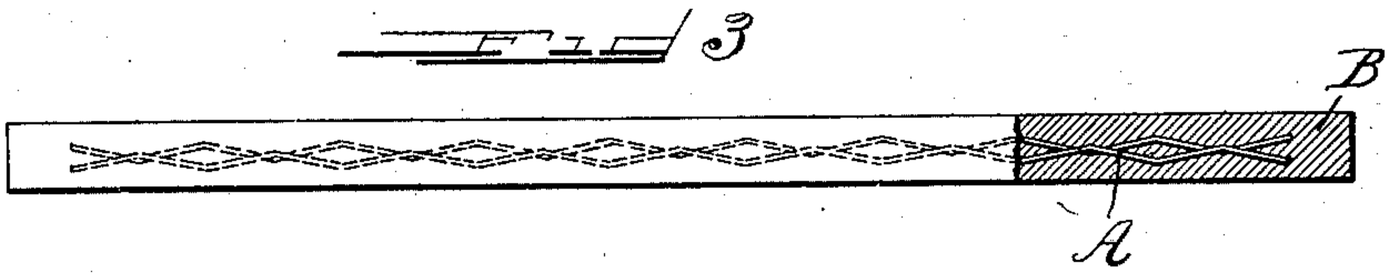


Fig. 4

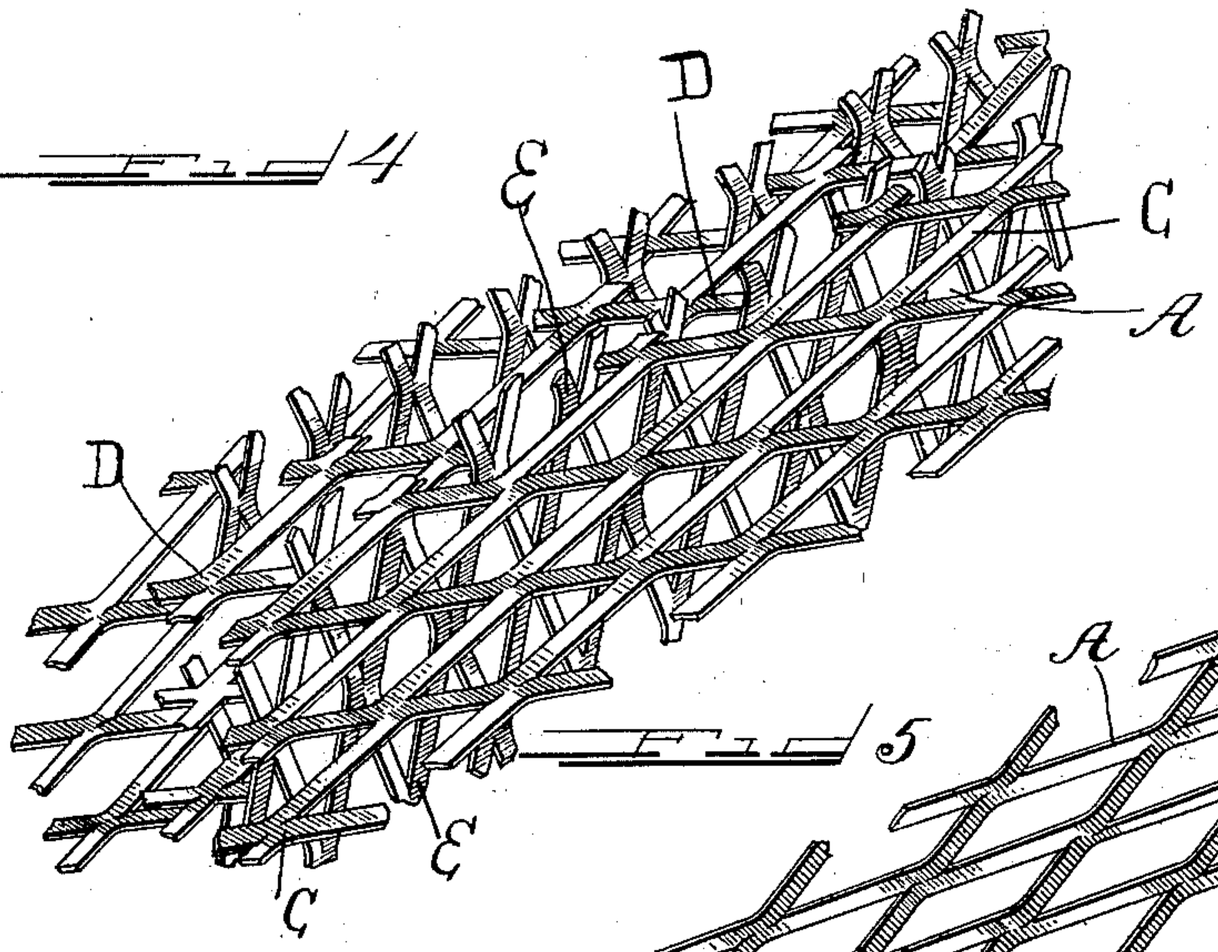
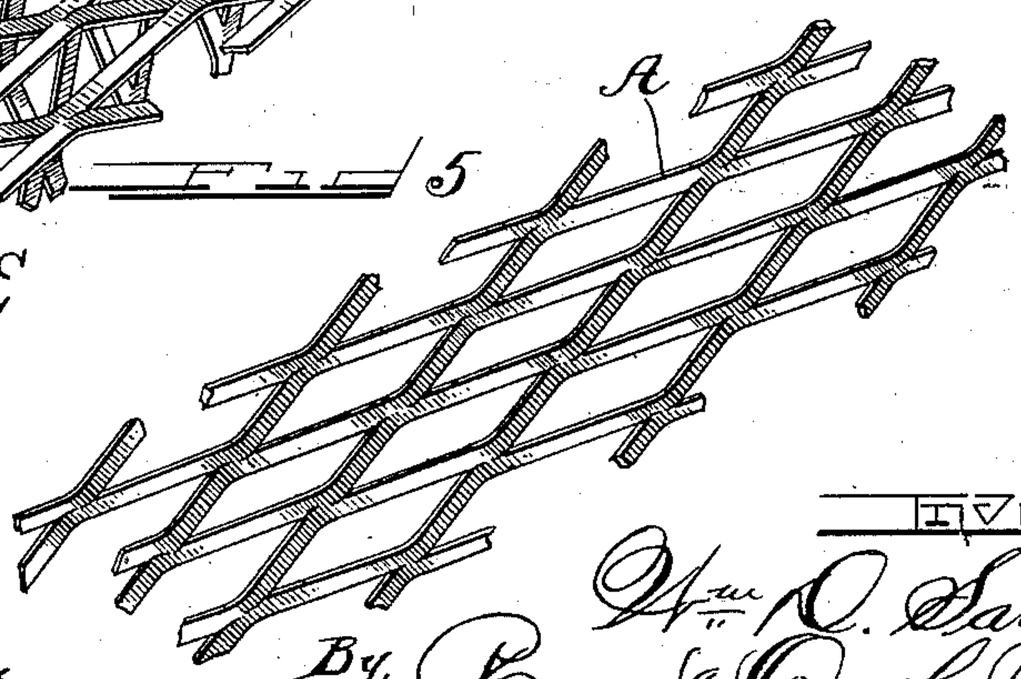


Fig. 5



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UNITED STATES PATENT OFFICE.

WILLIAM DURHAM SARGENT, OF CHICAGO, ILLINOIS, ASSIGNOR, BY MESNE ASSIGNMENTS, TO THE AMERICAN BRAKE SHOE COMPANY, OF SAME PLACE.

COMPOSITE METAL CASTING.

SPECIFICATION forming part of Letters Patent No. 664,438, dated December 25, 1900.

Application filed November 22, 1897. Serial No. 659,513. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM DURHAM SARGENT, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Composite Metal Castings, of which the following is a full, clear, and exact description.

This invention relates to improvements in that branch of the art of casting metal directed toward producing composite castings of various kinds, forms, and materials possessing great strength and varying degrees of hardness, the product being designed for special uses where these qualities are requisite and essential. These desirable results have sometimes been sought by the expensive and unsatisfactory methods of mixing the different metals in the cupola or furnace before casting; but the nearest approach to my invention known to me are the many old and well-known processes for producing a composite metal casting by pouring cast iron or steel upon or about wrought-metal inserts composed of rods or wires suitably shaped and disposed. None of these processes, however, as above outlined sought to produce composite castings of integral structure, and indeed such a product was not possible by any such process known to me. In the first place those processes seeking to produce a composite metal by pouring cast iron or steel upon a mass or body of wrought-iron rods or wires without previous special treatment succeeded in producing only a porous or spongy casting wherein the two metals remained separate and distinct although imperfectly united by reason of the production of carbonic-oxid or oxygen gas resulting from contact of the necessarily highly-heated cast metal with the scaly, corroded, or oxidized surface of the rods or wires. Those who sought to avoid this difficulty by special treatment of the wrought-iron rods or wires, coating them with tin or other like metals preparatory to making the castings, succeeded only to the extent of making composite castings which were compact in character, but in which there was no integrity of union between the cast and wrought metal, each metal retaining its distinctive form and character in the completed casting, with clear lines of division or seams therebetween.

The primary object of my invention is the production of composite metal castings of integral structure—that is to say, integral metal castings composed of different kinds of metals—without mixing or combining such metals prior to making a casting and without any special treatment of either metal.

A further object of my invention is the production of integral composite castings having uniformly distributed throughout the body thereof or throughout such portions thereof as may be desired and as finely divided as may be desired a metal differing in kind and quality from the cast metal, whereby the strength and hardness of the casting as a whole are greatly promoted.

My invention, more generally stated, is the production of castings having uniformly-distributed strengthening and hardened sections wherever desired in steel or iron castings and as finely divided as may be desired, whereby is produced a new metal of composite integral character possessing all the desirable characteristics of tensile strength of ductile metal and hardness of cast metal obtainable in castings as heretofore made without the necessity of mixing the metals previous to casting or specially treating the same.

The foregoing and such other objects as may hereinafter appear are attained by the devices illustrated in the accompanying drawings, in which—

Figure 1 represents a diagrammatic plan view of a casting made in accordance with my invention. Fig. 2 is a side elevation thereof, partly in section. Fig. 3 is a view similar to Fig. 2, showing a thinner casting than that shown in Fig. 2. Fig. 4 is a detail perspective view of a laminated expanded-metal insert, and Fig. 5 is a detail perspective view of a single sheet of expanded metal.

Similar letters of reference indicate the same parts in the several figures of the drawings.

In carrying out my invention I place in the mold in which the casting is to be made an insert or foraminous body or reinforcement A, consisting of any desired number of sheets or laminations, if more than one be necessary,

such foraminous insert consisting of the commercial product known as "expanded metal," which is composed of soft steel pickled, slitted, and expanded, so as to have a finely-divided character in cross-section. This metal is ductile and in the pickling process preparatory to being slit and expanded has all the scale, corrosion, and oxidation removed, so as to leave it perfectly clean and ready to unite with the cast metal in an integral mass. This expanded metal to which I have referred is a well-known commercial product now upon the market in all of the principal cities of the United States and is extensively used in the arts and trades for all kinds of purposes, sometimes as a fencing, sometimes as a metallic lath, and for most of the purposes of coarse wire-netting; but I have never known it to be used in metallurgy for making castings such as herein proposed or, indeed, for any other purpose. This metal is formed by taking sheets of metal of the desired kind and thickness and forming rows of slits therein, which rows are arranged in staggered relation to each other, and then the whole sheet is drawn laterally to the line of the slits, so as to open up the slits, forming a series of diamond-shaped openings, the strips of the metal between the slits in the act of forming assuming angular relation to each other. This leaves the strips of metal of very small cross-sectional area at all points, and with the angular disposition of the strips when an insert is made by a laminated pile of sheets of expanded metal the metal is in a finely-divided condition, but distributed with practical uniformity throughout the pile, the sectional area of the metal at any point being very small as compared with the superficial area. In the carrying out of my present invention I know of no other ductile metal by which the results sought by me can be produced, nor do I know of any other form of finely-divided metal, except that of the commercial expanded metal, of which the inserts can be successfully formed to attain the results sought by me. Upon and about these foraminous inserts I pour the iron or steel cast metal B, of any suitable mixture, according to the kind of casting desired, and by reason of the finely-divided character of the insert the latter will be partially fused by the heat of the cast metal poured thereon, and hence will be welded to the cast metal, so as to form an integral body. Obviously there is practically no limit to the varying kinds of integral metal which may be produced by my process, and especially as to the qualities of strength and hardness possessed thereby, for each change in the proportion or character of the cast metal will affect both of these qualities.

In Fig. 1 I have shown merely for the purpose of illustration a diagrammatic plan view of a casting made in accordance with my invention and which would appear substantially the same as a representation of either of the castings shown in Fig. 2 or Fig. 3, the dotted lines in Fig. 1 showing the general appearance of a sheet of expanded metal in plan view.

In Figs. 2 and 3 the edge of the metal is presented. Fig. 3 shows a casting in which but a single sheet of the expanded metal forms the foraminous insert, while in Fig. 2 the insert is made of a laminated pile of sheets, the pile representing the insert shown in Fig. 2 being shown in detail in Fig. 4, while the single sheet represented by the insert in Fig. 3 is shown in detail in Fig. 5.

So far as relates to the broad idea of my invention, it is immaterial whether the sheets of expanded metal when formed into a laminated pile, as illustrated in Figs. 2 and 4, are so arranged that the slits therein will extend all in the same direction or at right angles to each other or at any intermediate angle; but in the drawings for the purpose of illustration I have shown a laminated pile such as has been extensively used by me in making composite metal castings in accordance with this invention, and in said Figs. 2 and 4 I have shown the sheets of expanded metal so arranged that the alternate sheets will have their openings or slits extending in the same direction, while the intervening sheets will have their openings extending at a right angle thereto. Thus the top sheet C and the third sheet D will have their openings extending in the same direction, while the intervening sheet E and the fourth sheet will have their openings extending at right angles to each other, this arrangement being continued throughout the pile. The sheets C, D, and E, it will be understood, are cut from larger sheets and may therefore be cut in their present shape or in any desired shape, so as to have the slits or diamond-shaped openings therein running in any direction desired with reference to the outlines thereof, and likewise a laminated pile may be formed of sheets all having the same distribution of openings or openings at angles to each other in the alternate sheets of the pile. The production of the varying effects before referred to is well understood by those skilled in the art, and the attainment of these qualities is so easy of accomplishment as not to require a detailed description herein. For instance, in case it is desired to produce great strength in the casting, as well as hardness, the foraminous insert or reinforcement should preferably be produced from steel very low in impurities, and consequently possessing a high melting-point and great strength. This insert combined with either cast-iron or cast-steel will produce metal of much greater strength than hardness, yet possessing great integrity of structure. A less degree of strength would of course be produced if the foraminous insert or reinforcement were produced from malleable iron or copper, and likewise greater hardness would be secured if the cast metal be steel high in carbon instead of iron. All such variations and changes will

be readily understood by those skilled in the art, and by the practice of my invention practically any degree of strength and of hardness between the maximum and minimum may be readily produced by a proper adjustment of the ductile metal of which the inserts are formed and the mixture of which the cast metal is composed, and all these without a mixture of the different metals prior to casting or any special treatment of the expanded-metal insert. In any event the result of the practice of my invention will be an integral composite metal formed by casting a metal in fluid form upon or about a ductile metal in a solid form, and as a result of the finely-divided character of the expanded-metal insert there will be a practically uniform distribution of strengthening and hardening sections throughout the body of the casting wherever desired.

It will of course be understood that in such parts of the casting from which the expanded-metal inserts are omitted the casting will be composed wholly of the cast metal, thus affording a special facility and advantage for boring, tapping, and machining the casting at such part or parts. It will also be understood that by reason of the finely-divided character of the expanded-metal insert and the great superficial area thereof as compared with the cross area thereof at any point, as well as the removal of all scale, corrosion, and oxidation in the course of its manufacture, the effect of the high temperature of the cast metal is not in any wise deleterious and that there is neither time nor opportunity for the formation of oxygen gas to cause the casting to assume a porous or spongy-like character, but that in point of fact the casting is dense, solid, and integral in character, is composed of two metals differing in kind and quality perfectly united without joint or seam, and yet retaining to a greater or less degree all their original characteristics of strength and hardness distributed with practical uniformity throughout the body of the casting or so much thereof as may be desired.

The product of my invention is always an integral metal, and although composed in part of ductile metal, preferably soft steel, reduced to the form of expanded metal and of a thickness that obviates all danger of chilling the cast metal of which my new metal is partly composed, has no joints or seams therein, and in fact no line of division between the two kinds of metals at any point, one becoming welded to the other in the act of casting by reason of the peculiar character and disposition of the ductile metal.

My invention while simple possesses manifest advantages over any other invention heretofore practiced and produces a metal not possible to be produced by any other method known to me and a metal possessing in the maximum degree tensile strength, hardness, and durability where desired, the strengthening and hardened sections being disposed web-like throughout the structure of the metal.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. As a new article of manufacture, composite metal castings consisting of a relatively hard cast metal cast upon or about a ductile metal reduced to the form of a sheet of commercial "expanded metal," said cast and ductile metal being integrally united by fusion.

2. As a new article of manufacture, composite metal castings consisting of a relatively hard cast metal cast upon or about a ductile metal reduced to the form of a laminated pile of sheets of commercial "expanded metal," said cast and ductile metal being integrally united by fusion, substantially as described.

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