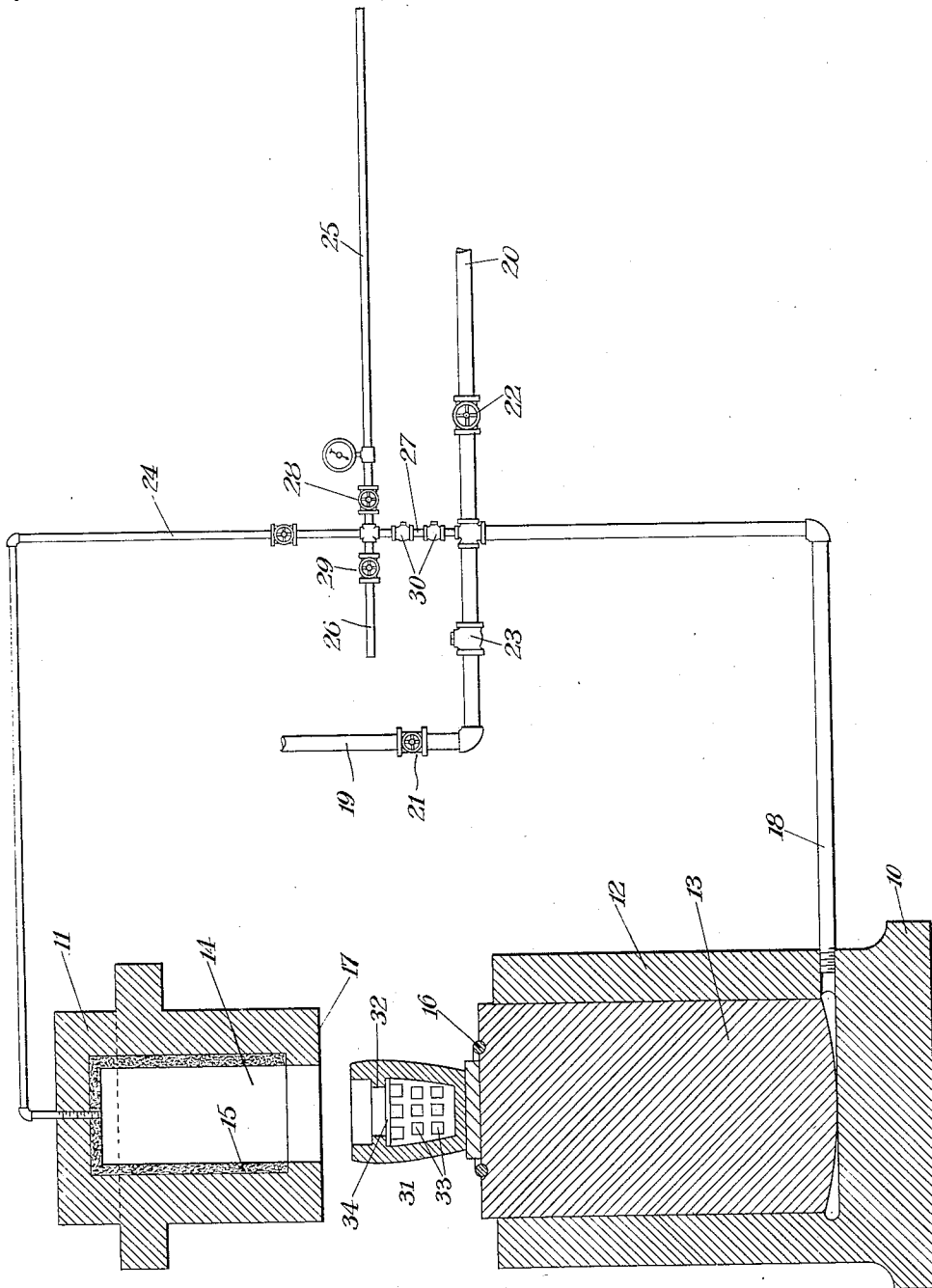


C. SCOTT & W. DEATS.
 PROCESS OF IMPREGNATING.
 APPLICATION FILED MAR. 31, 1911.

1,053,880.

Patented Feb. 18, 1913.



Witnesses:
 Minerva Lohel
 Marian Mickle.

Campbell Scott & Deats Inventors
 By *William Deats*
 Attorneys
 Prindle & Bright

UNITED STATES PATENT OFFICE.

CAMPBELL SCOTT AND WILLIAM DEATS, OF YONKERS, NEW YORK.

PROCESS OF IMPREGNATING.

1,053,880.

Specification of Letters Patent.

Patented Feb. 18, 1913.

Application filed March 31, 1911. Serial No. 618,110.

To all whom it may concern:

Be it known that we, CAMPBELL SCOTT and WILLIAM DEATS, of Yonkers, in the county of Westchester, and in the State of New York, have invented a certain new and useful Improvement in Processes of Impregnating, and do hereby declare that the following is a full, clear, and exact description thereof.

The object of our invention has been to devise a process of impregnating a relatively solid substance with a metal for purposes which will be more fully hereinafter explained, and to such ends our invention consists in the process of impregnating with metals hereinafter specified.

We have discovered that with the impregnation of a relatively solid substance with a metal having a lower melting point, compositions of matter can be formed which are highly advantageous for many uses. The subject of the present application for patent is such a process and is not to be limited to the particular purposes herein mentioned nor to the formation of compositions of matter only for the purposes hereinafter specified. We have found, for instance, that to impregnate carbon with a metal, such as brass, makes electric brushes or contacts which are of high conductivity and which cause sparking to a much less extent than contacts made only of carbon. We have found that carbon impregnated with brass, tin or a Babbitt metal, makes bearings which run with relatively little friction and which have great durability. We have found that impregnating the graphite core of a lead pencil with lead causes such core to have much greater durability than ordinarily and enables it to retain a point without sharpening much longer than usually. We have found that cast iron can be impregnated with brass, tin or Babbitt metal so as to form a bearing surface of much greater durability than that of the iron alone whether such impregnation be only on the surface or whether it penetrate entirely through the metal. We have found that we can drive molten metal through a carbon or other porous mold so as to fill a mold cavity and cause a perfect casting to be made. Many other substances can be impregnated by another substance by our process, as for instance, cement or porce-

lain objects can be impregnated with molten glass.

While we shall illustrate our process by the best manner of practising it with which we are familiar, we desire it to be distinctly understood that the illustrated process is only one of many possible processes and is, therefore to be regarded only as typical of the broad invention of which it is but one embodiment.

The apparatus by which such typical embodiment of the process is practised comprises a press consisting of a base 10 and a head 11 connected by bolts in the usual manner. A vertical cylinder 12 is formed on or attached to the said base and contains a piston 13. The head 11 contains a chamber 14 preferably having a heat-insulating lining 15. The upper surface of the piston 13 has a groove in which is mounted a soft metal gasket 16 and the under surface of the head 14 is made flat so that said gasket may perfectly fit against it. A pipe 18 is connected with the lower end of the cylinder 12 beneath the piston 13 and such pipe is connected with a water-supply pipe 19 and a water exhaust pipe 20. Inlet and discharge valves 21 and 22 respectively, control the said pipes, and a check-valve 23 is mounted in the pipe 19 between the valve 21 and the pipe 18. A pipe 24 is connected with the chamber 14, with an inlet pipe 25, an air discharge pipe 26 and with a pipe 27 connected with the pipe 18. The pipes 25 and 26 are respectively provided with an inlet valve 28 and an exhaust valve 29. The pipe 27 is provided with a check valve or valves 30 opening toward the water-pipe 18.

In the practice of our said process by the said apparatus, a crucible 31 containing the carbon to be impregnated and molten metal is placed upon the piston 13; the water inlet valve 21 is opened and water is admitted beneath the piston 13, raising the latter until its gasket 16 makes a tight joint with the surface 17, thus completely inclosing the crucible in the chamber 14 and making the latter air-tight. The air inlet valve 28 is then opened, thus admitting air to the water-pipe 18 through the check valve or valves 30, and also admitting air to the chamber 14. As the air pressure at the upper end of the piston is confined to the

area inclosed by the gasket, while the water pressure, augmented by the air pressure at the lower end of the piston, reaches the entire piston area, the pressure holding the piston against the head is much greater than that tending to force it away so that the admitting of air into the chamber does not cause any opening of the chamber by retraction of the piston. As the air has access to all sides of the crucible, there is no tendency to break the crucible. Heat of the metal has expanded the gases within the pores of the carbon and thereby expelled them to a considerable extent, and the pressure of the air overcomes the surface tension of the metal and drives the molten metal into the pores or interstices of the carbon, impregnating it to any desired extent according to the conditions as later herein described. As the pressure can reach the inner interstices of the carbon, we have found that we can impregnate comparatively delicate charcoal with molten metal without in any way breaking the structure of the charcoal. A very short lapse of time is sufficient for ordinary impregnation, and when the impregnation is completed, the air-discharge valve is first opened, and, when the air has escaped, the water-discharge valve is opened, permitting the piston to descend, when the crucible can be removed and the excess of metal, if any, poured off.

As carbon is of less specific gravity than metal, it is necessary, if the carbon is to be impregnated all over its surface, that the carbon be maintained below the surface of the metal. This can be accomplished in various ways. In the crucible which we have illustrated, we have provided an inner ledge 32, and after the crucible has been packed with the carbon blocks 33 to be impregnated, pieces of wrought iron wire or rods 34 are put into the crucible and engaged under the said ledge 32 to prevent the carbon blocks from floating in the metal. As wrought iron has a much higher melting point than brass, for instance, it is entirely practicable to use rods made of wrought iron for securing the complete immersion of carbon blocks in brass. Instead of the wrought iron rods, a disk or plate of fire-brick can be used, as we have found that metal readily passes through such material.

If desired, loose porous material, such as powdered carbon or graphite may be impregnated with metal, the metal serving also as a binder, so that the impregnated material becomes a solid mass. As the powdered carbon or graphite would float upon the surface of the metal and thus not be properly impregnated, it is necessary to hold such material beneath the surface of the metal, as by a disk or plate of fire-brick or in some other manner. For instance, if it is desired to form a bearing block of a given shape, a

separable porous mold of the said shape can be made, and such mold, after being filled with the powdered carbon, can be put into the crucible and held down in either of the manners hereinbefore described.

By varying the proportions of the carbon and metal, the qualities of the resulting product may be varied, such, for instance, as the conductivity or resistance to wear. If more metal is charged into the mold than will saturate the porous substance, the excess of metal simply remains in the crucible when the carbon is taken out. If less metal than will saturate the carbon be introduced, or if the time of the operation be sufficiently shortened, only the surface of the carbon may be impregnated. If graphite be used, the graphite compresses into coherent masses before impregnation takes place so that the resultant product has seams of metal running through it. If, however, some other form of carbon, such as coke-dust be added, this prevents the said compression into coherent masses and there is a uniform distribution of the metal throughout the mass. If desired, in order to secure a more uniform mixture of the metal and powdered graphite, the impregnated graphite may be stirred before the metal has solidified.

It will be understood that any method by which a relative difference of pressure can be produced between the pressure of the fluid and the pressure in the pores to be impregnated will accomplish the desired result.

We claim:

1. The process of combining a porous substance not naturally absorbent to a metal with a metal, comprising melting said metal and exerting pressure on said molten metal to force it into said pores.

2. The process of combining a porous substance not naturally absorbent to a metal with a metal, comprising melting said metal and immersing said substance in said molten metal and causing pressure on said metal.

3. The process of combining a porous substance not naturally absorbent to a metal and having a structure, with metal, comprising melting said metal and causing a difference in pressure between said metal and the pressure in said pores.

4. The process of combining carbon and metal, comprising melting said metal, immersing said carbon in said molten metal and causing pressure on said metal.

5. The process of impregnating carbon with metal comprising melting said metal, immersing said carbon in said molten metal and creating a pressure upon said metal.

6. The process of forming an article consisting of carbon and metal, comprising forming a block of carbon of the shape of the desired article, bringing said block into contact with molten metal, and producing a

difference in pressure between the pressure in the cavities in said block and the surface of said metal.

- 5 7. The process of forming an electrical contact, comprising forming a carbon block substantially of the shape desired for said contact, bringing said block into contact with molten metal, and producing a pressure on said metal.
- 10 8. The process of combining carbon and

metal, comprising casting the metal into the pores of the carbon under pressure.

In testimony that we claim the foregoing we have hereunto set our hands.

CAMPBELL SCOTT.
WILLIAM DEATS.

Witnesses:

MABEL E. SHERRY,
EDWARD A. FITCH.