UNITED STATES PATENT OFFICE.

FERDINAND EUGENE CANDA, OF NEW YORK, N. Y.

ANTI-FRICTION MATERIAL AND JOURNAL OR OTHER BEARING.

SPECIFICATION forming part of Letters Patent No. 313,916, dated March 17, 1885.

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To all whom it may concern:

Be it known that I, FERDINAND EUGENE CANDA, of New York, county and State of New York, have invented certain new and useful Improvements in Anti-Friction Materials and Journal and other Bearings Made Therefrom, of which the following is a full, clear, and exact description.

This invention has for its object the production of an anti-friction material or compound and of an improved journal or other bearing, or other moving parts of machinery made therefrom, as hereinafter described, whereby the friction and wear of the moving parts in contact will be greatly reduced.

My invention consists in an anti-friction material or compound composed of one or more metals or of one or more alloys, or of one or more metals with one or more alloys, all solid at ordinary atmospheric temperatures, and ground, or granulated, or pulverized, or otherwise divided into particles and mixed together with one or more lubricants or unctuous substances, more or less combined, not liable to fuse with the melting of said metals or either or any of them.

It also consists in a solidified metallic compound or journal or other bearing made from such material or compound, or partly therefrom, in which the lubricant or lubricants or unctuous substance or substances are disseminated through, combined with, and incorporated in the metal or metals, alloy or alloys forming such compound or material, and locked within the interstices thereof, substantially as hereinafter described; and it further consists in the method or methods of treating the material or materials used, and of welding, soldering, compacting, solidifying, and shaping the mass of which the journal or other bearing or bearing compound is made, substantially as hereinafter set forth.

To enable others to make and use my invention, I will proceed to more minutely describe it.

I take one or more metals, or one or more alloys, or one or more metals with one or more alloys jointly in any desired proportions, which I grind, or pulverize, or granulate, or otherwise divide into particles of any desired fineness. When thus ground or granulated, or pulverized, or otherwise divided into more or less fine particles, the same, if copper or other metals, or bronze or other alloys melting only at high temperatures are used either singly or jointly, may be coated with a covering of tin or other metal, or with Babbitt metal, or other alloy melting at lower temperatures. This may be done by any of the known or suitable methods; but of the methods known for coating metals or alloys I prefer the following—that is to say: I saturate the divided particles of metals or alloys to be treated with diluted muriatic acid in which metallic zinc has been dissolved. I then melt in a suitable vessel a quantity of tin or other metal or Babbitt metal, or other alloy. I then slowly add the divided particles of metals or alloys to the melted metal or alloy, maintaining the heat while so adding, and stirring briskly till the divided particles are coated. I then mix the ground, granulated, pulverized, or otherwise divided metal or metals, or alloy or alloys, and those thus prepared, or such one or more of them to be treated, thoroughly with one or more lubricants or unctuous substances not liable to fuse with the melting of said metals, or with the metals or alloys with which they are coated. Among such lubricants may be named graphite, mica, soapstone, asbestus, such lubricant or lubricants, or unctuous substance or substances being used in any desired proportions. The mixture is then ready for use, and may be put up in barrels or other packages for shipment and use, as required.

To use the mixture for making or forming a journal or other bearing, I place in a die or mold a sufficient quantity of it to make the bearing, or, where it is desired merely to line a journal-bearing, I place the bearing-shell (the inside of which may be coated with tin, or other metal, or Babbitt metal, or other alloy) in such die or mold, and put a sufficient amount of the mixture in the shell to make the lining thereof. The die or mold or the bearing-shell in the die or mold thus filled I then place in an oven or furnace and heat to a temperature sufficient to bring some of the divided particles of metal or alloy, or the coating thereof, if

coated, as stated, to a soldering or welding heat. I then subject the material, while hot, to hydraulic or other pressure to perfect the welding or soldering, and to lock the disseminated lubricant or lubricants or unctuous substance or substances within the mass, and to give it solidity, compactness, and shape, after which it is removed from the mold or die, when the bearing is ready for use. It is not, however, necessary to heat the die or mold. The mixture can be heated in a separate vessel or in the bearing-shell, and thereafter placed with the shell in the die or mold and pressure applied, the same as where heated in the die or mold.

Metals and alloys which melt at different degrees of temperature can be similarly used very advantageously together by first grinding, pulverizing, granulating, or otherwise dividing up the same into more or less fine particles, the metal or alloy which melts at the lower temperature acting as a solder for the other metals or alloys melting at a higher temperature to form substantially one solid mass, and operating as a binder to the whole, and to lock the disseminated lubricant or lubricants or unctuous substance or substances within it; and several fluxes can be used to advantage to quicken the action of the metals in welding, such fluxes being selected as are best suited to the metals or alloys under treatment.

Instead of the ground, granulated, pulverized, or coated metal or metals, alloy or alloys, and lubricant or lubricants, or unctuous substance or substances being made, as described, directly into a journal or other bearing, it may be simply and similarly formed into a compact and solidified mass of either regular or irregular shape, to be afterward shaped or worked up as required.

I am aware that metals have heretofore been amalgamated with mercury.

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

1. An anti-friction mixture composed of one or more ground, granulated, pulverized, or otherwise divided metals or alloys, or of one or more metals with one or more alloys, in any desired proportion, with or without a coating of tin or other metals or alloys and one or more lubricants or unctuous substances that will not fuse with the melting of the metals, substantially as specified.

2. A journal-bearing composed of one or more ground, granulated, pulverized, or otherwise divided metals or alloys, or of one or more metals with one or more alloys, in any desired proportion, and one or more lubricants or unctuous substances that will not fuse with the melting of the metals, mixed together and compressed into shape, substantially as specified.

3. The method herein described of making an anti-friction material or compound from one or more metals or alloys, or from one or more metals with one or more alloys jointly and one or more lubricants or unctuous substances, which consists in first grinding, granulating, pulverizing, or otherwise dividing into particles the metals and alloys which fuse or melt at high temperatures, and then coating or covering the same with tin or other metal or Babbitt metal or other alloy which fuses or melts at lower temperatures, and afterward adding to and mixing with the prepared or coated metallic particles the lubricant or lubricants or unctuous substance or substances, essentially as described.

4. The method herein described of making an anti-friction solidified material or compound or journal or other bearing, which consists in first grinding, granulating, pulverizing, or otherwise dividing into particles one or more metals or alloys or one or more metals with one or more alloys jointly with or without the addition of a suitable flux or fluxes, then adding one or more lubricants or unctuous substance or substances, then subjecting the whole to heat sufficient to bring some of the metals or alloys to a welding or soldering state, and afterward pressing the same, while hot, to perfect the welding or soldering and to lock the disseminated lubricant or lubricants or unctuous substance or substances within the mass, and to give the mass solidity, compactness, and shape, substantially as specified.

5. The method herein described of making an anti-friction solidified material or compound or journal or other bearing, which consists in first grinding, granulating, pulverizing, or otherwise dividing into particles one or more metals or alloys or one or more metals with one or more alloys jointly with or without the addition of a suitable flux or fluxes, coating one or more of said metals and alloys with tin or other metal or Babbitt metal or other alloy, then adding one or more lubricants or unctuous substance or substances, then subjecting the whole to heat sufficient to bring some of the metals or alloys or the coating thereof to a welding or soldering state, and afterward pressing the same, while hot, to perfect the welding or soldering and to lock the disseminated lubricant or lubricants or unctuous substance or substances within the mass, and to give the mass solidity, compactness, and shape, substantially as set forth.

6. The method herein described of lining journal or other bearings, which consists in placing a bearing-shell (the inside of which may be coated with tin or other metal or Babbitt metal or other alloy) in a die or mold, adding thereto ground, granulated, pulverized, or otherwise divided particles of one or more metals or one or more alloys or one or more metals with one or more alloys, some or all of which may be coated with tin or other metal or Babbitt metal or other alloy melting at lower degrees of temperature with or without the addition of one or more lubri-

cants or unctuous substances, also with or without the addition of a suitable flux or fluxes, then subjecting the whole to heat sufficient to bring some or all of the divided particles of metals or alloys or the coatings thereof, if coated, to a soldering or welding state, and afterward subjecting the mass to pressure, while hot, to perfect the welding or soldering, and to give the bearing solidity, compactness, and shape, substantially as set forth.

FERDINAND EUGENE CANDA.

Witnesses:

J. MIDDLETON,

SOLON C. KEMON.