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CORE COMPOUND

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9 Claims. (Cl. 22—188)

This invention relates to the making of sand cores in foundry work and has to do with a special oil compound for binding the sand particles together in baking the cores preparatory to placing in the molds for casting.

The objects of the invention are to provide a binder oil for the above purpose which will overcome the objections to other oils and compounds heretofore used in this work, and which will yield a firm core with less baking, also a more friable core after casting, one which is highly compressible to avoid cracking of castings in shrinking, also such an oil composition which will evolve but a relatively small amount of gas as compared to linseed and other oils previously used.

Before describing our special oil compound it would be well to state that of the various binders suggested for use in sand cores, linseed oil used pure and in various proportions mixed with other oils, also with soap, water, etc., have been largely used to incorporate thoroughly with the sand before baking the cores. However, numerous objections to these oils have been made, due to the fact that upon first applying heat to the cores in baking the same, the oily content of the sand becomes more fluid and settles toward the lower part of the core so that it no longer is evenly distributed throughout the mass, and after thus settling the core itself may sag, the baking is uneven with a result the core may be very uneven in its hardness and sometimes quite impervious over the oil-settled area so that gases formed in casting cannot escape with a result that much gas gets into the casting to greatly injure the same. Besides this, linseed oil especially when used alone, gives off great quantities of gas.

Also, when the molten metal is poured against such uneven cores it will burn in some places thus creating rough surfaces which require chipping and grinding, sometimes resulting in the loss of the casting.

Also, the over-hard cores are not sufficiently compressible to permit normal shrinking of the castings in cooling, particularly in aluminum casting where the shrinkage is very great and the metal frequently thin, so that in consequence the castings often split on account of the resistance offered to normal shrinking by the hard sand cores.

Another feature to be considered is the required mixing of water with the sand to get it in proper shape for molding, and that most of the oils used are highly repellant to water so that difficulty is encountered in getting an even mixture.

In experimenting to overcome the above noted and other objections to linseed oil mixtures as a core oil, we have discovered after practical trials of many different kinds of oils and oil compounds, that an oil which polymerizes and becomes hard upon the application of heat, instead of first softening and then hardening later by oxidation as with most oils, will yield a core of even texture and with no tendency to sag in the oven.

Following up this thought we finally evolved a water-miscible oil compound or emulsion which, after thousands of tests in many foundries in the casting of all kinds of metals, has proven almost epochal in this art.

The complete formula is as follows:

Water, 40 fluid ounces
Triethanolamine, 8 fluid ounces
China-wood oil, 50 fluid ounces
Perilla oil, 10 fluid ounces
Mineral oil, 10 fluid ounces, sp. gr. of about 0.9272, 21 degrees Bé., the grade known as dark neutral oil gives good results.

Commercial triethanolamine consists of a mixture of pure triethanolamine $(C_2H_5)_3N$ with small amounts of diethanolamine $(C_2H_5)_2NH$, and monoethanolamine (C_2H_5) NH_2 and it has been found to give better results than the pure material. Other members of the amine group have been found of value in this connection.

The materials are mixed in the order given and triturated for a short while until the chemical action between the triethanolamine and the vegetable oils is completed and at which time a permanent emulsion of the ingredients is effected. Artificial heat is not required.

The proportions of the ingredients may be altered somewhat, and I have tried caustic soda in place of triethanolamine, but with inferior results. Also the mineral oil may be somewhat heavier or lighter.

The China-wood oil has the peculiar property of hardening upon application of heat without first softening, when in the combination of ingredients given, and in the proportions used in sand core making, instead of first becoming more fluid as it would in common with oils generally if used plain.

The perilla oil increases the binding properties of the compound, and the mineral oil contributes to a certain flexibility.

The special oil emulsion is mixed with the sand

in proportions of from about 1 part of oil to 10 parts of sand, all the way to about 80 parts of sand, depending on the nature of the sand as well as the weight of the core to be supported, and under all conditions will always yield an even porous core. Water in any quantity may be added either before or after adding the compound and will be found to mix readily.

Baking of cores made with this oil may be carried out at from 250 to 300 degrees F. as against a temperature of about 400° or more required with linseed oil sand cores. Time required for baking is about half or two-thirds that required with linseed oil.

In the baking process our oil polymerizes and solidifies at once and does not migrate or soften to cause the cores to sag and lose shape and true dimensions.

Cereal binders may also be added and will be found to mix readily, when desired to produce unusually hard cores for any special purpose.

Cores made with our core oil produce practically no gas when the molten metal is poured in the mold, whether it be steel, grey-iron, malleable-iron, brass, aluminum, or the non-ferrous metals, and therefore reduces to practically nil the losses in castings due to blow holes created by the generation of gas from the cores. In cases where venting is practically impossible such molds can be poured with safety due to the fact that our core oil produces practically no gas.

On the contrary, linseed oil and the like oil binders, cereal and dextrine binders, are known to generate a large amount of gas in the mold making it nearly impossible to pour successfully such molds as can not be sufficiently vented to prevent "blows" caused by the accumulation of gas from the cores. But even under normal conditions the loss suffered in castings from gas generated by linseed oil and all the other core binders is a serious matter.

We believe this oil also represents an important step to improve the hygienic conditions in the foundry, due to the elimination of the heavy smoke and fumes which accompany the emission of the gases from the molds generated by the cores made of linseed oil and other core binders which irritate the eyes and lungs of the operator, by polluting the atmosphere in the foundry during pouring time and at the baking ovens.

After the mold has been poured the cores in the casting made with our core oil binder can be very easily removed because the cores collapse and the sand runs freely from the casting leaving same clean and smooth.

In reference to our appended claims, where we specify a non-volatile mineral oil, we include the heavier as well as the lighter lubricating oils which are not driven off by heat of baking the cores as would be the case with kerosene oil. Also, in specifying triethanolamine in the claims we include mono and diethanolamine either mixed or singly, though the commercial product containing all three has been found preferable.

Our copending application filed under Serial No. 733,880 on July 5, 1934, contains claims to the soda species of our invention disclosed but not claimed herein; also claims broadly the water miscible China-wood oil aqueous emulsion forming the body of our core-oil compound.

We claim:—

1. A binding agent for foundry sand cores comprising water, triethanolamine, China-wood oil, and mineral oil.

2. A binding agent for foundry sand cores comprising water, triethanolamine, China-wood oil, perilla oil and mineral oil.

3. A binding agent for foundry sand cores comprising water about 40 parts, triethanolamine about 8 parts, China-wood oil about 50 parts, and mineral oil about 10 parts.

4. A binding agent for foundry sand cores comprising water about 40 parts, triethanolamine about 8 parts, China-wood oil about 50 parts, perilla oil about 10 parts, and mineral oil about 10 parts.

5. A binding agent for foundry sand cores comprising an emulsion containing water, China-wood oil, and an agent adapted to form amines with a portion of said oil.

6. A binding agent for foundry sand cores comprising water, triethanolamine, and China-wood oil.

7. A sand core binder composed of an intimate mixture of China-wood oil, mineral lubricating oil and water, in combination with an agent causing solidification of the oil substantially without preceding increased fluidity upon the application of heat to the core.

8. A binding compound for foundry sand cores comprising water, China-wood oil, a non-volatile mineral oil, and an emulsifying agent.

9. A core-oil binding compound for foundry sand cores comprising water, China-wood oil, perilla oil, and an emulsifying agent.

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