UNITED STATES PATENT OFFICE.

FREDERICK C. STANLEY, OF BRIDGEPORT, CONNECTICUT, ASSIGNOR TO RAYBESTOS COMPANY, OF BRIDGEPORT, CONNECTICUT, A CORPORATION OF CONNECTICUT.

PROCESS OF MAKING CLUTCH RINGS FOR MOTOR CARS.

1,420,883. Specification of Letters Patent. Patented June 27, 1922.

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To all whom it may concern:

Be it known that I, FREDERICK C. STANLEY, a citizen of the United States, residing in the city of Bridgeport, county of Fairfield, in the State of Connecticut, have invented certain new and useful Improvements in and Processes of Making Clutch Rings for Motor Cars, of which the following is a specification.

This invention relates to improvements in clutch rings for motor cars or the like and process in making same, and is in part a continuation of an earlier application filed by me, Serial No. 325,911, now pending in the United States Patent Office.

The method hereinafter described, as has been demonstrated, is highly desirable in the commercial manufacture of clutch rings, and produces a product which not only has the desired tensile strength and the Brinell hardness and necessary co-efficient of friction, but results in the formation of rings of a very uniform character when manufactured in large quantities.

The process is carried out as follows:

I first make a pulp out of what is known as double-X asbestos fibre which is determined by grading. For example, I take the asbestos from the run of the mine and screen and weigh it, causing it to pass through a plurality of agitated screens, as for example, screens having half-inch mesh, quarter-inch mesh and one-sixteenths inch mesh. The following formula has been found highly desirable in the screening operation, in which ten ounces will pass the screen having the largest openings referred to, four ounces the second screen and be retained in the third, and two ounces pass through the smallest screen, towit, that having the one-sixteenth inch mesh. This is what I call the double-X asbestos fibre, and 2,000 pounds of this may be mixed with 2,000 pounds of scrap from the cuttings of double-X to which may be added 80 pounds of starch and 40 pounds of sulphite paper fibre. This pulp is then formed into sheets in a wet board machine, and then put in presses to remove part of the water. The sheets are then taken to a steam drier where they are dried to a temperature of from 180 to 220 F., to substantially remove all their water. They are then weighed for thickness in order to ascertain whether or not they are of the proper size, and are then rolled under pressure to get a more compact sheet of more uniform thickness. The rings are then cut out of the sheet, and the scrap may then be re-used for making new sheets.

The rings are then measured to micrometer size for thickness and particularly to eliminate any undersize rings. These rings may be from $\frac{1}{16}$ths to $\frac{5}{8}$ths of an inch thick. They are then put on steel rods, say for example, rods of some circular form, several hundred to a rod, and these mounted on a travelling carriage, and the rods containing the rings dipped into a saturating bath for say five minutes. This saturating bath may consist of 75% of linseed oil and 25% of toluol, the mixture having a gravity of 22 degrees Braumé at 70 degrees F. The linseed oil may be double-boiled linseed oil, having an iodine number of 175 to 180, while the toluol is known as chemically pure, having an end point of say 240 degrees F. To this is added 1% by weight of resinate of lead. The resinate of lead may be added to the linseed oil when the oil is heated to say 300 degrees F., there being say 99 parts of the oil to one part of the resinate, and this mixture is then added in proportions of 75 parts to toluol in proportion of 25 parts. It may be necessary to intermittently add either to the vehicle or the oil so as to keep the Baumé of the mixture approximately constant.

After this five minutes of saturation is completed, the bath being at say 70 degrees F., the rings are removed and allowed to drip for a few minutes to allow the excess saturant to fall back into the tank. The forms containing the rings are then removed from the carriage and allowed to stand and dry in the air from six to ten hours. They are then put into a closed oven and cured at 250 degrees F. to 300 degrees F. for five hours. They are then taken out of the oven and resaturated in the same solution for ten minutes, and the excess allowed to drip back into the tank as before. The carriers containing the rings are then removed and the rings allowed to dry for twenty-four hours, although they may be dried in a shorter time. They are then rebaked at 320 degrees F. for twenty-four hours in the oven as before. While still hot, the rings are

removed from the oven and subjected to pressure. This pressure may be applied as follows: The hot rings while still at a temperature of 200 degrees F. or more are placed on a rod in a screw-press and subjected to endwise pressure of say several tons. The rings are then removed from the press and have their inside and outside edges brushed with, for example, steel wire brushes to clean them and remove any ragged edges. They are then, if it is desirable, drilled for rivet holes. The rings are then surfaced with a suitable sander, as for example, emery cloth, and are then ready for use.

Where the rings are made in large quantities each batch should have samples tested for tensile strength and Brinell hardness. Rings made in this manner, as for example, a ring of $\frac{3}{16}$ths of an inch in thickness and of 7 inches internal diameter, might have a Brinell hardness of from 18 to 22 and a tensile strength between three and six thousand pounds per square inch. Rings made in this manner will withstand the action of a slipping clutch of a motor car revolving at the rate of 825 revolutions per minute with 125 pounds torque for a period of at least five minutes before breaking down.

I claim as my invention:

1. A process of making clutch rings consisting in forming asbestos sheets from asbestos stock of predetermined character, cutting out the rings from the stock, pressing them to desired size, subjecting them to a saturating bath of a drying oil contained in a volatile hydrocarbon vehicle and an oxidizing agent, maintaining the saturant at a predetermined gravity, permitting the rings to stay in such a saturant a sufficient length of time to permit of complete saturation, removing the rings and permitting them to dry, then subjecting the rings to a closed oven baking for a predetermined length of time, subjecting the rings to a second saturation in a similar bath and for a period of time sufficient to substantially completely saturate the ring, removing the rings and drying them and then subjecting them to a second baking, and then subjecting the rings to a mechanical finishing operation.

2. A process of making clutch rings consisting in forming asbestos sheets from asbestos stock of predetermined character, cutting out the rings from the stock, pressing them to desired size, subjecting them to a saturating bath of a drying oil contained in a volatile hydrocarbon vehicle, maintaining the saturant at a predetermined gravity, permitting the rings to stay in such a saturant a sufficient length of time to permit of complete saturation, removing the rings and permitting them to dry, then subjecting the rings to a closed oven baking for a predetermined length of time, subjecting the rings to a second saturation in a similar bath and for a period of time sufficient to substantially completely saturate the ring, removing the rings and drying them and then subjecting them to a second baking, and then subjecting the rings to a mechanical finishing operation.

3. A process of making clutch rings consisting in forming the rings from sheeted asbestos stock, subjecting the rings to saturation in a bath of a drying oil, a volatile hydro-carbon vehicle and an oxidizing agent soluble in the drying oil, and then subjecting the saturated rings to a baking action at an elevated temperature sufficient to harden the rings and give them a predetermined tensile strength.

4. A process of making friction facings, consisting of forming an unwoven felted sheet substantially from asbestos fibre; drying said sheet and cutting it into facing members of the desired shape; saturating said facings in a solution of a binder, containing drying oil contained in a vehicle of a cyclic ring hydrocarbon, in which is also dissolved an oxidizing agent soluble in oil; removing the facings from the saturating solution and subjecting them to a baking operation, and continuing such operation until the binder has been effectively oxidized.

5. A process of making friction facings, consisting of forming an unwoven felted sheet substantially from asbestos fibre; drying said sheet and cutting it into facing members of the desired shape; saturating said facings in a solution of an oxidizable binder contained in a vehicle of a cyclic ring hydrocarbon, in which is also dissolved an oxidizing agent; removing the facings from the saturating solution and subjecting them to a baking operation, and continuing such operation until the binder has been effectively oxidized.

6. A process of making friction facings, consisting of forming an unwoven felted sheet substantially from asbestos fibre; drying said sheet and cutting it into facing members of the desired shape; saturating said facings in a solution of a binder contained in a vehicle of a cyclic ring hydrocarbon, in which is also dissolved an oxidizing agent; removing the facings from the saturating solution and subjecting them to a baking operation, and continuing such operation until the binder has been effectively oxidized.

7. A process of making friction facings, consisting of forming an unwoven felted sheet substantially from asbestos fibre; drying said sheet and cutting it into facing members of the desired shape; saturating said facings in a solution of a binder contained in a vehicle of a cyclic ring hydrocarbon, in which is also dissolved an oxidizing agent soluble in oil; removing the facings from the saturating solution and sub-

jecting them to a baking operation, and continuing such operation until the binder has been effectively oxidized.

8. A process of making friction facings, consisting of forming an unwoven felted sheet substantially from asbestos fibre; drying said sheet and cutting it into facing members of the desired shape; saturating said facings in a solution of a binder contained in a vehicle of a cyclic ring hydrocarbon, in which is also dissolved an oxidizing agent soluble in oil; removing the facings from the saturating solution and subjecting them to a baking operation, and continuing such operation until the binder has been effectively oxidized.

9. The process of making friction facings, comprising forming a fibrous sheet, in saturating the material forming the sheet in a solution of an oxidizable binder contained in a cyclic ring hydrocarbon which has dissolved therein an oxidizing agent, in removing the material from the saturating solution, and in subjecting the same to a heat treatment to oxidize the binder therein.

10. The process of making friction facings, consisting in forming an unwoven felted sheet from asbestos fibre, in cutting the sheet into facings, in saturating the facings in a binder of oil contained in toluol having dissolved therein an oxidizing agent soluble in oil and in then subjecting the facings to the heat treatment to oxidize the binder.

11. The process of making friction facings consisting in forming an unwoven felted sheet from asbestos fibre, forming facing blanks from the sheet, in saturating the facings in a binder of oxidizable oil contained in a volatile vehicle, and having dissolved therein an oxidizing agent, and in then subjecting the facings to heat treatment to oxidize the binder.

FREDERICK C. STANLEY.