

C. A. WARN AND O. B. NORGREN.
CENTRIFUGAL METAL LINING MACHINE.
APPLICATION FILED APR. 26, 1920.

1,433,763.

Patented Oct. 31, 1922.
2 SHEETS—SHEET 1.

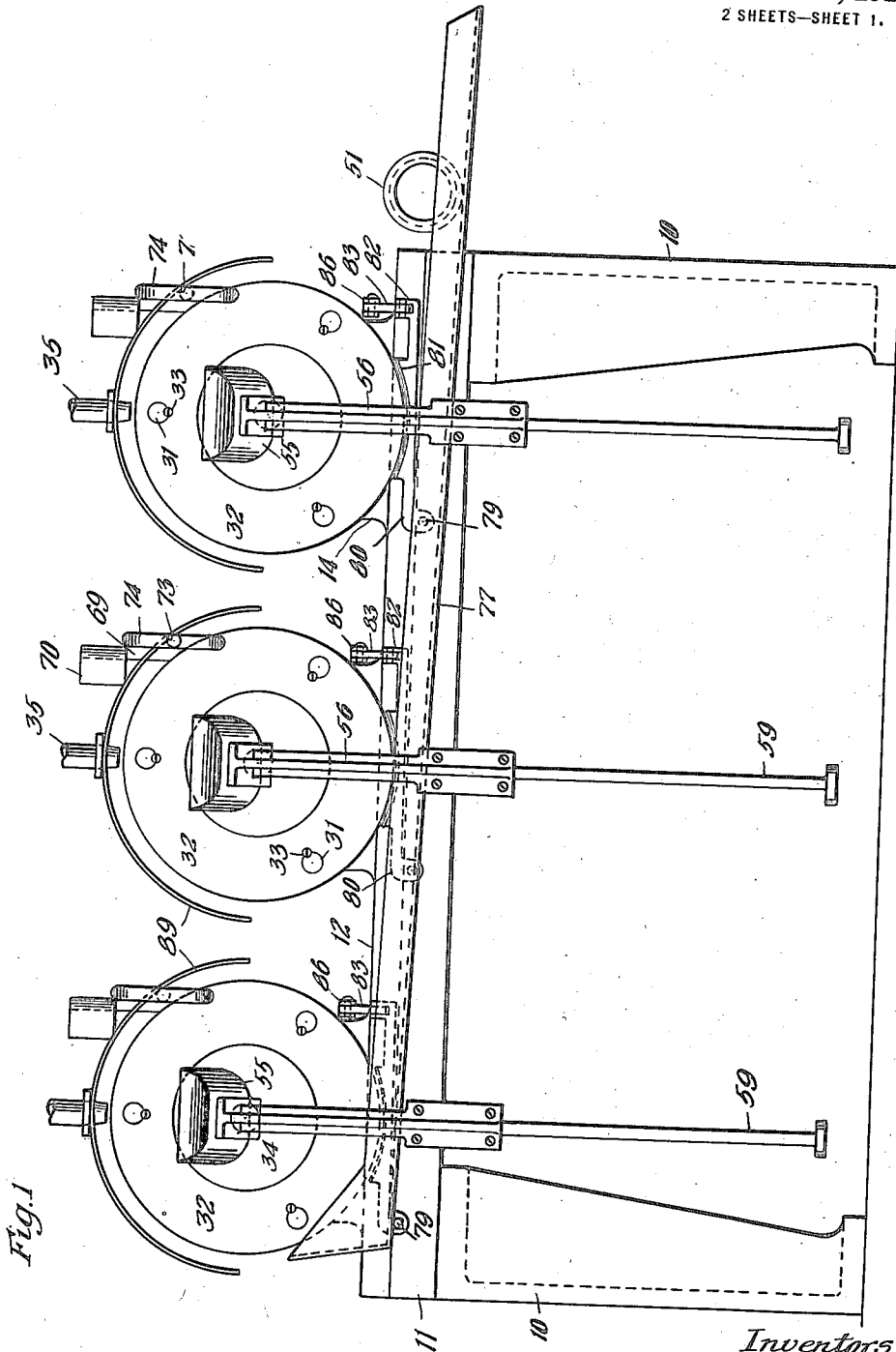


Fig. 1

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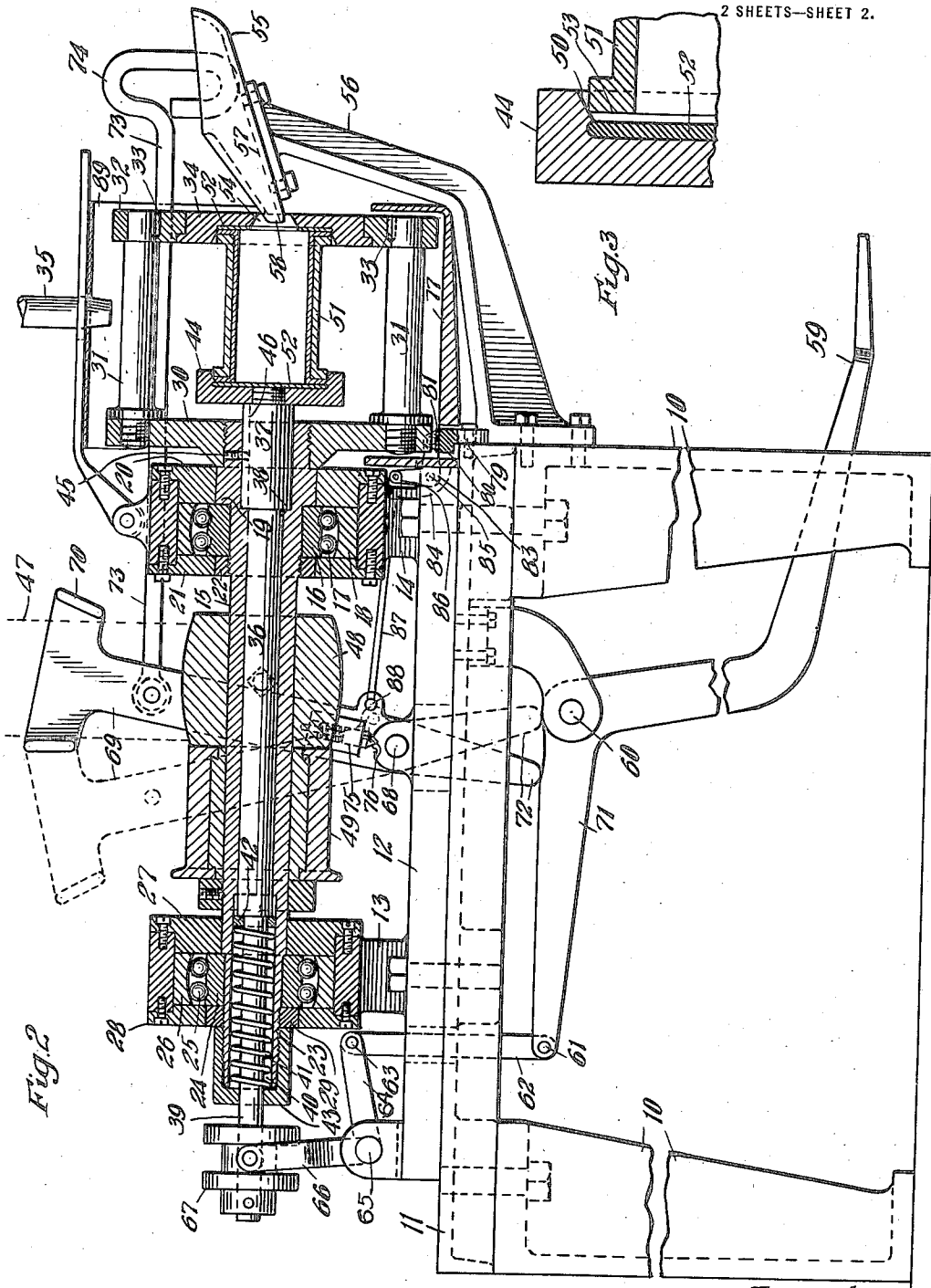


Fig. 2

Fig. 3

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UNITED STATES PATENT OFFICE.

CARL A. WARN AND OSCAR B. NORNGREN, OF CHICAGO, ILLINOIS, ASSIGNORS TO IDEAL TOOL & MFG. COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

CENTRIFUGAL METAL-LINING MACHINE.

Application filed April 26, 1920. Serial No. 376,578.

To all whom it may concern:

Be it known that we, CARL A. WARN and OSCAR B. NORNGREN, citizens of the United States, residing at Chicago, Cook County, Illinois, have invented a certain new and useful Improvement in Centrifugal Metal-Lining Machines, of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

This invention relates to improvements in centrifugal metal lining machines.

As is well known, there has been a constantly increasing demand for a cheap and efficient method of lining bushings or other similar articles with Babbitt metal and without the necessity of employing the usual molding methods. This demand has been greatly increased because of the rapid growth of the automobile industry where numerous babbitted bushings are required for the various shafts used on each automobile.

The object of our invention is to provide a machine for applying metal linings to the interiors of hollow articles, such as bushings, by means of centrifugal action to thereby obtain uniformity of distribution and at high speed.

More specifically, the object of our invention is to provide a machine for rapidly, uniformly and economically applying a relatively thin lining of babbitt to the interiors and ends of hollow articles such as bushings by centrifugal action.

Still another object of our invention is to provide a machine for the purpose above indicated wherein safety devices are employed to eliminate possibility of injury to the operators which might result from the articles being thrown out centrifugally when released inadvertently.

Other objects of our invention will more clearly appear from the description and claims hereinafter following.

In the drawings forming a part of this specification, Figure 1 is an end elevation of a three-spindle machine embodying our improvements. Figure 2 is a vertical sectional view taken longitudinally of one of the spindles in a plane coinciding with the axis of the spindle. In Figure 2, parts are shown in elevation, such as the framework, bed plate releasing mechanism, etc., and dotted positions of certain of the parts are

also indicated to more clearly illustrate the safety device employed. And Figure 3 is an enlarged detail section of one of the chucking plates to more clearly illustrate the manner of clamping the articles being lined and the method used in automatically centering the same in the chucks.

In said drawings, 10 denotes a suitable framework upon which the various movable parts of the machine may be mounted, said framework having a bed plate 11 at the top thereof to which the legs may be bolted and other parts applied. In the machine illustrated, three spindles are shown since this has been found the most advantageous arrangement, as it permits the operator to work at the different spindles successively with just sufficient time to permit the chucking of an article in one spindle and the supplying of the necessary measured amount of molten babbitt, the spreading of the babbitt and the cooling thereof, without loss in any operation. Inasmuch as all spindle arrangements are the same, it will only be necessary to describe one of them in detail.

As shown, each spindle arrangement employs the following structure. Extending upwardly from an auxiliary bed plate 12 are two bearing brackets or standards 13 and 14. Mounted in these bearing brackets is a chuck spindle 15, hereinafter described in detail. Said spindle carries at its front end within the bracket 14 a ball race bushing 16 with which cooperate anti-friction balls 17, the outer race plate being indicated at 18. The spindle is shouldered as indicated at 19 to limit its movement to the left, as viewed in Figure 2 and the anti-friction bearing and spindle are held in place by detachable plates 20 and 21 screwed or bolted to the bracket 14. A lock washer 22 is screwed to the spindle 15 to prevent outward movement of the spindle. At the rear end of the machine, that is, the lefthand end as viewed in Figure 2, the spindle 15 is reduced in diameter as indicated at 23 and is provided with a ball race bushing 24 with which cooperates another series of anti-friction balls 25, the corresponding outer ball race bushing being indicated at 26. Detachable plates 27 and 28 are screwed or bolted to the bracket 13 to confine the anti-friction bearing, as will be clear from an inspection of Figure 2. A similar lock washer 29 is screwed on the spindle to prevent movement

of the spindle to the right as will be understood.

The spindle 15, at its righthand or front end, has rigidly applied thereon, preferably by means of threads, a plate 30, the latter having screwed thereinto a plurality of spacing rods 31—31. To the outer ends of the spacing rods 31 is secured another relatively heavy plate 32, the latter being detachably secured to the rods 31 by machine screws or other suitable devices 33. The plate 32 is of annular form and has secured thereto in the central opening, a second or chucking plate 34. With the construction described, it is evident that the plates 30, 32 and 34 rotate in unison and, with the exception of the spacing rods 31, will have an open space therebetween to permit a blast of compressed air from an air supply pipe 25 to be directed upon the work, as hereinafter described.

The spindle 15 has a longitudinally extending central bore therein within which is mounted an auxiliary spindle 36. The latter is of largest diameter at its righthand end, as viewed in Figure 2 and as indicated at 37, thus providing an annular shoulder as indicated at 38. At its lefthand end, as viewed in Figure 2, the auxiliary spindle 36 is of reduced diameter as indicated at 39 and the bore in the main spindle 15, at its lefthand end, as viewed in Figure 2, is slightly enlarged as indicated at 40 so as to accommodate a coil spring 41. One end of said spring 41 bears against a washer 42 mounted on the section 39 of the auxiliary spindle and the other end of said spring bears against a cap 43 which is screwed on to the main spindle 15.

The auxiliary spindle 36 extends through the plate 30 and at its righthand end, as viewed in Figure 2, has secured thereto a chucking plate 44. The auxiliary spindle 36 is compelled to rotate in unison with the main spindle 15 by any suitable means such as the screw 45 carried by the main spindle and which extends into a longitudinally extending groove 46 in the auxiliary spindle 36 and by which arrangement it is evident that the auxiliary spindle 36 is permitted an axial movement relative to the main spindle 15. Rotation to the spindles is imparted by any suitable means, preferably by a belt indicated by dotted lines at 47 which is adapted to take over a fast pulley 48. A loose pulley on the spindle 15 is also provided as indicated at 49.

To facilitate the chucking of the bushings to be babbitted, the following arrangement is preferably employed. Each chucking plate proper, 34 and 44, is provided on its inner face with a conical recess 50, the maximum diameter of which is greater than the diameter of the adjacent part of the bushing 51 and the minimum diameter of which is

less than the diameter of the end of the bushing 51. At the bottom of each conical recess 50, we preferably employ an asbestos lining 52. With this construction, it is evident that the bushings 51 will be automatically centered at its ends in the conical recesses 50 and also that a small space will be left between the end faces 53 of the bushing and the asbestos lining 52 so that the molten babbitt may flow into this space thus left and line the ends of the bushing. The outer chucking plate proper 34 has a central opening as indicated at 54 and the adjacent asbestos lining 52 is similarly cut away in order to permit the introduction of the molten material, as hereinafter described.

In connection with each spindle of the machine, there is provided a container or receptacle 55 open at the top, the same being secured to a suitable bracket 56 attached to the framework of the machine. Said container has a sloping bottom as indicated at 57 and a discharge mouth or spout 58 which extends partly into the opening 54 and at such an angle as to properly deliver the molten metal to the interior of the bushing and near the outer end of the latter. As will be understood, the receptacle 55 is made large enough so as to easily accommodate a predetermined or measured amount of the babbitt required for the bushing.

The actual chucking or clamping of the bushing and release thereof are effected by the following means. For each spindle there is provided a foot treadle 59 pivoted as indicated at 60 to a suitable bracket on the framework, the upper end of the treadle 59 being pivotally connected at 61 to a vertically extending link 62. The upper end of the link 62 is pivotally connected at 63 to one arm of a bell crank 64 which is pivoted as indicated at 65 to suitable lugs on the auxiliary bed plate. The other arm 66 of the bell crank is preferably forked and acts as a shipper lever in connection with an annularly grooved bushing 67 secured to the end of the auxiliary spindle 36. By depressing the foot treadle 59, it is evident that the auxiliary spindle 36 will be retracted, that is, moved toward the left as indicated in Figure 2, and against the action of the spring 41. When the foot treadle 59 is not held, the spring 41 will automatically return the auxiliary plate 36 to its operative position. As will be apparent, the operator might be seriously injured if he inadvertently retracted the auxiliary spindle 36 while the chuck was being rotated with the article therein and in order to avoid this possibility, we employ the following arrangement. Pivottally supported on the auxiliary bed plate of the machine as indicated at 68 is a shifting lever 69, the upper end of which is suitably formed as indicated at 70 to engage the belt and shift it from one pulley to the other.

The lower end of the lever 69 is extended downwardly in line with the arm 71 of the treadle 59. The position indicated by full lines in Figure 2 is that where the pulley 5 is on the driving or fast pulley and it will be noted that the lower end 72 of the lever 69 engages the section 71 of the foot treadle to one side of the pivot 60 and in such manner as to prevent the foot treadle being displaced. The dotted line position of the lever 69, that is, when the belt is running over the loose pulley, shows that the end 72 is substantially in line with the pivot 60 of the treadle and consequently there will be no interference with the depression thereof. To operate the belt shifting lever 69, any suitable means may be employed such as the rod 73 having the handle 74 at its outer end. With this arrangement, it is evident that the auxiliary spindle 36 cannot be retracted so long as the belt is running over the fast or driving pulley 48. To hold the lever 69 in either of its positions, a spring-pressed latch 75 may be employed adapted to cooperate with suitable notches 76 in lugs provided on the auxiliary bed plate.

It is desirable that the chuck be positively stopped immediately upon throwing off the belt and to this end we have provided a friction brake constructed as follows, there being one for each spindle of the machine. Pivotaly attached to any suitable part of the framework as indicated at 79 is a lever 80 having a friction pad 81 thereon adapted to cooperate with the periphery of the chuck plate 30. At its free end, the lever 80 has secured thereto a clevis 82 to which is pivotaly connected one end of a bell crank 83. The bell crank is pivoted to the bed plate of the machine in a suitable slot 84 as indicated at 85. The other arm of the bell crank has pivotaly connected thereto a clevis 86 into which is adjustably threaded a connecting rod 87, the opposite end of said rod being pivotaly attached to the shipper lever 69 as indicated at 88. With the construction described, it is evident that when the shipper lever is moved to throw the belt off from the fast pulley, the friction pad will be drawn up into engagement with the chuck plate 30 and thereby stop further rotation in sufficient time to permit the operator to depress the treadle without danger of injury. A hood 89 may also be employed at each spindle as an additional safeguard.

It will be noted that the plates 44 and 34 are both removable and interchangeable with other plates so that the machine is adapted to handle bushings of varying diameters and of varying lengths merely by changing the size of the recesses 50 and by changing the effective thickness or distance apart of the plates 34 and 44.

The operation is as follows. The bushings to be lined are first tinned, preferably by dipping, before being lined. The operator then takes the tinned bushings and chucks one of them in one end spindle, preferably the lefthand end, as viewed in Figure 1. A measured amount of molten material is then dumped into the corresponding receptacle 55 and the material or babbitt will flow into the then swiftly rotating bushing. In actual practice, we rotate the chuck at approximately 1900 R. P. M. as this has been found to give satisfactory results. As the molten babbitt flows to the interior of the bushing, centrifugal action causes it to spread longitudinally of the bushing and simultaneously radially, the metal always seeking to spread itself in a uniform film. The babbitt not only flows along the interior of the bushing but will also flow into the spaces between the end faces of the bushing and the asbestos linings so as to form a babbitted facing on the ends of the bushing. In actual practice the lining will be poured so as to result in a thickness of about $\frac{3}{32}$ of an inch and this will subsequently be bored to approximately $\frac{3}{64}$ of an inch thickness. After chucking and supplying the babbitt for one spindle, the operator proceeds to the next spindle and repeats the operation, as will be understood. After all of the babbitt has run out from the receptacle to the interior of the bushing, the latter is allowed to continue rotation for a short time and the air blast, which is directed on to the exterior of the bushing, hastens the cooling action. When the babbitt has sufficiently hardened, the operator shifts the belt which simultaneously causes the brake band to come into operation, and finally operates the treadle so as to release the bushing and permit it to roll down the runway 77.

We have herein shown and described our machine as especially adapted for the lining of bushings with babbitt but it will be understood that our invention is not limited to this specific construction or use and all modifications and variations are contemplated as come within the scope of the claims appended hereto.

We claim:

1. In a machine having a framework, the combination with power driven devices for releasably holding and rotating an article; of mechanism for effecting release of the article from said holding devices; means for rendering either effective or ineffective, the application of power to said devices; and cooperating means associated with said first named means and with said mechanism for preventing operation of the latter while said devices are being driven by power.

2. In a machine having a suitable framework and a rotatable chuck thereon; of fast and loose belt pulleys associated with said

chuck; a belt shifter; and manually operable chuck-releasing mechanism including, a foot treadle, said belt shifter having a portion thereof arranged to engage and prevent operation of said treadle when the belt shifter is in position corresponding to the belt on the fast pulley, said treadle being freely operable when the belt shifter is in its other position corresponding to the belt on the loose pulley.

3. In a machine of the character described, the combination with a chuck including two opposed positively simultaneously driven plates, one of said plates being centrally apertured and both provided with conical recesses within which is adapted to be clamped and centered a bushing or the like, each of said conical recesses having a maximum diameter greater than and a minimum diameter less than the diameter of the corresponding end of the bushing whereby to leave a space between the end of the bushing and the bottom of said recess, said aperture being of appreciably less diameter than the interior diameter of the finished product; means for yieldingly pressing one of said plates toward the other to clamp a bushing therebetween and thereby allow for variations in bushing lengths; manually operable mechanism for moving said yieldingly pressed plate away from the other plate to release the bushing; and a receptacle for material in a liquid form, such as babbitt metal, located adjacent said plate with the central aperture, said receptacle having a discharge mouth extending within said aperture and arranged to deliver the molten material to the interior of the bushing or the like.

4. The combination with a chuck including inner and outer opposed positively simultaneously driven plates, the inner plate being axially adjustable and the outer plate axially immovable, said outer plate having a central aperture, said plates both being provided with conical recesses within which is adapted to be clamped and centered, a bushing or the like, each of said conical recesses having a maximum diameter greater than, and a minimum diameter less than the diameter of the corresponding end of the bushing, whereby to leave a space between the end of the bushing and the bottom of said recess, said aperture being of appreci-

ably less diameter than the interior diameter of the finished product; manually operable mechanism connected to one of said plates and adapted to move it away from the other; a receptacle for material in liquid form located on the outer side of said outer plate and having a discharge mouth extending within said aperture, arranged to deliver the molten material through said aperture to the interior of the bushing; and a supporting bracket fixed to said framework and upon which said receptacle is secured.

5. In a machine of the character described, the combination with a support; of a rotary carrier mounted on said support and held against longitudinal movement relative thereto; a pair of opposed clamping plates detachably mounted within the carrier and rotated therewith, one of said plates being movable longitudinally relatively to the other plate, and said last named plate being provided with an opening to admit molten metal; means for reciprocating said movable plate to clamp between the said plates a bushing to be lined; and a receptacle fixedly mounted on said support adjacent said plate with the opening, said receptacle having a discharge mouth extending within said opening and arranged to deliver molten material to the interior of the bushing.

6. In a machine having a framework, the combination with power driven devices for releasably holding and rotating an article; of mechanism for effecting release of the article from said holding devices; means for rendering either effective or ineffective, the application of power to said devices; cooperating means associated with said first named means and with said mechanism for preventing operation of the latter while said devices are being driven by power; and means controlled by said first named means for preventing rotation of said devices when not driven by power.

In witness that we claim the foregoing, we have hereunto subscribed our names this 9th day of April, 1920.

CARL A. WARN.
OSCAR B. NORNGREN.

Witnesses:

CARRIE GAILING,
UNA C. PERIN.