PRECISION FINISH

WITH *Timesaver*

NON-IMBEDDING
LAPPING
COMPOUND

TIMESAVER PRODUCTS CO.

Precision Finish with Timesaver Non-Imbedding Lapping Compound

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Chicago

Foreword

This treatise is prepared for the express purpose of presenting to you, by means of accurate photo plates and comparative description, the qualities that are essential to obtain precision fits on all bearing surfaces.

The information contained in this booklet embodies the results of 40 years experience in research and practical application, in the field of non-charging abrasive compounds.

The Timesaver Products Company Incorporated was founded by its present owners in 1919 and up to the present time has continuously served leading manufacturers, the Army, Navy, and Air Force, and enjoys worldwide distribution of its abrasive products.

Timesaver (Precision Finish) Lapping Compound is an improved product and represents a recent development. The two new classes of abrasive compound, namely, grades for ferrous metals and grades for non-ferrous metals, may be identified by their colors of green and yellow respectively.

Precision Finish with
Timesaver Lapping Compound

Fewer subjects related to the design and construction of machinery are of greater importance than the problem of bearing lubrication and the reduction of friction and wear. The importance of this subject has been especially emphasized in recent years, during which it has been necessary for the manufacturers of mechanical devices to meet the demand for equipment capable of greater load capacity and of higher operating speeds.

Improved design and the advanced technique of machining surfaces has made it possible to reduce tolerances and permit closer fits between the various types of moving members of an assembled machine.

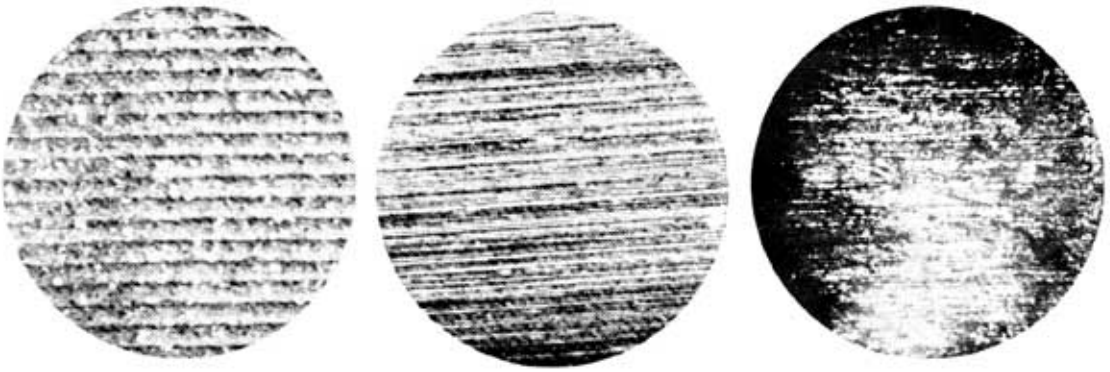
Even with the practice of modern technique and carefully controlled production, it is, nevertheless, impossible to hold sizes and surfaces to an exact measurement. Plus or minus tolerances result in varying fits between moving parts. Bearing surfaces differ due to tooling technique and the technician.

To endure higher operating speeds and greater load capacity, the contact surfaces must possess the necessary properties to promote ideal lubrication and free movement of parts under all operating conditions.

This can only be accomplished when the bearing surface is free from mechanical imperfections. Too much or insufficient clearance between parts, misalignment of parts due to improper fabrication or assembly, ridges and grooves caused by tool bits, reamers, grinding wheels, etc., prevent the formation of a uniform film of oil, the lack of which causes metal-to-metal contact. When metal-to-metal contact takes place, excessive friction is the immediate result. This is followed by increased internal temperatures, irregular expansions, contractions and distortions, scuffing, seizure and destruction of the bearing surface and the subsequent costly replacement of parts.

Micro photographs of various metals finished by the methods indicated:

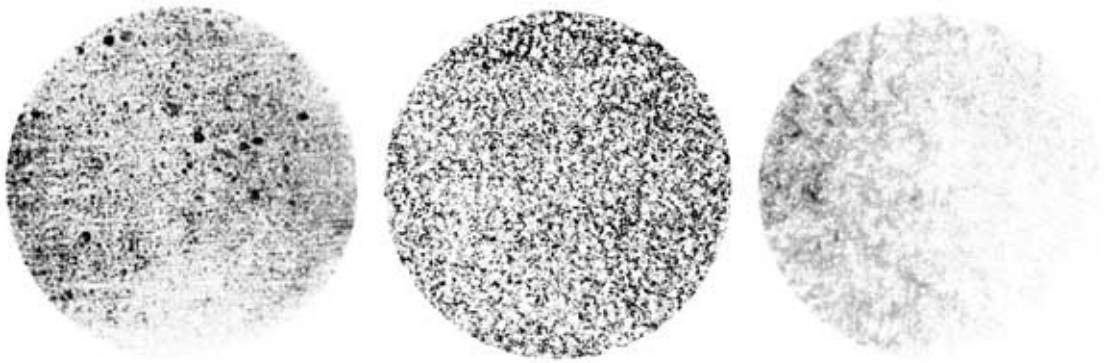
Magnified 15 Times



Machined Cast Iron | Ground Steel | Reamed Bronze

Surfaces, as the above, cannot be properly lubricated as long as the roughness exists, hence, the "run-in" period. When wear finally eliminates the ridges and grooves, the clearance between parts is usually too great.

Magnified 100 Times



Cast Iron | Steel | Bronze

Precision Finish with
Timesaver Lapping Compound

Surfaces are microscopically smooth, the metal structure undisturbed, open pored and oil retaining.

To meet the demand for a simplified fitting method that is both scientific and practical, the Timesaver Products Company pioneered in this field by developing a **non-charging abrasive compound**. This compound was formulated expressly for the finishing and fitting of bearing contact surfaces and at present is recognized as a standard medium for this purpose.

Timesaver (Precision Finish) Lapping Compound is the latest development of the Timesaver Products Company. This new product embodies all of the features of the original compound and in addition has the following improved characteristics:

- Faster cutting action
- Will produce finer finishes
- Possesses the property of remaining in suspension for a longer period of time when mixed with oil

The application procedure is so simplified that an unskilled operator will readily obtain excellent results. From 80 to 90% bearing surfaces, with proper oil clearance, can quickly be obtained on babbitt, bronze, brass, and cast iron bearings. Gear noises due to slight misalignment of parts, tool marks, and other irregularities are quickly eliminated. Proper gear tooth contact on worm, spur, herringbone and helical assemblies and microscopically smooth surfaces are realized by the Timesaver fitting method.

Action of Timesaver Compound

The cutting action of Timesaver (Precision Finish) Lapping Compound is rapid at first and gradually diminishes as the abrasive particles disintegrate into inoperative material. The finishing action is such that surface irregularities and surplus metal is gently and quickly removed without disturbing the natural metal structure.

Properties

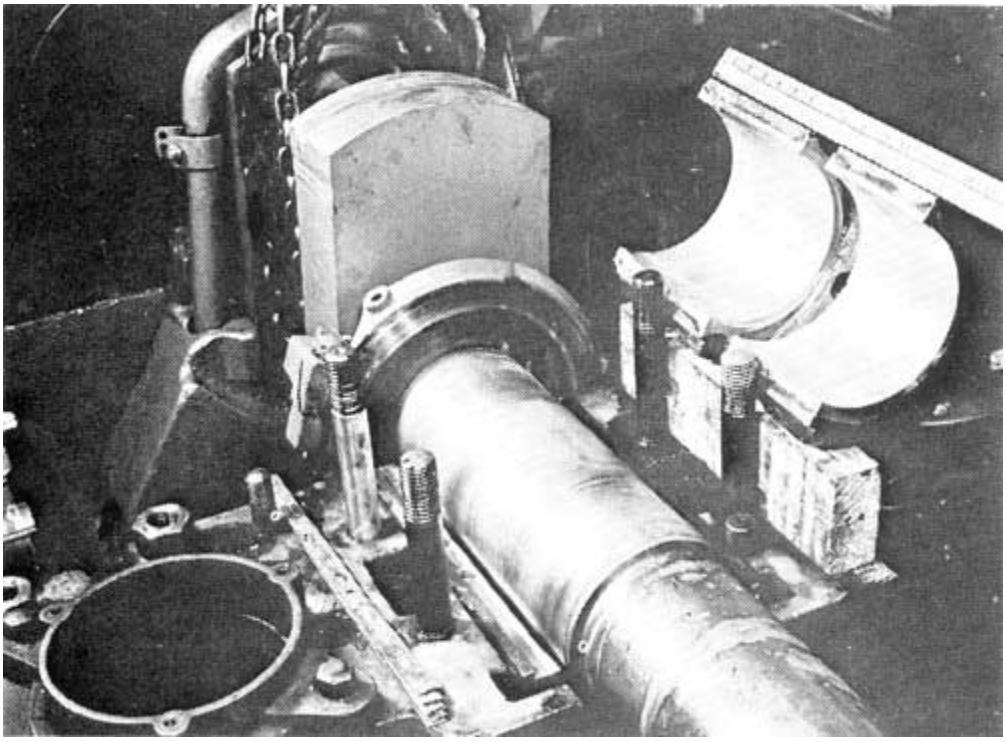
Timesaver Lapping Compound is manufactured expressly for the purpose of fitting and smoothing the bearing or contacting surfaces of either rotating, oscillating, or sliding parts of a mechanism. **The compound is produced in two general classes, namely grades for ferrous metals and grades for non-ferrous metals.**

Timesaver Lapping Compound does not contain emery, ground glass, silicon-carbide, aluminum oxide, or similar permanent charging abrasives. It will not charge into any metal surface or continue to cut.

To better describe the characteristics of Timesaver Lapping Compound, reference is made to the following excerpt from a report on tests made by the U.S. Navy Experimental Station, Annapolis, MD, Test No. 4387, Par. 18:

"Tests made of TIMESAVER Lapping Compound bear out the claims of the manufacturers that this compound does not imbed in the metal on which it is used, and that it quickly breaks down from an abrasive, first to a polishing compound and then further to inert material. These qualities allow its use where normally an abrasive could not be thought of, because particles of the ordinary abrasive could not be fully cleaned out of the machine, and might continue to grind or scratch when or where such action would not be desired."

Fairbanks-Morse Main Building



Timesaver Lapping Compound produced and ideal fit in one fifth of the time formerly consumed by hand scraping.

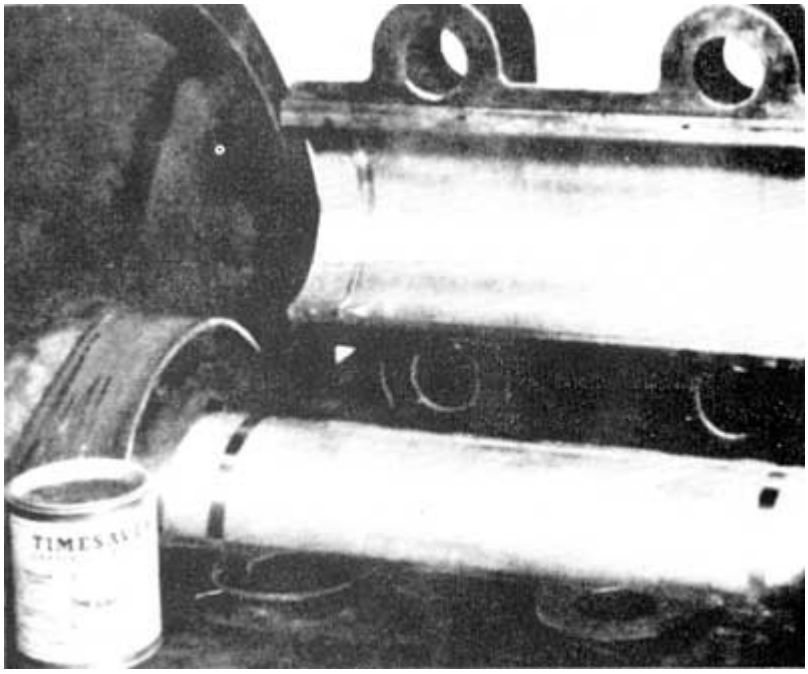
Application

Assembly lapping of parts with Timesaver Lapping Compound, regardless of shape, size, or the part involved, will result in:

- Precision fits
- Proper oil clearance
- Microscopically fine finish

The ultimate result is minimized friction, freedom of motion, and long wearing parts.

Gang Saw Main Bearing

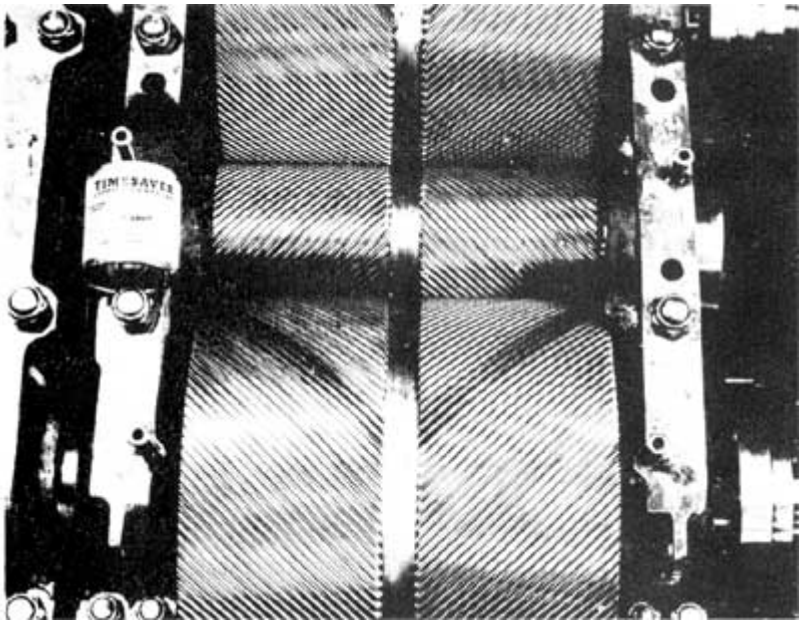


Hand scraping took six hours. It is now done with Timesaver in forty-five minutes.

Round Bearings

A bearing surface should be smooth and yet not glazed, and of exactly the same contour as that of the member it supports. Further, a specific clearance must exist between members to allow for the uniform maintenance of an oil film. The fitting process must be such as to preserve the natural qualities of the bearing alloy.

Yellow label grades of Timesaver Lapping Compound are especially suited for the precision fitting of all types of babbitt, bronze, and similar soft metal bearings. The lapping procedure is easily and economically accomplished and will yield perfectly fitting bearings with the proper oil clearance. Timesaver finished bearings have no high spots, consequently the necessity of a "run-in period" and the related dangers of scoring and over-heating are eliminated.

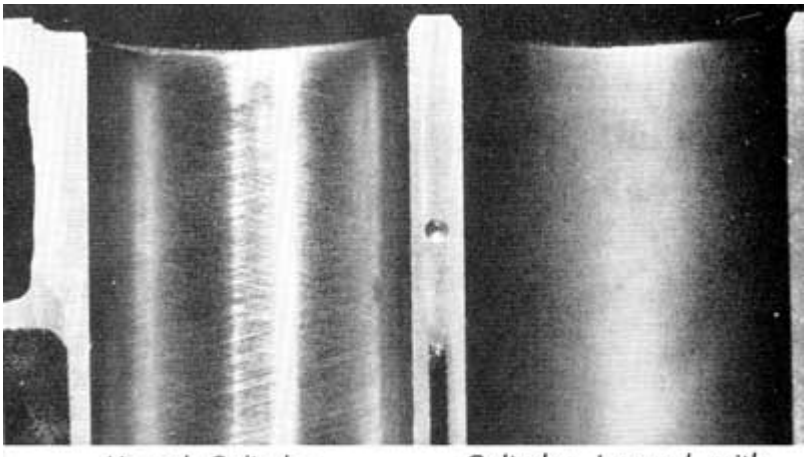


Many man-hours were saved by precision lapping of this marine speed reducer unit, in assembly, with Timesaver Lapping Compound. Assembly lapping compensates for slight alignment irregularities, effects perfect tooth contact and quiet operation.

Gear Lapping

Regardless of accuracy or precision exercised in the cutting or assembling of gears, practiced by modern methods, gear noises frequently occur as a result of machining irregularities or misalignment in final assembly. These difficulties can be overcome by the use of the Timesaver precision lapping method. This operation will definitely correct the vibration and eliminate the noise caused by improper tooth contact. Quiet operation, superior finish, and full tooth contact can be secured on all types of gears of various metals, which are used in transmission assemblies, speed reducers, and elevator hoists.

The fitting can be done by either lapping the gears in a fixture or after assembly as the non-imbedding self-eliminating nature of the Timesaver compound prevents excessive or continued cutting.



Honed Cylinder *Cylinder Lapped with Timesaver*

General

Timesaver Lapping Compound is an ideal medium for the assembly lapping of all the individual or moving parts of an assembled mechanism such as:

- Gears
- Bearings
- Lathe and planer ways
- Poppet and plug valves
- Silphon type seals
- Piston and cylinder walls
- Relieving of hot bearings

and in fact upon any type of bearing surfaces where precision fits and ideal operating conditions are desired.

Timesaver Grade Numbers

Timesaver Lapping Compound is produced in the two general classes as follows:

Green Label Grades

For lapping **ferrous materials** such as steel and iron (Roughing in hard bronze)

No. 55 Coarse	No. 111 Fine
No. 77 Medium	No. 333 Very Fine

Yellow Label Grades

For lapping **non-ferrous materials** such as babbitt, brass, bronze, aluminum, and copper

No. 40 Coarse	No. 80 Fine
No. 60 Medium	No. 100 Instrument Grade

Timesaver Lapping Compound is manufactured and sold in powder form for the following reasons:

1. Enables the consumer to make a mild or concentrated mixture and to use oil of various viscosities to meet existing lapping conditions.
2. Economical, as the consumer buys only the abrasive and supplies his own inexpensive vehicle.
3. Easy to store, not affected by temperature changes, keeps indefinitely, saves storage space, and is easy to dispense.

Precision Fits – Precision Finish
Without Special Tools
by
The Average Mechanic
with
Timesaver (Precision Finish)
Lapping Compound

DIRECTIONS
For Mixing and Using
Timesaver (Precision Finish) Lapping Compound

(Materials Recommended)

Mix Timesaver with oil (see specific application) as you use it and only in quantities needed for the particular job on hand. Mix thoroughly to obtain an even mixture and keep well stirred.

The following instructions suggest proportions and types of oil to use for specific applications. Variations, however, may be made to meet existing conditions. Timesaver Lapping Compound will not charge the metal or continue to cut.

Bearings
(Procedure and Materials Recommended)

No. 40 Course	(Yellow Label) – For roughing in and removal of excessive amounts of metal.
No. 60 Medium	(Yellow Label) – General lapping.
No. 80 Fine	(Yellow Label) – For finish and removal of small amounts of metal.

1. Round Bearings (Babbitt and Bronze)

Newly poured bearings are usually too tight to permit the shaft to bottom. If this is the case, relieve side pinch with a scraper only enough to permit the shaft to bottom in both halves.

Mix compound with thin oil (SAE 10 or 20) in proportions of about one part Timesaver Compound to 3 or 4 parts of oil, by volume. Spread the mixture evenly on bearing halves. Shim properly to maintain alignment.

Bolt up cap, not too tightly, but just so shaft can be easily turned by hand. Rotate shaft manually or under power at a speed of not over 100 R.P.M..

Gradually take up on bearing, removing shims if necessary, as high spots are removed. At intervals add a small amount of oil and gradually take up on bearing halves making additional applications of the lapping mixture if necessary.

Caution

Never permit bearing surfaces to become dry or gummy at any time during the operation. The lapping mixture, on the bearing surfaces, must be kept in a semi-fluid state to obtain even distribution, rapid action, and uniform removal of metal. Add oil if necessary.

When a full bearing surface has been obtained, tighten cap to final position, add plain oil and continue to lap for a short period. This operation produces the final finish and proper oil clearance. This position should not be changed or varied following the cleaning operation or during the final assembly. Flush out with thin oil.

Timesaver lapped bearings have the proper oil clearance and should not feel as tight as a scraped or machined bearing as no allowance is necessary for the wearing down of high spots.

Solid Bearings and Bushings

Fit bearings snugly to shaft. Apply Timesaver and oil mixture to the bearing and shaft. Insert shaft and lap with a twisting motion, adding oil or lapping mixture if necessary until proper clearance is obtained. Flush out with thin oil.

Hot Bearings

Mix a small amount of Timesaver with oil. The mixture must be very thin. (Proportions 1 to 10.) Apply freely to bearings and shaft through oil holes. Rotate the shaft. Add the thin mixture until bearing is free. Then flush out with thin oil or kerosene and lubricate as in normal practice.

2. Gear Lapping (Steel and Iron)

(Spur, Helical, Herringbone, in Assembled Speed Reducers)

(Materials Recommended)

No. 55 Course	(Green Label) – For roughing in and removal of excessive amounts of metal.
No. 77 Medium	(Green Label) – General lapping.
No. 111 Fine	(Green Label) – For fine finish and removal of small amounts of metal.

Mix Timesaver Lapping Compound with heavy gear oil in proportions of about one part Timesaver to three or four parts of oil by volume.

Protection of Ball or Roller Bearings

Bearings should be protected against the possible entrance of lapping compound, either by shields or by plugging the oil holes and ends of bearings with heavy cup or paraffin grease.

It is customary to leave the cover off the gear case for convenient inspection and application of lapping compound. Bearing races should be held in place by bolting down with blocks before lapping the gears. Failure to do this will retard the lapping operation as irregularities of gear teeth may be sufficient to slightly raise the shaft and prevent topper contact.

Brake Loads

Fast lapping action depends upon whether or not the gear teeth are in firm contact. Brake loads should be as heavy as the safe heating limit of the gears and shaft will permit. Failure to use a brake load will result in most of the compound running through between the teeth with very little lapping action.

The lapping mixture of Timesaver Compound and oil may be applied either by pouring on in small quantities or by the use of a paintbrush.

Lapping speeds should be as fast as possible without throwing compound from the gears.

Gears should be run a short time with oil before the lapping compound is applied.

Lapping mixture should be applied sparingly across the entire face of the gears every few minutes.

Occasionally check the lapping progress by wiping off several gear teeth to note the area of contact.

Continue to lap until the unit is noiseless, free from vibration, and the desired tooth contact has been obtained.

Caution

Surfaces should never be allowed to become dry or gummy. If this condition develops, apply plain oil at intervals between the applications of lapping mixture.

Filing of High Spots on Extreme Ends of Tooth Faces

Sufficient lapping will eventually remove these spots unless they are of excessive hardness. However, when such spots are present on the gear rather than on the pinion, this may require a considerable amount of time and lapping compound, and further cause extensive wear to the corresponding section of the tooth faces on the higher speed pinion gear. If examination shows that it will ultimately be necessary to resort to filing, it is advisable to do this during the early stages of the lapping procedure.

Cleaning of Cases and Gears

Flush gear cases and gears with kerosene, diesel oil, or some commercial solvent and remove cup grease from bearing oil holes. Since Timesaver Lapping Compound is not a permanent abrasive, nor will it charge into the metal surfaces, it is easily removed by normal cleaning methods.

3. Gear Lapping (Steel and Iron) Fixture

(Materials Recommended)

No. 55 Course	(Green Label) – For roughing in and removal of excessive amounts of metal.
No. 77 Medium	(Green Label) – General lapping.
No. 111 Fine	(Green Label) – For fine finish and removal of small amounts of metal.

Mix Timesaver Lapping Compound with heavy gear oil in proportions of about one part Timesaver to three or four parts of oil by volume. The proportions of compound to oil may be reduced to as little as one part compound to 10 parts of oil. Lapping speeds will be reduced accordingly.

Lapping Fixtures

The type of lapping fixture desirable depends upon the nature of production requirements. Companies manufacturing standard lines of speed reducers, or machinery containing trains of standard speed reducing gears, can sometimes advantageously employ a dummy case of fixture with fixed centers duplicating assembly conditions. Provisions for brake load will expedite lapping.

For all general lapping requirements, fixtures with adjustable centers furnish greater flexibility. In such fixtures, it is usual practice to lap from spread to normal centers and sometimes to close centers where the allowable clearance or backlash permits. While provision for a brake load is desirable in such a fixture, similar results are frequently obtained by keeping the centers as close as possible without excessive tightness.

Procedure

Lubricate gears with clear oil, allowing it to spread before lapping mixture is applied. Lapping speed should be as fast as possible and yet not at a speed sufficient to throw the compound from the gear teeth and waste it. Apply either by pouring or with a paintbrush.

On fixtures designed for lapping standard gear trains of the same size, a further saving both of material and time of attendance is obtained by fitting the fixture with a sheet metal trough for holding the lapping compound. The gear teeth dip into the lapping compound as the gears revolve. The trough should be constructed so that only the teeth of the largest gear will dip into the compound as the small gears may otherwise receive excessive lapping. Economy in

the use of material will result by making the trough as shallow as possible and sloped so that the compound will flow to a point directly under the largest gear.

Cleaning of Gears

Since Timesaver materials will not charge or imbed, the compound is very easily cleaned from gears by using kerosene, or similar commercial solvents.

4. Bronze Worm Gear Lapping – Assembled Units

(Materials Recommended)

No. 40 Course	(Yellow Label) – For roughing in and removal of excessive amounts of metal.
No. 60 Medium	(Yellow Label) – General lapping.
No. 80 Fine	(Green Label) – For fine finish and removal of small amounts of metal.

Mix Timesaver Lapping Compound with heavy gear oil in proportions of about one part Timesaver to three or four parts of oil by volume.

Bearings may be protected by plugging oil holes and ends of bearings with heavy cup grease. The cup grease should be removed when the lapping operation is completed and at the time the gear case is cleaned.

Brake Load

Brake load, if any, should be only sufficient to keep teeth in **light** contact. Blackening of tooth faces and excessive heating will indicate too much brake load. Excessive brake loads must not be used as such loads will wear a shoulder on the steel worm and tend to cause serious pitting of both gear and worm and wiping of the bronze.

In lapping units with fixed centers, where gears are tight, care must be used even without brake load, otherwise overheating and excessive expansion will result. This can usually be controlled by applying plenty of oil.

Lapping speeds should be as fast as possible without throwing compound from the gears.

Gears should be run in a short time with oil before the lapping compound is applied.

With drain plug removed, apply compound and oil mixture either by pouring or with a paintbrush.

If gear tooth surfaces tend to become dry or gummy between applications, occasionally apply clear oil.

Occasionally check the lapping progress by wiping off several gear teeth to note the area of contact.

Continue to lap until the desired surfaces have been obtained.

Flush out case with some commercial solvent and remove cup grease from bearing oil holes.

5. Lapping Elevator Winding Machines After Installation

(Materials Recommended: Same as in Par. 4)

Drain oil from gear case and if possible plug bearing oil holes. Sparingly apply compound and oil mixture while elevator is being operated at normal speeds. Apply clear oil if the tooth surfaces have a tendency to become dry or gummy. Flush out gear case when lapping operation has been completed.

6. Bronze Worm Gears – Fixture Lapping

Use same materials and procedure as recommended in Paragraph 4. Note: Grades No. 55 and No. 77 (Green Label) may be used for roughing in when lapping gears in a fixture.

Lap with centers as close as possible but avoid overheating or blackening of tooth faces. It is better practice to use no brake load. Brake if any, should be only sufficient to keep the teeth in light contact. Blackening of tooth faces and excessive heating will indicate too close centers or too much brake load. Either will tend to wear a shoulder on the steel worm and cause serious pitting of both gear and worm. Keep surfaces well lubricated between applications of the lapping mixture.

Close Centers or Brake Load

For all general requirements, fixtures with adjustable centers furnish greater flexibility. It is usual practice to lap from spread to normal centers and sometimes to close where the allowable clearance or backlash permits.

A material saving both of compound and time of attendance results from the use of a shallow metal trough fitted beneath the gears, for holding the lapping mixture. This will permit the gears to dip into the compound as they revolve.

7. Lapping Machine Slides and Ways

(Iron or Steel)

**Use Grade No. 77 Medium (Green Label) for average work and fast cutting.
No. 111 (Green Label) for finish lapping.**

Mix Timesaver Lapping Compound with medium or thin oil (SAE 20 or 10) in proportions of about one part Timesaver to three parts of oil, by volume.

Parts must be lapped in assembly and in their normal operating position.

Loosen gibs to permit the free entry of the lapping mixture.

Apply Timesaver and oil mixture in quantities sufficient to cover the surfaces. Add a small quantity of plain oil and operate mechanism a few strokes to obtain even distribution of lapping compound.

Slightly tighten gibs and operate mechanism either by hand or under power at a moderate rate of speed.

Continue to gradually tighten gibs as lapping progresses and metal is removed, making alternate applications of fresh Timesaver mixture and plain oil about every ten or fifteen seconds.

Continue in this manner until free movement, desired seat, and smooth surfaces have been obtained.

Caution

Scoring will occur if the surfaces are allowed to become dry or gummy. Add plain oil if necessary. Tighten gibs gradually and avoid excessive pressure.

After desired fit has been obtained, flush out with kerosene, diesel oil, or some chemical solvent. As Timesaver Lapping Compound does not imbed or charge the metal, the cleaning can be accomplished without disassembling the machine.

8. Slides and Ways

(Bronze Parts)

Use Grade No. 60 Medium (Yellow Label) for average work. No. 111 Fine (Green Label) for hard bronze and fast cutting action.

Mix, apply and proceed according to the foregoing instructions. (See Par. 7)