

BOOK ONE

Indian Industrial School,
CARLISLE, PA.

INDUSTRIAL CLASS LESSONS IN

HARNESS-MAKING



By JOHN CHARLES JORDAN

Instructor of Harness-Making and Carriage-Trimming

TUSKEGEE INSTITUTE, ALABAMA

PREPARATION



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PREFACE

This book is intended to meet the primary needs of students taking a course in HARNESS-MAKING. It is the result of the careful study of the fundamental and practical needs involved in this branch of technical work.

The Drawings have been accurately prepared, and will be found immensely serviceable to the learner.

The Measurements are from every point of view, correct, and the AUTHOR feels in presenting this Course, that he is supplying a long felt want.

BOOKS II and III, which come respectively after this, are for INTERMEDIATE and ADVANCED STUDENTS. Each of the three books is to be used one year in connection with the INDUSTRIAL CLASSES. The course of study in the Catalogue will be seen to correspond with lessons treated in these Books, and therefore to follow such an order, means to ascertain the very best results.

AUTHOR.

THE ART OF MAKING HARNESS SUCCESSFULLY

FIRST QUARTER

INITIATORY

Beginners should bear in mind that they have chosen a branch of technical work that requires undivided attention. The cleanliness of the shop must be one of your regular duties this year. This must be well done. In cleaning, do not fail to dust the benches well and sprinkle the floor before sweeping, as the dust will ruin the pores of leather, do not allow trash or rubbish to be covered up in corners or in other out-of-sight places, as this tends to create disease. Always open the windows at top and bottom, thus permitting thorough ventilation, which is quite essential to good health. Again you must cultivate a good memory as there are many things which must be at your ready command. Hundreds of measurements are necessary to be borne in mind by harness-makers, and these should not be confused. Attention is next called to the many advantages derived from the careful study of blue-prints. By this means a picture of the object to be studied or made is right before you, also the corresponding measurements are plainly indicated thereon. Whenever you are given an article to make, get a drawing for it and place it on the rack before you. Full specifications must next be had and you may then proceed with your work, leaving nothing to chance, but understanding every point thoroughly as you go on. Interest yourself in mechanical drawing and learn to draw every article in your trade to any scale or style desired. It will aid you in your after business life and above all make of you a broad and well-rounded mechanic.

NAMES OF TOOLS

In order to know one tool from the other and to appreciate the various purposes for which each tool is used, one must be acquainted with their different names and these must be committed to memory, for in many ways they are to the harness-maker an alphabet.

They must be conveniently arranged as follows:

- (a) 1. Head Knife. 2. Cap Knife. 3. Gauge Knife. 4. Splitting Knife.
(b) 5. Saddler's Tack Hammers. 6. Riveting Hammer.
7. Face Hammer.

- (c) 8. Common Edge Tool. 9. Flat Edge Tool. 10. French Edge Tool. 11. New Style Edge Tool. 12. Rein Trimming Tool.
(d) 13. Saddler's Lacing Pliers. 14. Saddler's Steel Pliers. 15. Bolt Pliers. 16. Nut Pliers.
(e) 17. Revolving Punch. 18. Drive Punch. 19. Face Heel Punch. 20. Terret Punch. 21. Back Band Punch. 22. End Punch.
(f) 23. Harness Awl. 24. Round Awl. 25. Lacing Awl. 26. Collar Awl.
(g) 27. Steel Compass. 28. Patent Leather Compass.
(h) 29. Creasing Machine. 30. Riveting Machine.
(i) 31. Single Edge Creaser. 32. Double Edge Creaser. 33. Screw Creaser.
(j) 34. Pricking Wheel. 35. Over Stitching Wheel.
(k) 36. Loop Sets. 37. Rivet Sets. 38. Claw Tool. 39. Cutting Knippers. 40. Anvil. 41. Vise. 42. Chisel. 43. Raising Block. 44. Mallet. 45. Stitching Horse. 46. Board Iron. 47. Stuff Stick. 48. Tickler. 49. Regulating Needle. 50. Shears. 51. Rule.

THE USE OF THE TOOLS.

KNIVES

1. The head knife is used for general cutting, skiving and pointing up straps. It is also used for scalloping and cutting patterns.
2. The cap knife is used for cutting threads and trimming up work.
3. The guage knife is used to cut any number of straps a uniform width. It is not however to be guaged higher than 4 1-2 inches.
4. The splitting guage is used for skiving and making straps thinner. It will also split off uneven surface on any part of a strap. Their minimum and maximum widths are six and ten inches respectively.

HAMMERS

5. Saddler's tack hammer is used for tacking up work before it is stitched. It is also used for driving in stationary and clinch tacks.
6. Riveting hammer is used for riveting purposes, such as putting on the hame clips, heel chains, hame tugs, traces, etc. It is also used for raising.

7. Face hammer is used for beating down stitches before work is trimmed up. It is also used for chisel work.

EDGE TOOLS

8. The common edge tool is used for taking the edge off the flesh side of straps and for edging double and stitched work.

9. The flat edge tool is used for taking the edge off the top side of straps.

10. The French edge tool is used for taking the edge off of straps to be raised, also for taking edges off of saddle skirts to be faced.

11. The new style edge tool is used to trim double and stitched work. It is especially designed for oval edge trace and pole strap work.

12. The rein trimmer is used for round work, such as gag runners, round lines, winker stays, etc.

PLIERS

13. The saddler's lacing pliers are used for lacing, pulling needles through heavy work, etc.

14. The steel pliers are used in riveting work and in making strong pulls.

15. The bolt pliers are used to take out and put in the bolts on gig saddles and coach pads.

The nut pliers are used to adjust the nuts on gig saddles and coach pads.

PUNCHES

17. The revolving punch is used for punching different size holes in straps. This punch has from four to six tubes.

18. The drive punch is used for making holes where rivets are to be put and also in the front end of traces.

19. The trace heel punch is used to punch holes in the back end of traces.

20. The terret punch is used to punch terret holes, hook holes and bolt holes.

21. The back band punch is used for punching back bands on saddles. Also holes on front ends of traces.

22. The end punch is used for cutting holes where buckles are to be put. The strap doubled, the punch is applied where it bends.

23. The harness awl is used to make holes for stitches.

24. The round awl is used for marking and making holes.

25. The lacing awl is used for lacing.

26. The collar awl is used to work on collars.

27. The steel compasses are used for measuring equal spaces, describing arcs, circles, etc.

28. The patent leather compass is used to make lines, arcs, and circles on patent leather.

29. The creasing machine is used for creasing straps of various widths.

30. The riveting machine is used for braddding.

31. The single edge creaser is used for making a single crease on the edge of straps.

32. The double edge creaser is used for making a double crease on the edge of straps.

33. The screw creaser is used for layers.

34. The pricking wheel is used to indicate the number of stitches required to the inch.

35. The overstretch wheel is used to set the stitches up and is run over the stitches after they are put in.

36. The loop sets are used to set up loops.

37. The riveting sets are used in riveting iron brads.

38. The claw tool is used to pull tacks.

39. Cutting knippers are used for cutting rivets, tacks, etc.

40. The anvil is used as a support for heavy hammering.

41. The vise is used as a clamp for holding work.

42. The chisel is used to cut rivets, terrets, hooks and other hard metals.

43. The raising block is used for raising straps.

44. The mallet is used to hammer on punches.

45. The stitching horse is used to hold work, while being stitched.

46. The board iron is used as a support for heavy hammering, also as a weight for pressing folds.

47. The stuff stick is used for stuffing pads, cushions, etc.

48. The tickler is used for making lasting impressions.

49. Regulating needle is used for plaits.

50. The shears are used to cut cloth and other light materials.

51. The rule is used for measuring.

PREPARATION OF LEATHER

The preparation of leather is of paramount importance to the beginner as well as to the master mechanic, and failure to understand this subject means a loss of time, money and in most cases a very unsatisfactory job. To prepare

leather for working the first thing to be done after cutting is to put the stock into the Steeping Tub and allow to remain for at least one hour or at least until the leather is wet through, but not until the grease begins to come out. After this is done wrap the stock up in a cloth and allow to samma. The leather is then ready for use. After the knife work is finished blacking is next in order. To properly black or sal-soda a strap first lay all the straps on the bench with the wrong side up and apply the sal-soda, rubbing the fibers both ways. Next apply the blacking to the edges and the flesh sides, after which apply tallow, rubbing the fibers only one way. Then slick and rub dry with stiff wrapping paper. Creasing is next in order and may

be done on the Creasing Machine or by hand. After this is done the leather is ready to be fitted up. To fit up work only enough need be pricked to cover what is turned under. You must then tack the work together for stitching. In stitching be sure to set your awl at an angle of 45 degrees and push it in straight and pull it out likewise. Do not form the habit of twisting the awl, because in most cases it will break or make bad stitches. Pull the stitches in even and smooth on the front, but not so that they cut the grain of the leather. On the back the stitches should be drawn in a little tighter. After stitching the work should be neatly trimmed up, overstitched and polished.

LEATHER CLASSIFIED

Leather is bought in three classes, viz.: Light, medium and heavy. A side of leather is half a hide and is subdivided as follows: Back, neck, shoulder, flank and belly. The first thing to be done to a side of leather after it is unwrapped is to straighten the prime edge, and take off from fifteen to twenty inches. This will give you three portions of the side from which to work. Leather is bought by the pound, side or roll.

WAGON HARNESS TRIMMINGS

To trim wagon harness simple mountings are always preferred. Some of the most simple classes of buckles are XC Center-Bar, XC Roller, Japan, Trace, Sensible, Champion-Trace, Kangaroo, Crown, Wire-Bent-Heel, Acme-Rein, Barrel-Shape and Combination.

BITS

Bits are either Jointed or Stiff XC or Japan and twisted or smooth mouth.

RINGS, HOOKS AND HAMES

Rings and hooks are either XC or Japan. Rings are measured as to their diameter, while hooks are generally known as "Pad Hooks."

Hames are either Wood or Steel and are trimmed in XC Japan or Brass. Their measurement should be the same as that of the collars on which they are to be used.

CHAINS

There are three classes of chains employed in wagon work, viz.: Heel-Chains, which are from 3 to 3 1-2 feet, and used on the rear end of traces; Breast-Chains, which are usually 26 inches, and Trace-Chains.

PARTS OF SINGLE WAGON HARNESS

HAME STRAPS

To make a wagon hame strap, first cut a piece of medium grade leather 3-4 inch x 24 inches. Skive the poor end to a bevel edge and point up the best end for a billet. Take off top edges with No. 2 flat edge tool and the bottom edge with No. 3 common edge tool, then turn back 2 inches on the poor end and punch a buckle hole. Next black and crease the strap, then prick 2 inches to cover the 2 inches turned back on the poor end, and put in a roller Japan or an XC center bar buckle. In case of the former, put in two loops, one on top next to buckle and one on bottom next to this one. In case of the latter put in one loop on bottom. Tack up, stitch, trim and set up loop. Then punch 6 holes 2 inches apart.

SIDE STRAPS

The side strap is called by many "breeching strap," and occupies a position on either side of the horse. The object of this strap is to offer a support to the horse in backing. It also assists greatly in holding loaded vehicles off the horse while going down hill. To make the side strap cut a piece of medium grade leather 1 inch x 54 inches. Skive poor end to a bevel edge and point best end for a billet. Turn back 6 inches on poor end and punch a buckle hole, then edge, black and crease the strap. Prick with No. 7 wheel far enough to catch in loop. Bend the strap and secure the bulge by stitching down 1 inch on poor end. Punch 8 holes 2 inches apart. Of what advantage is the bulge?

PARTS OF SINGLE WAGON HARNESS

HIP-STRAPS

Hip straps for wagon-harness fall into two classes, viz.: Loose and forked. To make loose hip strap first cut leather of medium grade four pieces size of breeching tugs x 32 inches, point best end for billet and skive poor end to bevel edge. Edge, black and crease the straps. Then turn back two inches on poor end and prick enough to cover same. Then tack into a ring size 1 and 3-4 inch and stitch. To make fork hip straps cut a piece of medium grade leather 1 and 1-2 inch x 28 inches. Set a compass 3-4 inch wide and mark up 18 inches from best end. Intersect this mark with a cross mark and punch a hole. Turn back 3 inches on poor end, skive to bevel edge and point up each fork for billet. Hollow the strap out where it bends in the ring.

TURN-BACK

Since there is to be very little strain on the turn-back, it may be cut from light portions of the side. The object of the turn-back is to unite the saddle and hip-straps. Its width therefore depends largely upon the width of the hip-straps and size of the ring in which they join. To make the turn-back first cut out a piece 1 and 1-8 inch x 36 inches, skive poor end to a bevel edge and best end to a feather edge, edge, black and crease. Then turn back 3 inches on best end and lap in ring. Next cut chape by pattern, then extend turn-back on chape 3 and 1-2 inches. Punch a buckle hole 2 inches from poor end and put on buckle and slide loops. Punch 8 more holes 2 inches apart.

PARTS OF SINGLE WAGON HARNESS

DRIVING REINS

The driving reins commonly called lines, play the most important part in a set of harness. With them the driver guides his animal into whatever place he desires and with them the driver often saves his life in case the animal is frightened. Cut the reins therefore from prime portions of the side. The fronts are 1 inch x 7 and 1-2 feet, the hand parts 1 inch x L. S. Skive both ends of fronts to a bevel edge also best end of hand parts. On poor end mark up 4 inches and cut this down to 5-8 inch, point one for billet, punch a hole 2 inches from end on other. Then edge, black and crease the strap. Turn back 2 inches on best end of fronts and catch on snaps, prick 4 inches on poor end and lap on best end of hand parts. Then put a 5-8 inch center bar buckle on poor end, and tack up and stitch. Lines should not be less than 12 feet when completed.

BREECHING

In making the breeching for a wagon harness, we must bear in mind that it is to be subjected to much friction and strain. It must therefore be made up so as to withstand these conditions. A fold body is preferable. It may be cut from the belly portions of the side 4 and 1-2 inches x 40 inches. Run through splitting guage until it will bend without cracking. Then wet, slick out and straighten up the edges. Next find the cross center on the black side and find the center from end to end on the flesh side, and mark up three inches from each end. Set your compass 1-4 inch more than width of your layer and mark to the 3-inch line. Then hammer to center line. Put in 2 layers of buckram filling and pop stitch. Cut four tugs 1 inch x 12 inches and make 4 inches with chapes.

PARTS OF SINGLE WAGON HARNESS

GIRTHS

Girths or Belly-bands for single wagon harness are of two distinct classes, viz.: Single strap and fold body. A description of the latter will suffice. To make the girths cut two pieces of belly-leather 4x18 inches and 4x20 inches respectively. Find centers and allow for layers same as in cases of breeching folds. The layers are 1x24 inches and 1x26 inches respectively. Skive each end to a feather edge. Then edge (top only), black and crease. Turn back 3 inches on each end and prick the balance. Tack up, stitch and beat the stitches down. Remember in case roller buckles are used a loop must be put behind each buckle. Center bar buckles however are much more desirable and can be used to excellent advantage.

TRACES

When we think of the traces for a wagon harness, we must have it clearly fixed in our minds the part they are to play while the harness is in daily use. Remember upon the traces depends the whole capacity for drawing heavy loads, often amounting to thousands of pounds. It is therefore quite necessary that they be cut from heavy prime portions of the side not less than two ply, i. e., two pieces to each trace 1 and 1-4 inch x 4 feet. Select two smooth pieces for tops, crease and prick all the way. In fitting up care must be taken to put a good end and a poor end together. After stitching, wet and hammer, then glass to even surface and take off edges with No. 4 common edge tool. Then black, tallow and gob.

QUESTIONS ON SINGLE WAGON HARNESS

1. How many parts has a set of single wagon harness? 2. How many rings, buckles and dees would be required? 3. A man bought a set of single wagon harness recently for which he paid \$12. If the bridle and lines cost 1-3 of the total cost the breeching would cost 1-2 as much as the bridle and lines. What was the cost of each? The traces cost 1-6 of the total cost, how much more did the traces cost than the breeching? 4. How many square inches in a side strap? The poor ends of the hand parts of lines are 1 inch wide, if this is to be cut down to 5-8 inch, how much must be taken off each side? How much less wide is a turn-back than a hip strap? 6. If a hame strap sells for 15 cents and two for 25 cents, how much would a dozen such straps cost? 1 and 1-2 dozen? 7. A man bought 6 sets of single wagon harness as follows: 1 set @ \$12 and 1-3, 2 sets @ \$14 and 1-4, 1 set @ \$9 and 1-8 and 2 sets @ \$14 and 1-20. He gave the harness-maker a check for \$75, how much change did he receive? 8. How long is the heel-chain for single wagon traces? Notice the blue-print for loose hip straps. How does ring space compare with that of fork hip straps? 9. What effect does a center-bar buckle have on loop work? 10. Write an essay carefully describing but in as few words as possible how each part in a set of single wagon harness is made.

THE ART OF MAKING HARNESS SUCCESSFULLY

SECOND QUARTER

PARTS OF SINGLE WAGON HARNESS

SADDLE

The saddle for a Single Wagon Harness is the seat of much friction and weight, and it must therefore be made to withstand these. The saddle is a union of parts, the number of which depends upon the style and mechanism desired. However, the most common saddle now in use is a flexible flat pad, because of its being adjusted to the size and shape of any horse's back. To make this saddle, the following parts must be carefully considered, viz.: Housin, Straw-Board, Skirts, Skirt-Points, and Pad. Let us now consider these parts in the above arranged order. The housin may be cut of medium grade leather 4 inches x 20 inches and must be tapered to 2 inches and skived to a bevel edge, straw-board must then be cut 3 inches x 19 inches. Skive to a bevel edge and place under the housin so as to be 1-2 inch from its edges. A line must then be made 3-4 inch from the edge of housin and pricked, tacked and stitched to straw-board. Then find the center and mark 5 inches each way and punch terret holes. Put in nuts and clinch the tacks on the back side. Then cut the housin layer 1 inch x 26 inches. Skive each end to a feather edge and turn back 4 inches on each end, after edging top only, black and crease then prick. The Back-Bands are two ply, one piece 16 inches and one piece 11 inches, made up 14 inches in dees. Skirts are cut 2 inches x 15 inches and lap under housin. The poor ends are tapered to 1 inch. Skirt-points are cut 1 inch x 12 inches and lap 2 inches on poor end of skirts. Then stitch on housin lay, and catch on back-bands. Cut pad 5 and 1-2 inches x 26 inches. Hollow out in center to 4 inches. Cut binding 1 inch x 21 inches.

PARTS OF SINGLE WAGON HARNESS

SHAFT TUGS

The Shaft Tugs for single wagon harness are used as a support for the shafts and are attached to the back-bands of the saddle by means of heavy buckles. These tugs are to be of heavy prime material, cut 1 inch x 20 inches. Measure 9 inches from poor end and punch a buckle hole, then skive poor end to bevel edge and channel 8 inches, leaving 1 inch on end unchanneled. Then black and crease 9 inches on best end. Put in trace buckle and a loop just behind. Next put a solid plug so as to rest against a dee that must be placed 6 inches from buckle heel. Put a wedge-shaped plug on other side to run within 1-2 inch of end. Tack up and stitch. Glass, trim and sand-paper. Then black, bend and tack. Punch a hole 1 and 1-2 inch from end. Put a billet 1 inch x 12 inches on dee.

BRIDLE CROWN-PIECE

In making a crown piece for a wagon bridle first cut out a piece of prime leather 1 and 3-8 inch x 24 inches. Then set a compass 6-8 inch wide and mark up 7 inches from each end. Intersect this mark with a cross mark and at this point punch a hole. Split from each hole out to the end and point up the four forks for billet. Then edge the crown and black and crease each edge. Put a buckle tug 5-8 inch x 3 inches in the center of the crown and stitch on. Punch four holes in each fork 1 and 1-2 inch apart, the total width of the crown determines the width of the crown-cheeks and throat-latch. This also regulates the amount necessary to leave unstitched in the Front. Rosettes should be used on all bridles as they hold the Front in proper place.

PARTS OF SINGLE WAGON HARNESS

BRIDLE THROAT LATCH AND FRONT

To make a throat-latch for a wagon bridle, cut a piece of medium grade leather 5-8 inch x 22 inches and skive each end to a bevel edge. Then turn back 2 inches on each end and punch a buckle hole, put in buckle after blacking and creasing, prick, tack and stitch.

A front is cut 6-8 inch x 22 inches of medium grade leather. Edge and black and turn back 3 and 1-2 inches on each end. Leave a space of 1 and 4-8 inch for the crown to slip through then stitch down the ends which must be skived to a bevel edge.

BRIDLE CHEEKS

To make cheeks for a wagon bridle first select a piece of medium grade leather 6-8 inch x 30 inches. Then measure 2 inches from poor end and punch a buckle hole, then measure 8 inches from this hole, punch another buckle hole, skive poor end to a feather edge and point the best end for a billet. Then edge the strap and black and crease it. Next prick the 8 inches between the buckle holes. Then cut out two blinds 8 inches by pattern, after fitting these up, rights and lefts, tack and stitch. Then put blinds in cheeks. Fold the two inches on poor end, back, tack and stitch. Then trim off blinds and the back, black and finish with tallow, punch 2 holes 2 inches apart in billet.

QUESTION

1. How does the hame strap compare in width and length with the side strap? 2. Where is each used and for what purpose? 3. How does a center-bar buckle affect the use of loops? 4. How must the width of a loop compare in most cases with that of the strap on which it is used? 5. How is its length obtained?

PARTS OF SINGLE WAGON HARNESS

BRIDLE WINKER STAYS AND REINS

Winker stays are cut from light grade leather 5-8 inch x 11 and 1-2 inches. Point best ends for billet. Skive poor ends to feather edges. Edge, black and crease this strap, then let poor end down in winker 1 inch and stitch in. Reins for a wagon bridle are cut from medium grade leather 3-4 inches x 6 feet. Skive each end to a bevel edge then edge the strap, black, crease and turn back 2 inches on each end, prick, tack up and stitch on. If billets are used they must be cut 3-4 inch x 8 inches and placed on 1-2 inch beyond the 2-inch lap. If two-piece rein is preferred one piece is cut 2 and 1-2 feet, the other 3 and 1-2 feet and the end of the latter pointed for billet. Put the best end next to the bit.

HAMES AND COLLAR

The Hames and Collars for Single-Wagon harness must be ordered either from factory or jobber. In ordering this, carefully specify the size of hames and collars which must be obtained by measuring the neck of the horse on which they are to be used. To measure for a collar, stand on one side of horse's neck and put one hand on top of a rule held in other hand on opposite side and notice what length is indicated on bottom of neck. This amount is the size of collar and hames required.

PARTS OF DOUBLE-WAGON HARNESS

BRIDLES, SIDE-STRAPS, HIP-STRAPS, HAME-STRAPS, BREECHING AND TRACES

Double-Wagon harness are made in many styles and patterns, but the most generally used is a stage design or a chain trace or open style. To make a set of double harness we must first consider what relation the double harness bears to the single, what changes arise in the workings, and most of all, what parts are of the same measurements and constructions as those in the single-wagon harness about which we have already learned. A careful study will show that the bridles, side-straps, hip-straps, hame-straps, breeching and traces are the same for both kinds of harness and must now be reviewed.

TRACE GIRTHS

Trace Girths or Belly Bands for Double-Wagon Harness are made single strap and with or without a tug combination to catch back-bands. To make these girths first cut a piece of prime leather 1 and 1-4 inch x 42 inches. Skive both ends to a bevel edge and from poor end turn back 2 inches and punch a buckle hole. On best end turn back 8 inches and punch a buckle hole, edge, black and crease, also prick. Then put a roller buckle and loop on poor end, and on best end put in a trace buckle, behind which put a 1-4 inch plug with a notch for buckle heel. Next put in a loop then skip 1 and 1-2 inch and put in a wedge-shaped plug to run within 1-2 inch of the end. Tack up and stitch, then trim, black and tallow.

TRACE BILLETS

Trace Billets are cut of prime leather 1 and 1-4 inch x 22 inches. Skive poor end to a bevel edge and point up best end for billet. Next turn back 8 inches on poor end and punch a buckle hole. Then edge, black, crease and prick. Tack up same as best end of Trace Girths and stitch, then black plugs, tallow, etc.

PARTS OF DOUBLE WAGON HARNESS

TRACE STAY STRAPS

Trace stay straps are cut of medium grade leather 1 inch x 16 inches. The poor end is to be skived to a feather edge or as in most cases left blunt and the best end is pointed up as a billet. When the traces are ready put the Trace Girths on the two traces that are to work on the inside and the traces should have chapes on the best ends. The Trace billets must be put on to work on the outside and both girths and billets must be placed 20 inches from the hames. In putting on the Stay Straps turn back 2 inches on the poor end and catch in a ring and rivet firmly down half way over girths and billets. Also rivet down best end.

TRACE LOOPS

Trace Loops are cut of medium grade leather 1 inch x 18 inches. The poor ends are skived to bevel edges and best ends pointed up for billet. Turn back 2 inches and make up just as you would a hame stap. Then punch 5 holes 1 inch apart.

PARTS OF DOUBLE WAGON HARNESS

DRIVING REINS

Driving Reins or Lines for Double Wagon-Harness are made in six pieces as follows: Two hand parts each cut 1 and 1-8 inch x LS. The best end must then be skived to a bevel edge and 4 inches on each of the poor ends must be cut down to 5-8 inch. How much must actually be cut from each side? These ends are then worked up as poor ends of single lines. Next cut two fronts 1 and 1-8 inch x 7 and 1-2 feet, and two other fronts 1 and 1-8 inch x 6 and 1-2 feet. The two longer ones are called "Outside Fronts" and the two shorter ones "Inside Fronts." The best ends of both sets of fronts must be skived to bevel edges and the poor ends of outside fronts also, while the poor end of inside fronts after being beveled must have buckle holes put 2 inches from each end. Then edge all the straps and crease and black each edge. Then tack up and stitch snaps on best ends and after the buckles have been stitched on, then buckle inside fronts on outside fronts so that they will extend 10 inches longer, and lap best ends of hand parts under poor ends of fronts. Tack up and stitch. How many inches lap would you allow for these?

TURN-BACKS

The Turn-Backs for double-wagon harness are constructed same as those for single-wagon harness with one exception and that is the length of the turn-back for double wagon harness is from 5 to 5 and 1-2 feet long.

BACK BANDS

The Back-Bands for double wagon harness are cut 18 inches by pattern, with the ends tapered to 1 and 1-4 inch. The layers are cut 1 and 1-4 inch x 42 inches and the filling 1 and 1-4 inch x 14 inches. The loops 3-4 x 8 inches.

PARTS OF DOUBLE WAGON HARNESS

TRACES WITH CHAMPION TRACE BUCKLES

To make a Double-Wagon Harness with Champion Trace Buckles necessitates some changes worthy to be noted. Observe the blue-print however and you will at once see that the same principle involved in former trace work is substantially maintained here also. These traces must be at least two ply and the front or tug ends are cut 1 and 1-4 inch x 26 inches and made up 20 inches in the buckle dees. Now the back portion of the trace is cut 1 and 1-4 inch x 28 inches, one end blunt and the other end pointed up for billet. Put two strong loops 3 inches behind buckle-dees. The heel chain works on blunt end of back portion. Put two girths on buckles to work on inside 1 and 1-4 inch x 36 inches, stitch best end in buckle loops 2 inches. Put a buckle and loop on poor end. Put 2 billets 1 and 1-4 inch x 16 inches on buckles to work on outside. In the upper buckle loop put tugs 1 and 1-4 inch x 8 inches made up 3 and 1-2 inches.

CHAIN TRACES AND OPEN-EYE SNAPS

The chain-trace double harness is the most commonly used of all. It is less than half as cheap as other models, but in most cases injures the sides of the horses on which it is worked. To make this harness, Hook-Hames must be used and in each of the breeching rings must be put an open-eye snap. This acts as a side-strap as it fastens in the chain trace. It is clearly understood that in this case no back-bands, girths, side-straps, etc., are required. If Back-Bands of any description are used they will most likely be the same as those used in plowing, 4x48 inches with buckles on each end. This harness usually sells for \$12.50.

QUESTIONS ON WAGON HARNESS AND PROBLEMS

1. Name all the tools and tell for what each one is used. Of what advantage are blue-prints? Why is absolute cleanliness of the shop a necessity?

2. Classify leather, trimmings and chains. Explain how three kinds of straps are made. What would be the cost of 10 sets of wagon harness at \$14 and 1-4 each? If nine sets of double-wagon harness were purchased for \$405, what was the price per set? What did five sets cost?

3. A gentleman once placed an order for 210 bridles for wagon harness, he requested that 1-7 of this number have blinds, and that 1-10 the number of blinds have spots on them. How many blind bridles did he wish? How many were to have spots on them? How many were to be open face? If the blind bridles were sold at \$1.50 each, and the bridles with spots for \$1.75 each and the open bridles at \$1.45 each, what did the lot of bridles cost the man?

4. Make a sketch of a side of leather and indicate its divisions by dotted lines. How would you sal-soda a strap? How would you edge a strap? What is meant by "Samma?" Write an essay of about 200 words and carefully describe how a fold body breeching is made.

THE ART OF MAKING HARNESS SUCCESSFULLY

THIRD QUARTER

HALTERS

A FIVE RING HALTAR

To make a five ring haltar all the straps should be cut of medium grade leather except where the article is intended for a stallion or a wild colt. In these cases cut all the straps from prime leather as follows: Throat latch and crown each 1 and 1-4x22 inches, cheeks 1 and 1-4x14 inches, nose-band 1 and 1-4x18 inches, chin band 1 and 1-4x19 inches, chin tug 1 and 1-4x15 inches and buckle tug 1 and 1-4x8 inches. On all the straps give 2-inch lap. Edge, black and crease. Then get haltar squares and stitch one on each end of cheeks. On right cheek and upper end also put crown with best end for billet and throat latch. On left cheek put buckle tug. Then make up chin tug 5 and 1-2 inches and leave 1 and 1-4 inch space for throat latch, on bottom end put in haltar bolt and ring. Then put in nose and chin bands on bottom of cheeks.

A COW HALTAR

In making a cow haltar it is a vastly different problem from that of a horse haltar. It is as follows: Cut a strap of medium grade leather as indicated on blue-print 1x6 and 1-2 feet. Skive poor end to a bevel edge and point up best end for billet. Then edge, black and crease. Punch a buckle hole 2 inches from poor end and put in a buckle and loop. Then twist and slide on ring. Next cut two cheeks 1x9 inches and place 6 inches from the center on the nose portion to where it strikes on the head portion. Stitch these on slanting, then brad. Also punch 8 holes 2 inches apart. For calves cut the proportions down to 3-4 as much.

PARTS OF DUMP CART HARNESS

KIDNEY STRAPS

The Kidney Straps for Dump Cart Harness is made of medium grade leather 1 inch x 5 feet and each end skived to a bevel edge, blacked and creased. Turn back 2 inches on best end and catch in butt loop on breeching, then run kidney strap between buckle and first loop on turn-back, and on poor end cut a buckle hole 2 inches from end, put on a buckle and two slide loops, punch 8 holes 2 inches apart.

BREECHING

The Cart Breeching is of prime leather single strap 4x60 inches. Each end is skived to bevel and made up 52 inches, the layers are in two pieces each 2x18 inches and each end pointed up. In turning back 4 inches on the breeching body catching in two butts, cut hole where it bends for side chain 18 inches long. Run the butt through the chain. Put two tugs 14 inches from each end.

BREECHING TUGS

The Breeching Tugs for Dump Cart Harness are cut 1 and 1-4x12 inches and made up 4 inches in dees. Chapes must be used on these tugs to prevent scratching the horse and they must extend down below the dees and be caught in while stitching.

GIRTH

The Girth for the Cart saddle is of prime leather 1 and 1-4x42 inches. Turn back 2 inches on each end and punch buckle hole. Then edge, black, crease and put in two buckles with loops behind. Tack up and stitch.

BILLET

The billets for the saddles are of solid prime leather 1 and 1-4x18 inches. Skive poor end to a bevel and point best end up for billet. Then black and crease.

PARTS OF DUMP CART HARNESS

TURN-BACK

Dump Cart Harness is used on horses and mules to carry sand, gravel, manure, trash or other things in a two-wheel vehicle designed to be unloaded by raising the front and thus permitting the load to slide out the back. The harness then must be designed with this in view. Most of the weight rests on the saddle which must be heavily padded and of sufficient other proportions to protect the animal's back from great weight and strain. There is a little more jerking of the Turn-back than in other harness and we may now consider its construction. To make this turn-back we first decide its style. In most cases it is of a reverse plan. Cut medium grade leather 1 and 1-8x48 inches, the poor end is pointed up for a billet and the best end skived to a feather edge. Cut a chape 6 inches by pattern and extend the turn-back on the chape 4 and 1-2 inches and turn 3 inches under to catch in a ring with the wrong side up. Next cut a buckle hole in turn-back 1 and 1-2 inch from chape end, put in buckle and a loop in front of same. Put 3 other loops behind buckle equally distant apart, tack up and stitch.

HIP STRAPS

There are only two hip straps in Dump Cart Harness, each 1 and 1-4x32 inches. Make these up 30 inches in turn-back rings. Point best ends for billet, skive poor ends to a bevel, black, crease and prick. Then punch 6 holes 1 inch apart.

PARTS OF DUMP CART HARNESS

SADDLE

To make the Saddle for Dump Cart Harness first get the tree. This will be made of hard wood with a groove in the top. It will also have paddles extending on either side. This tree will be sent by your specifications usually from 16 to 20 inches across its arc-way. Next cut your housins for front and back of belly leather by their respective patterns. It will be noted that the pattern for the front contains acute angles and that for the back right angles. This difference is necessary because the acute angles when pressed against the tree make a rise in the housin which fits the portion of the horse's back on which it rests. The right angles when pressed against the tree allow the back housin to rest flatly upon the main portion of the back and thus this difference is advantageous. After cutting out the housins, paste straw-board underneath of the same shape save the lip portions. Then paste rubber duck over the straw-board and lip portions and when dry put a 1 and 1-4 inch binding around the arc-edges. Then tack housin lips under tree and press down firmly on top and tack to paddles. Then cut skirt by patterns and run billet through and screw firmly under tree laping 3 inches. Then tack ends of skirts on top of housins to paddles. Next cut Rim and front of pads out of strong duck or trimming leather by patterns, long stitch them, whip stitch or machine stitch. Then tack each pad in by tacking rim to housin, edge and stitch, using one needle and a heavy thread from front to back, leaving 4 inches in the back of each pad for stuff hole. Then stuff. Put loop between pads in center.

QUESTIONS AND PROBLEMS ON WAGON AND DUMP CART
HARNESS

1. What is the length of Champion Buckle Traces? Of the Belly Bands? Of the Buckle Tugs? What set of straps are not required when these traces are used on harness? In a Chain Trace Harness, what parts are not required that would be in the stage design? Write a short paper on "Reins."

2. Why is it necessary to allow inside fronts to extend 10 inches longer than the outside fronts? What is the length of Trace billets? Of Trace Girths? How much space is allowed for the trace to slide through? What kind of plugs are used in their construction? How long is a kidney strap? How many cubic inches in a Dump Cart Breeching if it is 1-4 inch thick? Why is it necessary to heavily pad a Cart Saddle? What angles should the Housins contain and why? Notice the blue-prints for Cart Saddle and pick out the arc-measures. If the edges of the turn-back lie in the same plane and keep the same distance apart throughout their course, what would they be called?

3. Give all the measurements for a Horse Haltar? A Cow Haltar? Write a paper and give in detail every step in the construction of a Cart Saddle. Give the dimensions for two classes of back-bands.

4. A factory recently received an order for \$600.00 worth of wagon and cart harness. The double harness was to cost twice as much as the single, and the cart harness was to cost as much as the single and double harness together. What was each kind of harness to cost?

