UNIVERSITY OF IDAHO
College of Agriculture

Heavy Duty Stock Trailer

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Stockmen are always looking for a fast and easy method of loading and transporting farm animals. These two ideas were in mind when the Agricultural Engineering Department designed and constructed a livestock trailer for the University of Idaho farm.

The trailer has a capacity of 1,000 pounds although this capacity has been exceeded by easily transporting two saddle horses. The trailer was also constructed for rugged off-highway travel.

A tailgate loading ramp for on-the-spot loading plus a hand-operated winch to help pull an animal into the trailer are two important features of this trailer.

The first step was to design the frame and axle for maximum ruggedness, as is shown in Figure 1. The frame is of welded steel construction, using 3 x 1 3/8 x 3/16-inch channel and 6-inch gusset plates, 1/4-inch thick, for reinforcement at the corners where the cross members join the outside members of the frame. An additional channel was welded in the center of the frame lengthwise to increase the strength and rigidity of the frame.

The axle was constructed by welding two light truck spindles inside a 3-inch channel cut at a 45-degree angle and bent 90 degrees as shown in the spindle attachment detail in Figure 2. By constructing the axle in this manner, the frame of the trailer was lowered leaving a sufficient clearance of 14 inches for off-highway travel. Hubs and rims were then mounted on the spindle using 6:70 x 15-inch, 6-ply tires. However, it has been determined that these tires are too light when heavy animals are being transported.

The floor of the trailer was constructed of eight 2 x 12-inch wood planking, laid parallel to the axle, with one 2 x 10-inch plank ripped to a width of 9 1/2 inches. Three of the flooring boards were cut 77 inches in length and then were cut and shaped to form a 6 x 4-inch extension. The 1 1/2 x 1/4-inch strap irons were bolted to the 6 x 4-inch extension to reinforce the 2 x 12-inch wood planking used for the bottom boards of each side. The straps, bolted to the extension, were also bolted to the floor on the inside of the bottom side boards by welding a 5/16-inch bolt to each strap. To reinforce the corners, 3 1/2 x 3 1/2 x 1/4-inch angles and 1/4 x 2 1/2-inch bolts were used to join the 2-inch board at the front of the trailer to the 2-inch side boards. The remaining side boards were constructed of one 1 x 12-inch and two 1 x 10-inch boards spaced 2 inches apart and bolted to vertical tapered 2 x 4-inch stakes held to the bottom board by two stake loops per stake. The stake loops were used to facilitate the removal of the side boards when transporting other farm products.

A glance at the construction plans in Figure 2 shows the front end gate was constructed similar to the two sides. An additional feature was added by using two additional 1 x 10-inch boards to form half-sides to discourage the animals from attempting to escape from the trailer.

A hand-operated winch was

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Figure 1.—The all-steel welded frame construction. Note the axle mounting method used to lower the frame. Holes are provided in the frame so the axle may be shifted forward or to the rear to obtain the correct balance of the trailer.

mounted on the front end gate to pull any stubborn animals into the trailer. This winch is a 2-inch pipe with a ratchet wheel and pawl. The 20-tooth ratchet wheel was constructed of 1/2-inch plate steel, 6 inches in diameter with a 5-inch root diameter. The angle between the teeth is 18 degrees. The ratchet was welded to the 2-inch pipe extending the width of the trailer. Two hooks were welded to the 2-inch pipe to secure a rope for winching balky animals into the trailer. Three lengths of 2 3/8 x 1 1/2-inch pipe welded to 8-inch strap irons and bolted to the vertical 2 x 4-inch stakes, form the bearings for the 2-inch pipe. A detachable crank for the winch was made from 3/4-inch steel rod and a 2 3/8-inch pipe. The 2 3/8-inch pipe was notched and when slipped over the 2-inch pipe, it then engages with a 1/4-inch pin welded to the 2-inch pipe. The crank, when not in use, is placed in the bracket on the front end gate and secured by tightening a wing nut.

The rear tailgate was constructed of 2 x 12-inch lumber. The tailgate, when lowered, serves as a ramp for loading and unloading the animals. Three 2 x 4-inch wood uprights were used in the construction of the trailer but these uprights were replaced by 3-inch channel iron to support the weight of the animals during loading. The tailgate was hinged at the bottom of the trailer by welding a length of 3/4-inch pipe at intervals to a 3 x 3/16 x 60-inch strap iron bolted to the frame and then welding the

pipe to steel straps on the tailgate at different intervals. Thus, to form a close-fitting hinge, it was only necessary to cut between the intervals of weld on the bottom strip bolted to the frame and the tailgate straps and then insert a 3/4-inch shaft for a pin connection as shown in the hinge construction in Figure 2.

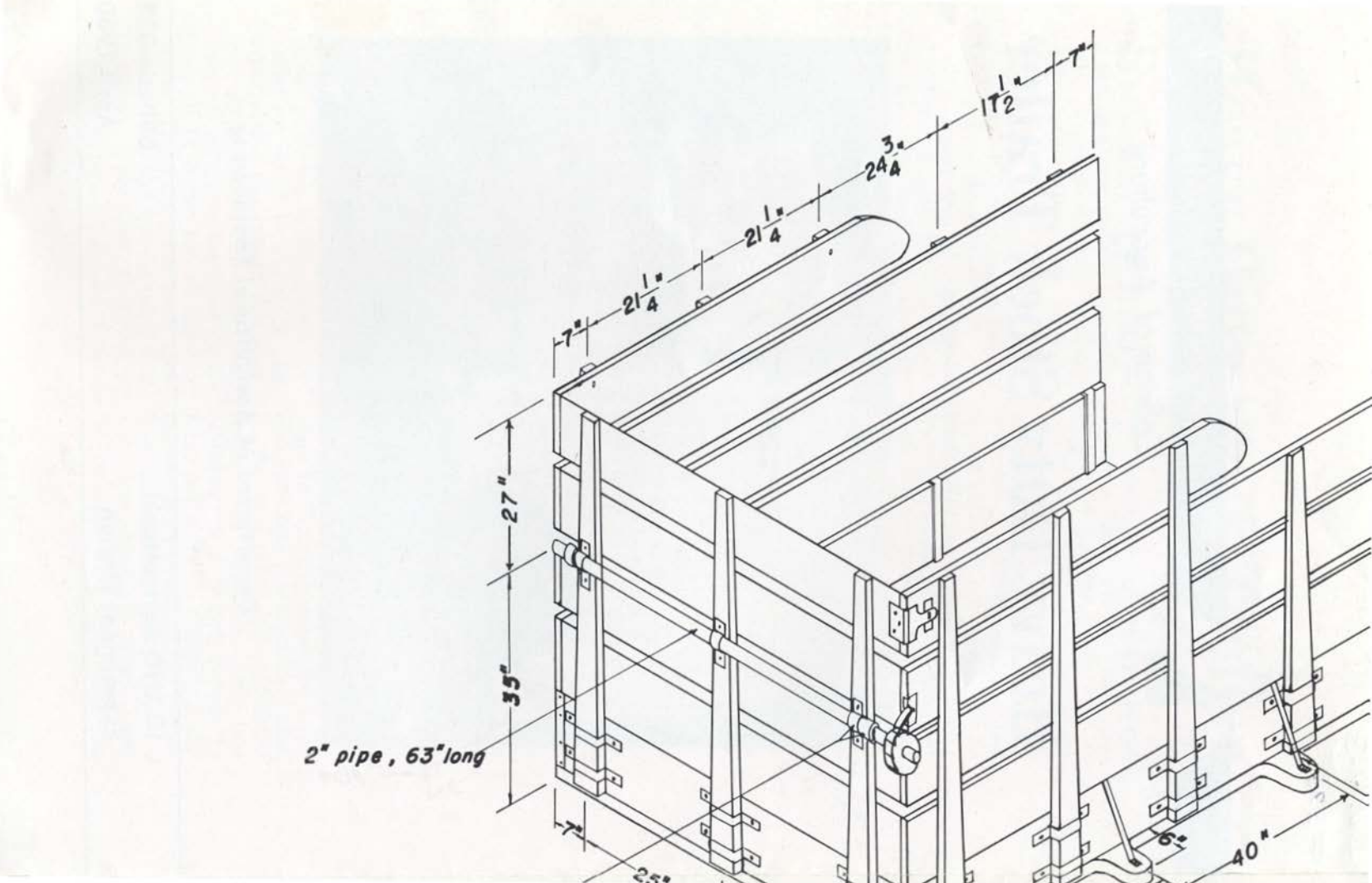
The rear and front tailgates are fastened in a closed position by using a heavy T-hinge modified to form a hasp, and a harness spring snap, attached to a chain, is used to lock the hasp and staple.

The hitch is a heavy duty ball and socket available commercially and built up on the frame of the trailer so the trailer would be in a level position when being towed. The fenders are made of sheet metal and light angle iron and then bolted to the sides and the 6 x 4-inch floor board extensions.

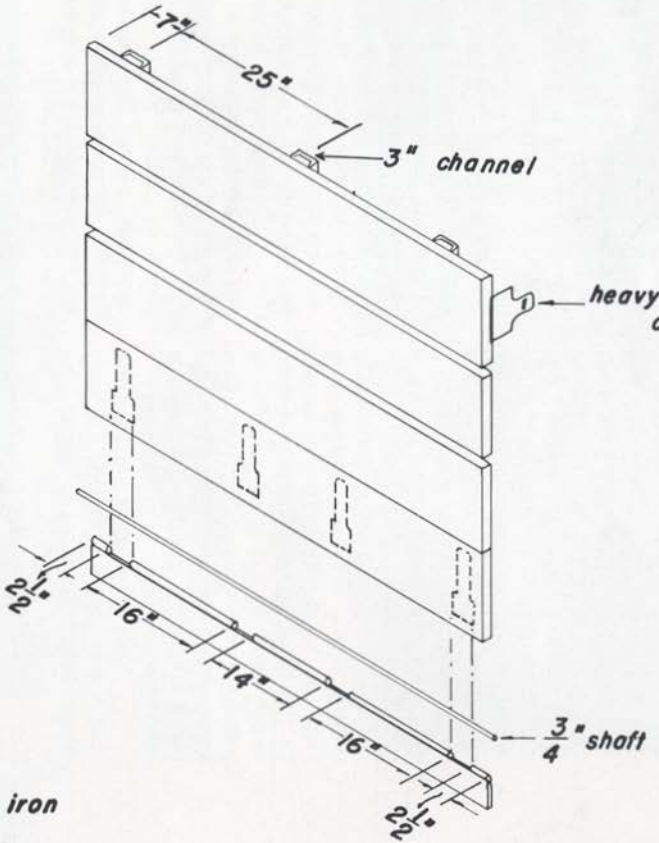
BILL OF MATERIALS

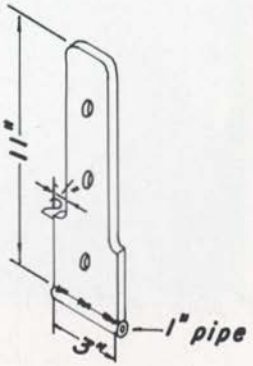
Item	Number	Length	Size
Channel Iron	3	79 1/2"	Standard 3"
	1	76"	"
	2	6 3/4"	"
	2	103"	"
	3	64"	"
	1	120"	"
	2	41"	"
	1	3"	"
	3	48"	"
Sheet Iron	1	4 1/4 sq. ft.	1/4" Plate
Bar Stock	1	71"	3" x 3/16"
	2	6"	3" x 1/4"
	1	15'	1 1/4" x 1/4"
	1	20'	1 1/2" x 3/16"
Angle Iron	2	8"	2 1/4" x 5/16"
	2	11"	3 1/2" x 1/4"
Rod	1	64"	3/4"
	1	22"	3/4"
*Pipe	1	60"	3/4" ID
	1	60"	2" ID
	3	1 1/2"	2 3/8" ID
Bolts	4	5"	1/2" Carriage
	6	3/4"	1/2" Machine
	6	2 3/4"	5/16" Carriage
	6	2 1/4"	5/16" Carriage
	36	3 1/2"	1/4" Carriage
	144	2 1/2"	1/4" Carriage
	92	2 1/4"	1/4" Carriage
	34	1 1/4"	1/4" Carriage
Lumber	4	48"	2" x 4"
	9	60"	2" x 4"
	2	54"	1" x 10"
	4	99"	1" x 10"
	2	99"	1" x 12"
	1	64"	1" x 12"
	1	64"	2" x 10"
	10	64"	2" x 12"
	3	77"	2" x 12"
Spindle	2		Light truck – 1 ton
Wheels	2		
Tires	2		
Miscellaneous hardware, heavy duty ball and hitch, and ratchet and pawl.			

ID denotes inside diameter

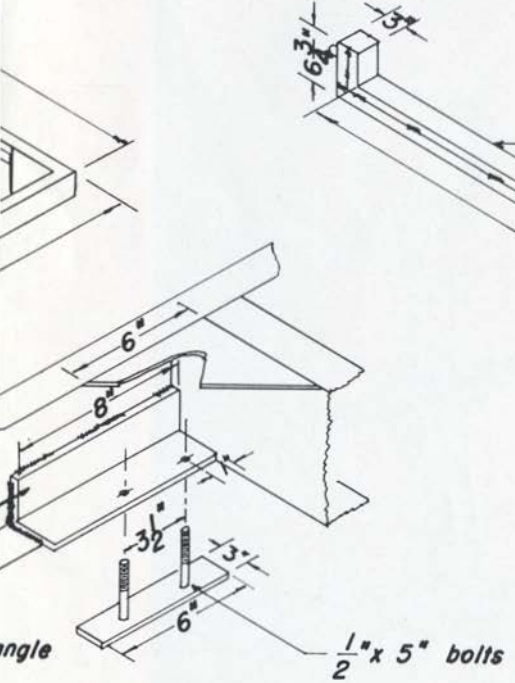

7"
21 1/4"
21 1/4"
24 3/4"
11 1/2"
7"
27"
35"
2" pipe, 63" long
7"
25"
6"
40"

30"x 1½"x¼" strap iron

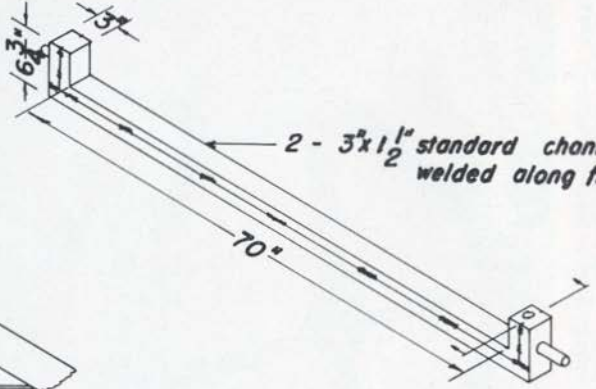




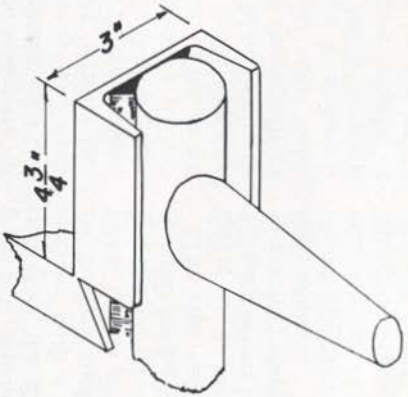
TAILGATE AND HINGE
CONSTRUCTION



SECTION DETAIL OF
AXLE MOUNTING



AXLE



SECTION DETAIL OF THE
SPINDLE ATTACHMENT

for the heavy duty stock trailer.

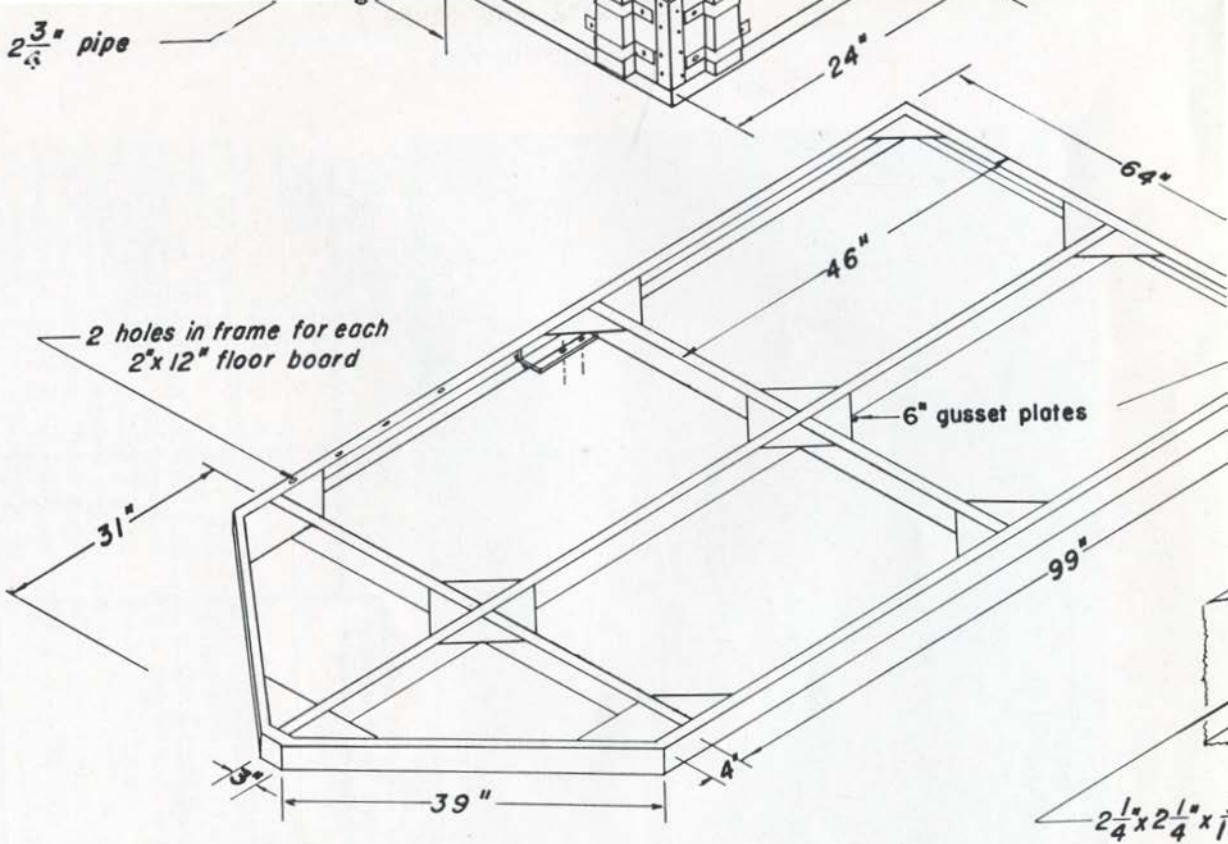


Figure 2.—Construction