

Aug. 28, 1951

D. S. ROBERTSON ET AL

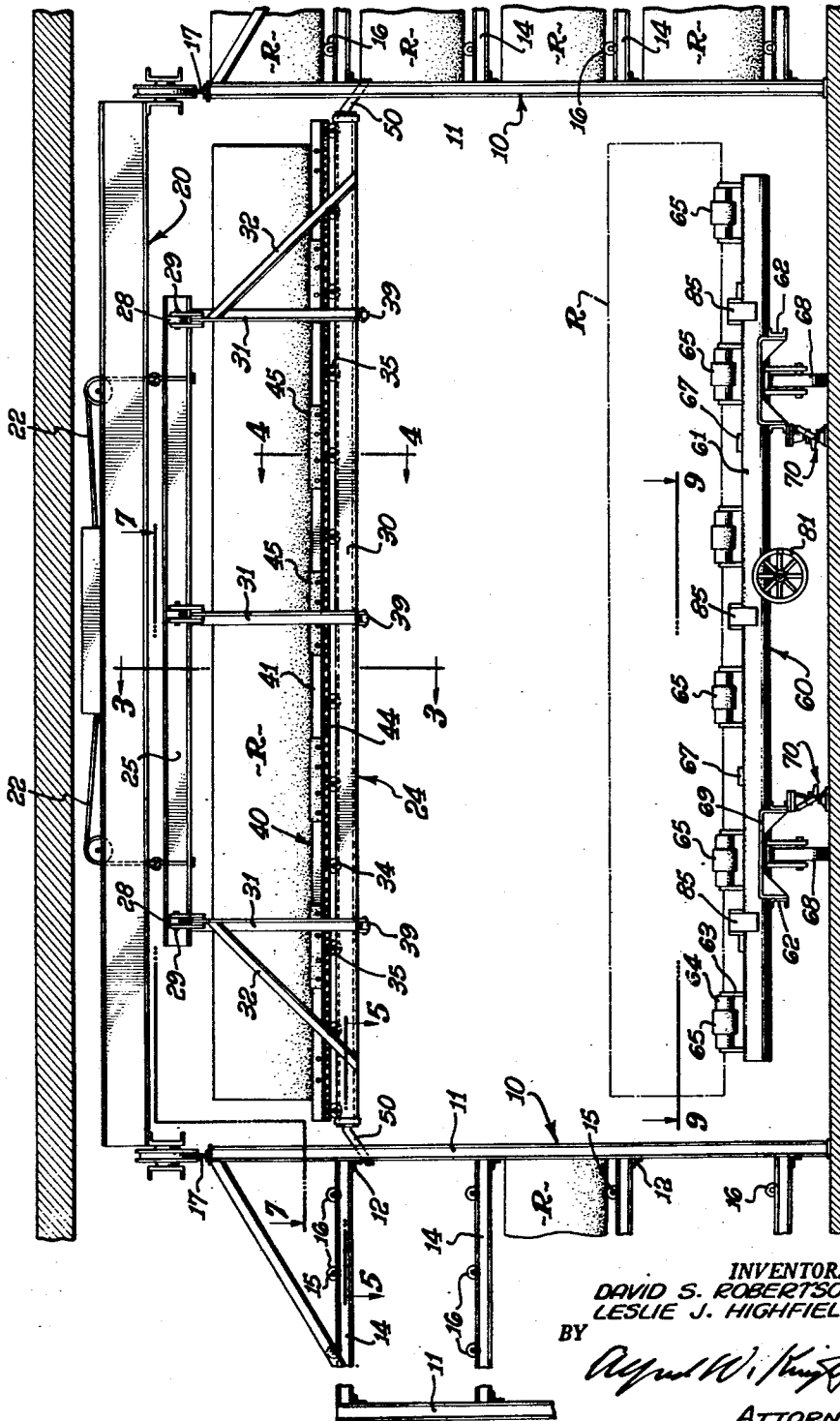
2,565,740

APPARATUS FOR HANDLING ROLLS OF SHEET MATERIAL

Filed Aug. 18, 1947

5 Sheets-Sheet 1

Fig. 1.



INVENTORS.  
DAVID S. ROBERTSON  
LESLIE J. HIGHFIELD  
BY *Reginald W. King*  
ATTORNEY.

Aug. 28, 1951

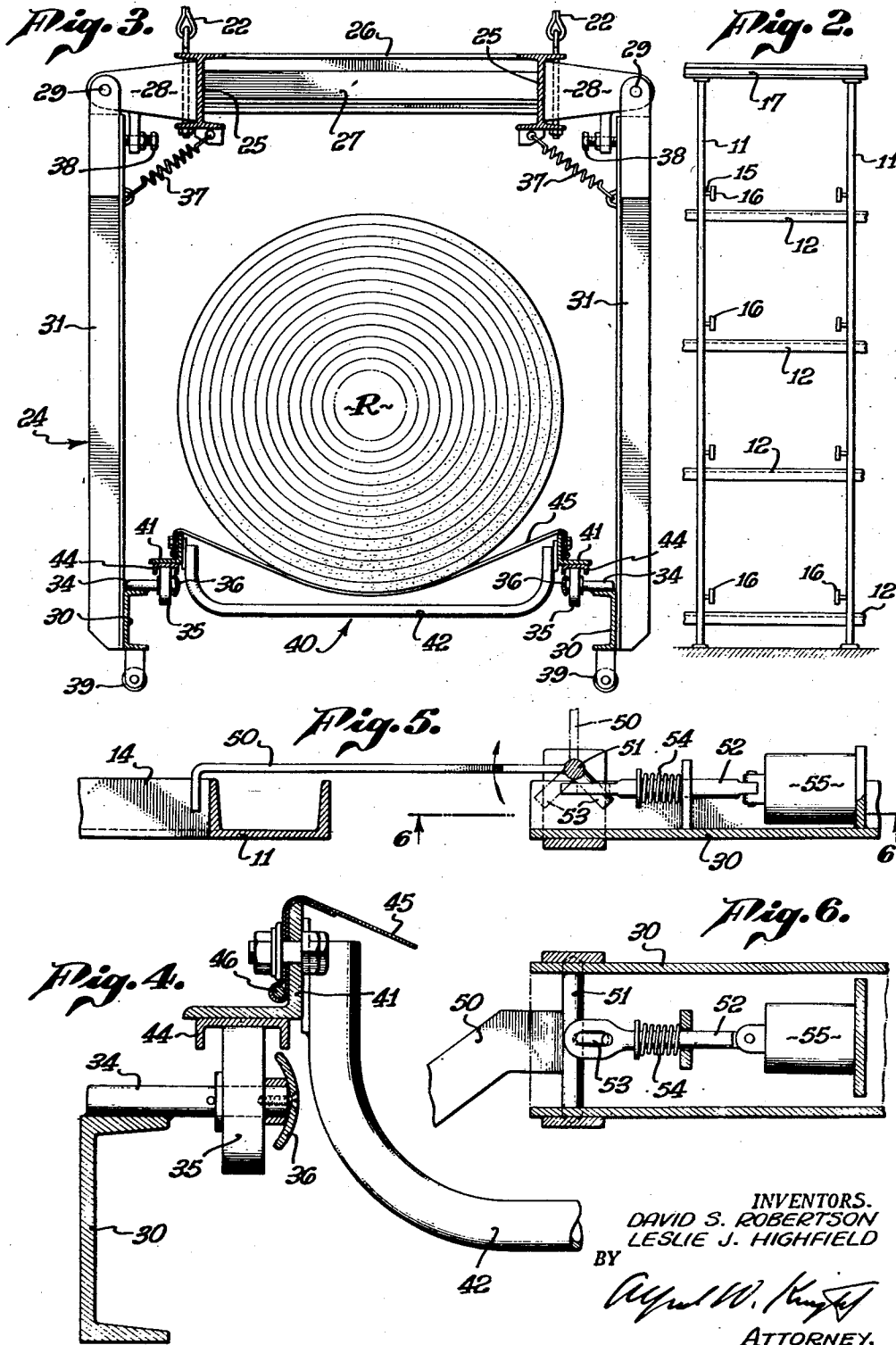
D. S. ROBERTSON ET AL

2,565,740

APPARATUS FOR HANDLING ROLLS OF SHEET MATERIAL

Filed Aug. 18, 1947

5 Sheets-Sheet 2



INVENTORS.  
DAVID S. ROBERTSON  
LESLIE J. HIGHFIELD

BY

*August W. Knight*  
ATTORNEY.

Aug. 28, 1951

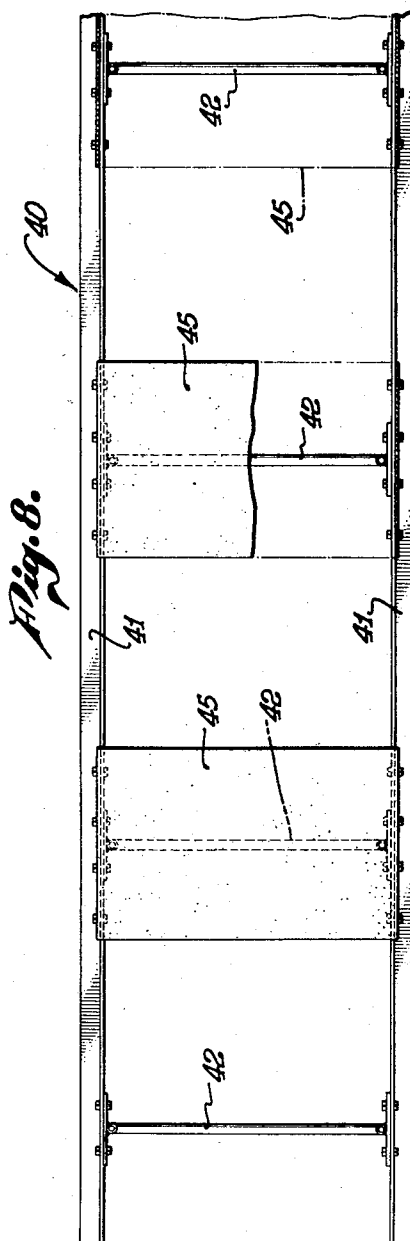
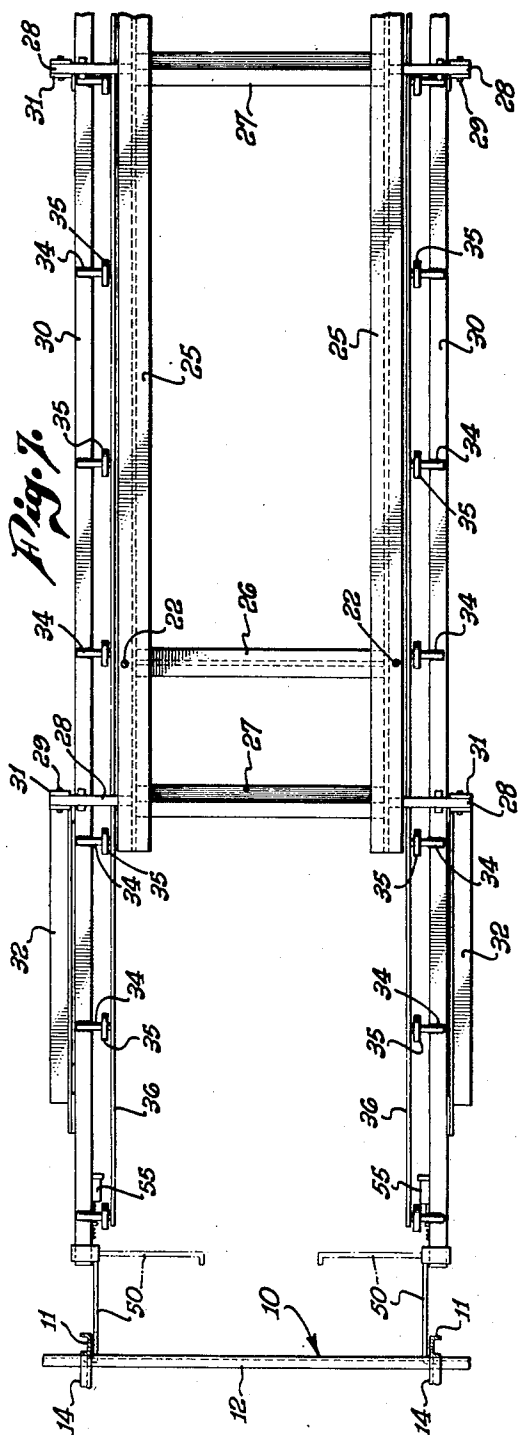
D. S. ROBERTSON ET AL

2,565,740

APPARATUS FOR HANDLING ROLLS OF SHEET MATERIAL

Filed Aug. 18, 1947

5 Sheets-Sheet 3



INVENTORS.  
DAVID S. ROBERTSON  
LESLIE J. HIGHFIELD  
BY

*Raymond W. Knight*

ATTORNEY.

Aug. 28, 1951

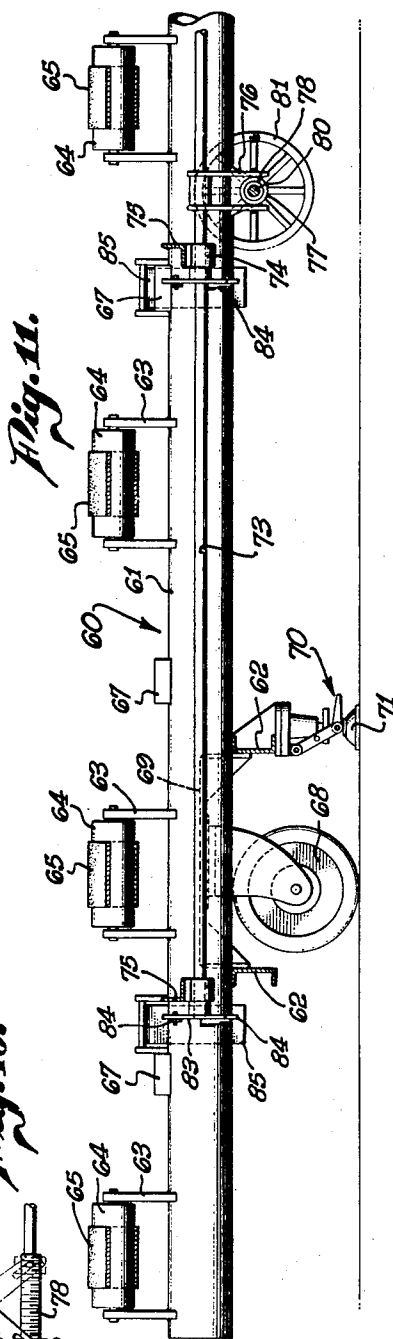
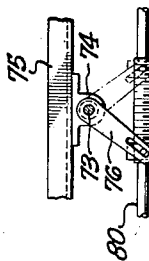
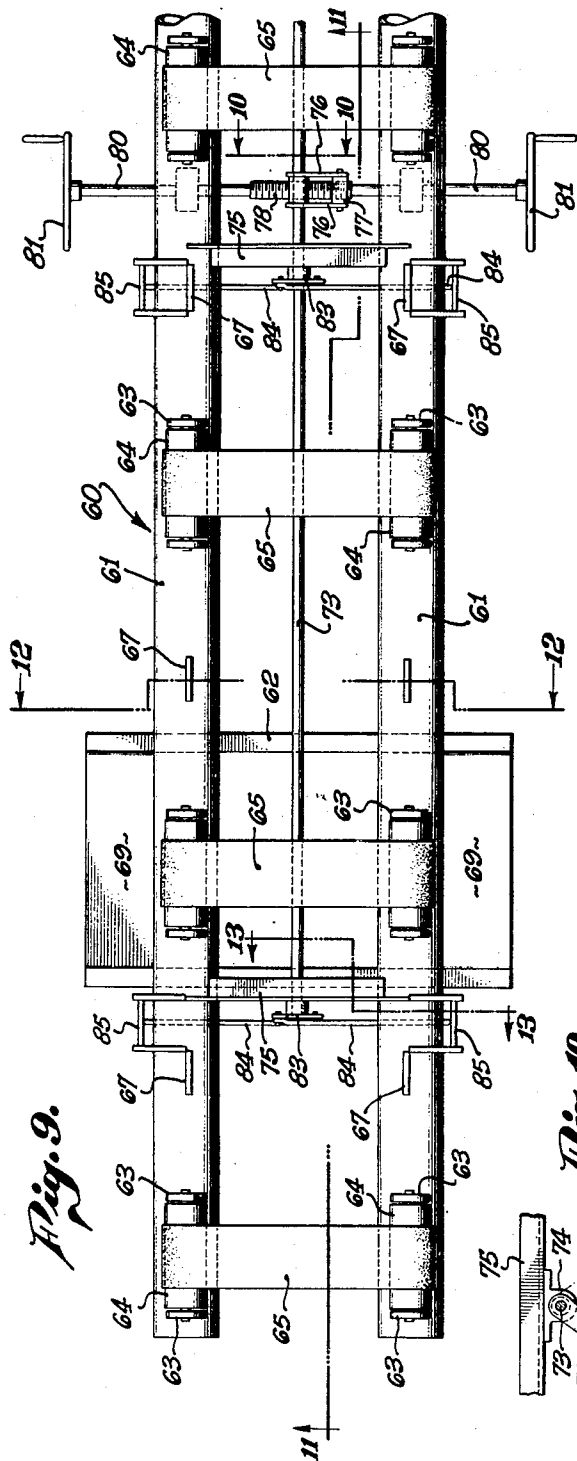
D. S. ROBERTSON ET AL

2,565,740

APPARATUS FOR HANDLING ROLLS OF SHEET MATERIAL

Filed Aug. 18, 1947

5 Sheets-Sheet 4



INVENTORS.  
DAVID S. ROBERTSON  
LESLIE J. HIGHFIELD

BY

*Wm. W. King*  
ATTORNEY.

Aug. 28, 1951

D. S. ROBERTSON ET AL

2,565,740

APPARATUS FOR HANDLING ROLLS OF SHEET MATERIAL

Filed Aug. 18, 1947

5 Sheets-Sheet 5

Fig. 12.

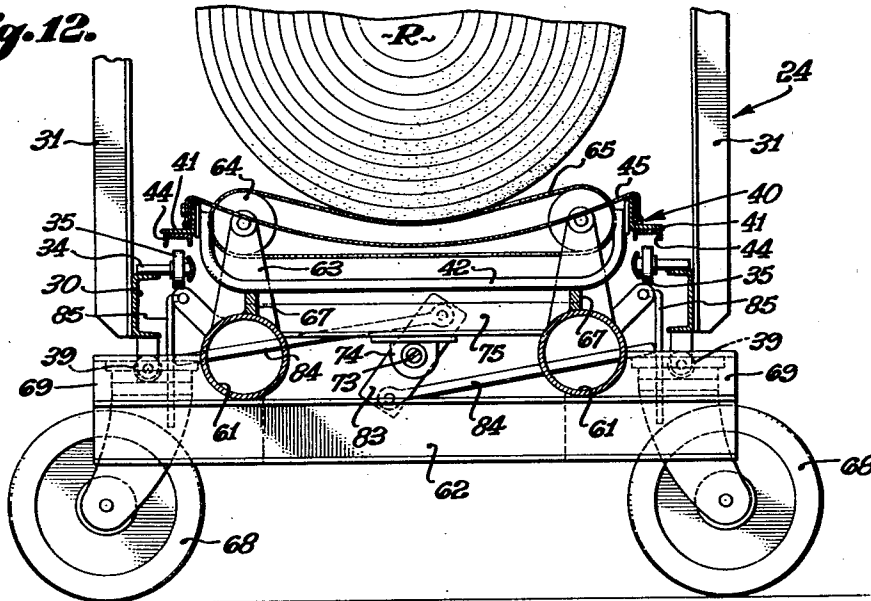


Fig. 14.

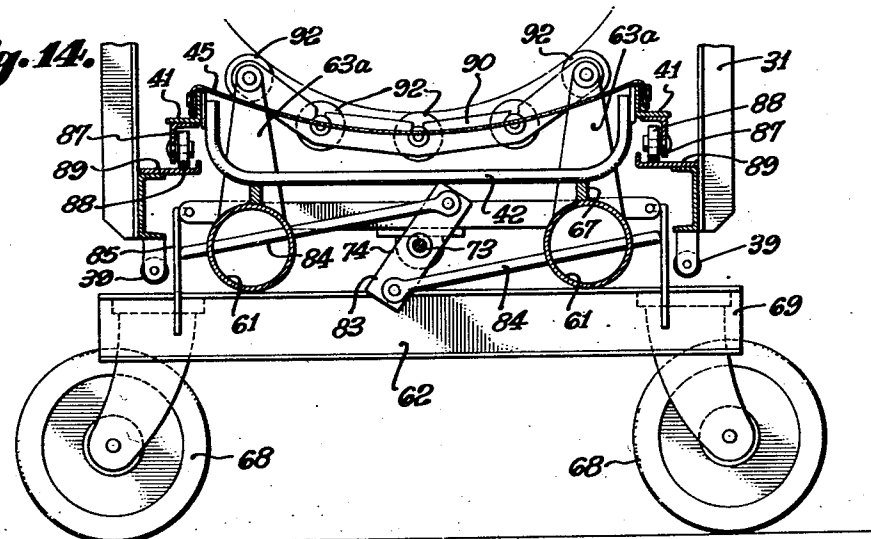
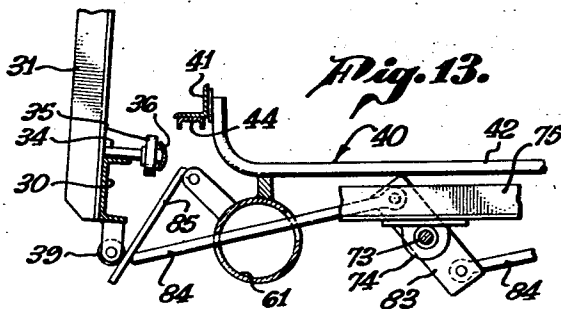


Fig. 13.



INVENTORS.  
DAVID S. ROBERTSON  
LESLIE J. HIGHFIELD

BY

*Wm. W. King*  
ATTORNEY.

## UNITED STATES PATENT OFFICE

2,565,740

APPARATUS FOR HANDLING ROLLS OF  
SHEET MATERIAL

David S. Robertson, Santa Monica, and Leslie J. Highfield, Los Angeles, Calif., assignors to Textile Handling Equipment Co., Santa Monica, Calif., a corporation of California

Application August 18, 1947, Serial No. 769,136

19 Claims. (Cl. 242—58)

1

The present invention relates generally to means for handling and storing rolls of sheet material, particularly textile materials, such as rugs, carpets, cloth and the like. In order to fully disclose our invention, we show and describe our invention as applied to storing and handling broadloom or other floor covering; but it will be understood that our invention is in no way limited to any particular type of material or size of roll.

The problems encountered in handling large, heavy rolls of floor coverings are well known in the art, and are more or less obvious from the character of the rolls themselves. Carpets, as for example broadlooms, are made in long lengths and then rolled up. These rolls are received in storerooms of both wholesalers and retailers of rugs; and it is in this form that rugs are stored and handled until they are cut to size and shipped out to the ultimate customer.

The rolls of carpeting, as well as other floor coverings, are heavy, usually weighing several hundred pounds and oftentimes weighing over a thousand pounds each. These large rolls are very bulky since they run upwards from six feet to as much as twenty feet in length. Rolls of this character present obvious difficulties in manual handling because of the size and weight of the rolls, and also because they are so limber and easily deformable that the rolls alone are very difficult to handle.

The rolls would be more easily transportable if they were more rigid; and it is impossible to use tongs or other similar mechanical elements in lifting and handling rugs because such implements would damage the rugs. Under these circumstances it is hard and exasperating work to handle these rolls manually.

No entirely satisfactory solution to this problem has heretofore been known. Various mechanical devices have been proposed, but the apparatus involved in handling large rolls has either been of the minimum character or has not been particularly adapted to the task at hand. For this reason known devices have not been efficient and have been very definitely limited in real utility and value.

Under these circumstances it is a general object of our invention to provide apparatus for handling rolls of floor covering and the like that is adapted to handle the rolls during all phases of normal operations occurring during handling and storage of rugs in warehouses and similar places, thus eliminating or reducing to a minimum all manual operations.

2

It is also a general object of our invention to provide apparatus that is adapted to quick and easy handling of rolls, thus effecting a saving in the time required for the various operations and the movement of the rolls, and gaining greater use and efficiency from a given installation.

It is also an object of our invention to provide rug-handling apparatus of the character described which is strong enough to handle the heaviest loads encountered and sufficiently versatile to meet all ordinary requirements, yet is simple in construction and operation and economically justifiable.

These and other objects of our invention have been attained by providing in combination with a storage rack, a cradle for individually supporting each roll, a carrier adapted to transport a cradle and the roll carried thereby, and a work bed which is adapted to receive the cradle and roll from the carrier. The rack ordinarily has a plurality of storage compartments each of which is adapted to receive a cradle and a roll on the cradle, the cradle and roll being moved endwise horizontally into a storage compartment. The carrier is adapted to transport the cradle and roll from place to place, and for this purpose it is designed to be moved both vertically and horizontally, and can be brought into registry with any desired compartment in the rack in order to receive a cradle by longitudinal movement out of the storage compartment onto the carrier.

Travelling hoisting means is provided for actually moving the carrier, this hoisting means preferably being one which is capable of horizontal and vertical proponents of motion within the necessary limits imposed by the particular installation. The hoisting means is adapted to transport the carrier from one position to another, and especially from a position opposite a storage compartment to a position above the work bed which is adapted to receive the cradle and roll from the carrier. The carrier can be disengaged from the cradle so that the carrier may be moved away leaving the roll free for working while on the work bed. The work bed includes means to support the cradle and other means to support the roll independently of the cradle so that by grasping one end of the sheet of material the roll may be unrolled while resting on the work bed. The portion unrolled is ordinarily cut off to size and finished as a rug or carpet filling a particular floor area.

How the above objects and advantages of our invention, as well as others not particularly referred to herein, have been attained, will be more

3

readily understood by reference to the following description and to the annexed drawings, in which:

Fig. 1 is a fragmentary elevation of a complete installation, there being shown at either side of the figure fragmentary vertical sections of two opposed storage racks with a central aisle between them, the carrier with a cradle thereon and a work bed being shown in elevation in this central aisle;

Fig. 2 is a fragmentary elevation of the front of a storage rack showing a single column or vertical row of storage compartments;

Fig. 3 is an enlarged vertical section on line 3—3 of Fig. 1 through the carrier with a cradle and roll carried thereby;

Fig. 4 is a fragmentary vertical section, similar to Fig. 3, taken on line 4—4 of Fig. 1;

Fig. 5 is a fragmentary horizontal section and plan view, at the front of the storage rack showing the locking means carried on the carrier, as indicated by line 5—5 of Fig. 1;

Fig. 6 is a fragmentary vertical section and elevation on line 6—6 of Fig. 5;

Fig. 7 is a fragmentary plan on line 7—7 of Fig. 1 showing approximately one-half of the hoisting means and the carrier without a cradle;

Fig. 8 is a fragmentary plan view of approximately one-half of a cradle only;

Fig. 9 is a fragmentary plan view on line 9—9 of Fig. 1 showing approximately one-half of the work bed;

Fig. 10 is a fragmentary elevation of a portion of the work bed as indicated by line 10—10 of Fig. 9;

Fig. 11 is a fragmentary vertical section through approximately one-half of the work bed as indicated by line 11—11 in Fig. 9;

Fig. 12 is a fragmentary transverse section through the work bed on line 12—12 of Fig. 9, showing in addition a cradle and a roll carried by the work bed and the carrier in lowered position;

Fig. 13 is a fragmentary transverse cross section similar to Fig. 12 but taken on line 13—13 of Fig. 9, showing the lower end of one side of the carrier swung outwardly to clear the cradle; and

Fig. 14 is a fragmentary transverse section similar to Fig. 12 of variational forms of work bed and mounting for the rollers on the cradle.

### Construction

Referring now to the drawings, there is shown in Fig. 1 at least a portion of all of the major units or sub-divisions of the apparatus which we provide, according to our invention, for handling and storing the rolls of sheet materials. These units are the storage racks, the travelling crane or hoist, the cradles for individually supporting each roll, the carrier attached to the hoisting means for transporting the cradles from one place to another, and the work bed upon which the roll rests while it is being unrolled or otherwise worked upon. Each of these major units of the apparatus will be described in detail, after which the operation of the apparatus as a whole will be described.

At the right- and left-hand sides of Fig. 1 are portions of storage racks, each indicated generally at 10. Although our invention is able to operate equally well with but a single storage rack, it is preferred to have two oppositely facing racks separated by a central aisle, as greater efficiency and utility is thus obtained. Each storage rack is a stationary structure having one or more storage

4

compartments each of which is adapted to receive a single roll R with the axis of the roll horizontal.

The exact dimensions and number of compartments furnished by the storage racks 10 are matters of choice to be determined by the sizes and quantities of the rolls to be stored. By way of example, a typical installation may be adapted to handle as many as one thousand rolls. In any given installation, the storage racks and their compartments may be of varying dimensions to accommodate rolls of different sizes.

Storage racks 10 are preferably a structural steel framework open on all sides to admit light and air to the rolls. This construction not only has the advantage of economy, but also makes the rolls relatively accessible for cleaning and for spraying with moth-proofing liquids. Typically, the compartments are arranged in horizontal and vertical rows. The structure illustrated herein has four compartments in each vertical row, as shown in Fig. 2, which shows the front elevation of a single vertical row. Generally speaking, the storage racks are formed by vertically extending posts 11 at the front and rear corners of each compartment, and transverse members 12 and longitudinal members 14 at the bottom of each compartment. Additional structural members may be used as necessary or desired.

The longitudinally extending members 14 of each storage rack carry a plurality of horizontally extending axles 15 upon which are mounted rollers 16. A number of such rollers 16 are spaced at regular intervals along each rack member 14 at the lower side of each storage compartment. These rollers support the roll-carrying cradles, as will be more fully described.

Along the front at the top of each storage rack 10 and supported by front posts 11, is a rail 17. The two rails 17 thus provided form a track upon which is carried the travelling crane or hoisting means, generally indicated at 20, which spans the aisle between the two storage racks. The travelling crane may be of any conventional type and is not necessarily limited to the construction shown, nor to one which is supported by the storage racks.

Travelling hoist 20 is provided with electric motors and control means therefor, not shown, for moving the hoist in a direction parallel to the front of the storage racks. The hoist is also provided with other electric motors and control means therefor, not shown, which raise and lower the four cables 22 which are attached to the cradle carrier indicated generally at 24.

The construction of carrier 24 is shown in detail in Figs. 1, 3 and 7. It consists of three principal parts, a generally rectangular frame at the top of the carrier, and a pair depending hangers, one at each side pivotally connected at its upper end to the frame and adapted at its lower end to engage a rug-carrying cradle. As may be seen from Figs. 3 and 7, the upper frame portion of the carrier consists of a pair of longitudinally extending, laterally spaced I-beams 25 which are connected together in parallel relationship by a plurality of transversely extending members. Two of these transverse members are I-beams 26 located at the connections of cables 22 to the carrier frame. Other transverse members, such as angles 27, are located opposite the outwardly extending arms 28 upon which the side hangers are pivoted at 29.

Each hanger consists basically of a longitudinally extending channel 30, or similar member, which is suspended from arms 28 at one side of

5

the carrier frame by upwardly extending members 31 and braces 32. Each horizontally extending channel 30 has attached at its upper edge a plurality of longitudinally spaced pins or axles 34, each of which has rotatably mounted on it a roller 35. Rollers 35 are similar to rollers 16 on the storage racks and, like the latter, are provided to engage the roll-carrying cradle. Guard rail 36 is fastened to the inner ends of axles 34 and extends the full length of the carrier.

Tension springs 37 are connected to the carrier frame and to the swinging hanger sides in order positively to draw the sides downwardly and inwardly to a predetermined position established by means of set screws 38. The under sides of channels 30 may be provided with roller bumpers 39 which, as will be more fully explained later, engage the work bed.

The carrier is designed to lift and transport a cradle. It will be realized of course that many details of construction of the carrier are determined by the size and construction of the cradle to be used in connection with the carrier. A cradle, typical of those which may be used satisfactorily as a part of our invention, is shown in Figs. 3 and 8.

The rug-carrying cradle, which is indicated generally at 40, comprises a pair of transversely spaced and longitudinally extending side rails 41 which are connected together at intervals by transversely extending U-shaped members 42. The longitudinally extending side rails may, if desired, be tubular or otherwise shaped in cross section, but may conveniently be made from structural angles, as may be seen best in Fig. 4. Transverse members 42 are formed of pipe or tubing with short upwardly extending legs attached to side rails 41 in any suitable manner. Members 42 maintain the side rails in spaced parallel relationship.

On the under side of the outstanding leg of each side rail 41, is attached a shallow channel 44, with the legs extending downwardly. Channels 44 form a track at each side of the cradle which engages and moves over rollers 35 on the carrier or rollers 16 on the storage rack as the case may be. The legs of channels 44 keep them properly aligned with the rollers on which the cradle is supported.

When carried by cradle 40, roll R is supported on flexible slings 45 which are spaced longitudinally along cradle 40 and extend between side rails 41. Slings 45 are wide belts of canvas or similar material. Slings 45 may be attached to side rails 41 by any suitable arrangement; but we have shown in Fig. 4 a simple form of fastening means which permits a desirable amount of adjustment in the length of a sling 45. Each end of the sling is folded over and the doubled portion is bolted to the upstanding leg of an angle 41. At the end of the loop in the sling there is placed a rod 46 which is sufficiently bulky to prevent the sling from being pulled upwardly between the leg of angle 41 and the washer on the fastening bolt.

As may be seen in Fig. 1, carrier 24 is capable of being brought into a position opposite the end of one of the storage compartments for the purpose of receiving therefrom a cradle and a rug on the cradle. When in this position, it is desirable that the carrier be held against longitudinal movement toward and away from the storage rack. For this reason locking means is provided at each end of the carrier, such locking

6

means being shown in detail in Figs. 5 and 6. At each of the four corners of carrier 24 there is pivotally mounted a hook shaped member 50 which has a downwardly inclined shank in order that the outer end of the hook can engage a post 11 of the storage rack slightly below transverse angles 12. Hook 50 is pivotally mounted on channel 30 of the carrier by a pivot pin 51. The hook is normally adapted to swing from a position extending endwise from the carrier, as shown in full lines in Fig. 5, through an arc of 90° to a transverse position, as shown by the dot-dash lines in Fig. 5.

Movement of hook 50 through this 90° arc is accomplished by means of operating rod 52 which is slotted at one end to receive pin 53 on pivot 51. Compression spring 54 normally urges rod 52 toward the left, as viewed in Fig. 5, to swing hook 50 into the transverse position indicated by the dot-dash line. A solenoid 55 attached to the opposite end of rod 52 can be actuated to retract the rod against spring 54 and move hook 50 into the extended or locking position in which it engages the storage rack. When the circuit to solenoid 55 is broken, hook 50 is restored to the non-locking position by the expansion of spring 54 moving rod 52 oppositely to the movement induced by the solenoid.

The carrier is adapted to lower the roll and cradle onto a work bed which is indicated generally at 60. This work bed comprises a pair of longitudinally extending, and transversely spaced, members 61 which are interconnected by two pairs of transverse channels 62. A pair of channels 62 is located toward each end of members 61 and holds the latter in spaced relationship. The two longitudinally extending members 61 have mounted above them on arms 63 several pairs of rollers 64, each pair carrying an endless belt 65. There are a plurality of such transversely extending belts 65, the individual belts being longitudinally spaced from each other as shown particularly in Figs. 9 and 11. Belts 65 support the roll R on the work bed.

The work bed is also adapted to support a cradle, which can be supported conveniently on longitudinal members 61 by engagement therewith. It is preferable, although not necessary, that pads 67 be placed on member 61 at positions to engage transverse members 42 of the cradle. Pads 67 serve to obtain a proper relative positioning of the cradle, as will be more evident from later description.

Although our invention is broad enough to include a work bed of different character or one which may be stationary, it is preferable that the work bed be mobile so it can be moved along the aisle between the storage racks. For this purpose we prefer to provide work bed 60 with wheel means which engage the floor upon and over which the work bed moves. This wheel means includes four castored wheels 68 which are each mounted on the under side of a U-shaped bracket 69 carried by and between the ends of transverse channels 62. Wheels 68 are mounted upon the bracket in any suitable manner to swivel as the truck is moved, permitting the work bed to be accurately located in any desired point.

Because there are times when it is desired that the work bed remain stationary, the work bed is provided with two foot locks, indicated generally at 70, which are mounted on brackets carried by channels 62. These foot locks are not shown or described in detail because they are

of conventional construction, and other types may be used equally well. In the type here shown, a spring (not shown) forces a gripping member 71 firmly into engagement with the floor, and by this engagement holds the work bed against movement over the floor. By compressing the spring, grip 71 is raised from the floor and the work bed is again rendered mobile.

After the carrier has deposited the cradle and roll on the work bed, it is desirable that the carrier be removed from the work bed. For this purpose the work bed carries means for freeing the carrier and cradle to permit removal of the carrier from the work bed while leaving the cradle resting upon the work bed. Such means may best be seen by reference to Figs. 9 and 12, and comprises a longitudinally extending shaft 73 which is rotatably mounted in bearings 74 each carried by a transverse member 75. At its center, shaft 73 carries a pair of fixed arms 76 which are connected at their outer ends by a slot-and-pin arrangement to travelling nut 77 on lead screw 78. The lead screw may be rotated by shaft 80 which has a hand wheel 81 on each end. Rotation of shaft 80 by means of a hand wheel in one direction causes nut 77 to move from one end of lead screw 78, as shown in Fig. 9, to the other end, and it can be returned by rotating shaft 80 and lead screw 78 in the opposite direction. The travel of nut 77 moves arms 76 through an arc and causes corresponding limited rotation of shaft 73.

At its ends and at a point near its center, shaft 73 carries a short, double crank 83 which has a push rod 84 connected at each end. Each push rod passes through one of the longitudinal members 61 which acts as a guide to direct the outer end of the rod. The inner wall of members 61 is provided with a slot, as shown in Fig. 13, while the far or outer wall is provided with a circular opening but slightly larger than a rod 84 in order that the push rod may slide freely through the longitudinal member but be accurately guided thereby. The end of each push rod 84 engages the inner face of a swinging plate 85 pivotally mounted on a fixed arm attached to the adjoining member 61.

Rotation of shaft 73 in a given direction, as previously described, causes push rods 84 to be moved from the retracted position shown in Fig. 12 to the extended position shown in Fig. 13, and then back again to the retracted position. In the position of Fig. 12, each swinging plate 85 is in a substantially vertical position, while in the extended position shown in Fig. 13, each push rod 84 has pushed the associated plate 85 outwardly to an inclined position. As the plate swings out, it engages a bumper 39 on the lower end of the depending hangers on carrier 24. The entire side of the hanger is swung outwardly, around pivot 29, by movement of plates 85 so that rollers 35 are moved laterally a sufficient distance to be free and clear of track 44 and side rail 41 on the cradle. As shown in Fig. 12, the rollers have been previously disengaged from the cradle by lowering the carrier for a short distance below the cradle which is at rest upon the work bed.

By reversing the rotation of shaft 73, push rods 84 are retracted and plates 85 swing downwardly to their normal vertical position. When this is done, the lower ends of the carrier hangers move inwardly under the force supplied by springs 37 until rollers 35 are again directly underneath track 41 on the cradle. The inward travel of

the rollers is regulated by means of adjusting screws 38.

### Operation

Having described the construction of a preferred form of our invention, we shall now describe the sequence of operations which may be accomplished with the apparatus in order to efficiently and effectively store and handle rolls of material.

Initially a roll of material R is placed upon a cradle 40 so that the roll rests upon flexible slings 45 in the manner shown in Fig. 3. The manner of handling the roll to place it upon the cradle is immaterial to the present invention, and it may be assumed that this operation is performed manually. During this operation, the cradle may be assumed to be supported upon a table, not shown in the drawings, and afterward the cradle is moved longitudinally, with the roll, onto the carrier 24 so that rollers 35 on the carrier engage tracks 44 on the cradle side rails 41. This is the relative position of the cradle and carrier as shown in Fig. 3. By means of travelling crane 20, the cradle and roll are lifted by the carrier and transported horizontally and/or vertically the distance necessary to bring the carrier opposite an empty storage compartment in a storage rack 10. Solenoids 55 are then actuated to swing locking arms 50 into engagement with posts 11, as shown in Fig. 1. The roll and cradle may now be pushed off the carrier and into the empty storage compartment. During this operation channels 30 of the carrier are longitudinally aligned with longitudinally extending members 14 of the storage rack so that rollers 35 on the carrier and rollers 16 on the storage rack are aligned in two rows. Thus the cradle moves smoothly off the carrier and onto the rollers in the storage rack where the cradle remains holding the roll. Fig. 1 shows a cradle and roll lifted by the carrier into a position opposite a top row storage compartment preparatory to moving the roll and cradle into the storage compartment at the left-hand side of Fig. 1, in the manner just described.

Solenoids 55 are then de-energized and locking arms 50 are swung inwardly of the carrier which may now again be moved up or down or lengthwise along the aisle between the storage racks.

After having stored a number of rolls on individual cradles in the manner just described, it is assumed that it is now desired to remove from a rack one of the rolls in order to cut therefrom a length of carpet. Carrier 24 is again brought into position opposite the selected storage compartment containing the particular rug R from which it is desired to cut a piece. The locking means on the carrier is brought into engagement with the storage rack. The cradle and roll are then moved longitudinally from the compartment and onto the carrier, the rollers on the carrier and storage rack being aligned so that cradle tracks 44 pass smoothly from rollers 16 to rollers 35.

When the roll and cradle have been centrally positioned on the carrier, as shown in Fig. 1, the locking means are retracted and the carrier is now free to be moved longitudinally of the aisle, as well as vertically, by means of hoisting means 20. At this stage the transportation of the carrier can be divided into two phases. First, it is moved along the aisle in front of the storage racks until it occupies a position directly above

work bed 60. Then the carrier with the cradle and roll upon it is lowered onto the work bed.

The work bed is adapted to receive the carrier and cradle by downward movement of these parts in a vertical path. The longitudinal spacing between endless belts 65 is such that they lie in the spaces between longitudinally spaced slings 45 on the cradle. Thus, as the cradle is lowered, slings 45 pass downwardly between endless belts 65 and are actually lowered to positions below these endless belts.

By this arrangement roll R is lowered onto endless belts 65 which receive the full weight of the roll and support it on the work bed independently of the cradle, as will be seen in Fig. 12. After the cradle is lowered sufficiently that slings 45 are lower than the endless belts on the work bed, the transverse members 42 of the cradle are brought into contact with the longitudinally extending members 61 of the work bed. Transverse members 42 rest upon pads 67 which are easily machined to the desired height to properly position the cradle.

Continued downward movement of the carrier for a short distance results in disengagement of rollers 35 from tracks 44 as shown in Fig. 12. In this position, the cradle is supported entirely by the work bed, as is likewise roll R, and the roll is supported independently of the cradle. The sides of the carrier hang free and do not support or engage the cradle.

Next, the hand wheel 81 is turned in order to rotate shaft 73 and move push rods 84 outwardly. The push rods move against swinging plates 85 which engage bumpers 39 on the lower ends of the sides of carrier 24, and cause these sides to swing outwardly, as shown in Fig. 13, pivoting around pins 29. This outward movement of the sides of the carrier brings them into positions from which they can be moved upwardly free and clear of the sides of cradle 40. The carrier is raised by hoisting means 20; and guard rails 36 prevent rollers 35 and axles 34 from fouling on track 44 or snagging the roll R as the carrier moves up or down. The cradle and its load thus remain on the work bed, while the carrier is disengaged from the cradle and moved clear of the work bed so that it is not in the way of any operations upon the roll. Also the carrier is free to be put into service handling other rolls.

The workman now seizes the free end of the rug in roll R and pulls on this end in a direction generally parallel to the floor. The roll R revolves, unrolling the rug, and endless belts 65 move forward around rollers 64 which turn freely. In this way, the roll of carpet can be unrolled while it is supported upon the work bed, eliminating any necessity for manual lifting or transporting of the roll after it has once been placed on belts 65. After the proper length of carpet has been unrolled it is cut off; and the excess carpet is rolled up again by manually revolving roll R upon endless belts in the opposite direction.

To return the roll to its storage compartment, the operations described are reversed. The carrier is now brought overhead and then lowered over the work bed, with one of the sides of the carrier at either side of roll R. Rollers 39 engage plates 85 and the lower ends of the carrier sides are swung outwardly against springs 37 until the sides have once again reached positions substantially as shown in Fig. 13. To retract push rods 84, hand wheels 81 are turned in the direction opposite to the previous motion

and the lower ends of the carrier sides move inwardly until rollers 35 are positioned again directly beneath tracks 44.

When hoisting means 20 is actuated, carrier 24 is lifted and by engagement of rollers 35 with tracks 44, cradle 40 and the roll thereon are raised off the work bed and can be transported into position opposite the compartment in which it is desired to store the rug. Hooks 50 of the locking means are swung out to engage the rack to hold the carrier in position opposite the open end of the compartment while the cradle and roll are moved longitudinally off the carrier into the storage compartment, all as previously described.

From the foregoing it will be seen that manual handling of the rolls is substantially entirely eliminated and that our apparatus is able to perform all of the operations necessary to handle the roll incidental to storage and moving it to and from a work bed or other place at which lengths are cut from the roll. The heavy operations of lifting the roll and moving it horizontally along the aisle in front of the storage racks are performed by power-operated means contained in the hoisting means 20. However, the loaded cradle moves so very easily over the rollers on which it is carried that power means are not required, and it is more convenient to push the loaded cradle manually onto and off of the carrier when taking rolls from the storage compartments or returning them thereto.

#### Modifications

In the foregoing description of the construction of our improved apparatus, we have shown an arrangement wherein the cradle is provided at either side with a track which engages and rides over a plurality of rollers in the storage racks and on the carrier. Rollers are provided in two rows, one at either side of the carrier and storage compartment, properly spaced to be engaged by the two tracks on the cradle. It will be obvious however that the location of the tracks and rollers can be interchanged, that is that the rollers can be mounted upon the movable cradle while stationary tracks are provided upon both the storage racks and the carrier.

Such an arrangement is shown in Fig. 14 in which all of the parts are constructed as previously described, except for reversing the relative positions of the rollers and tracks. In Fig. 14 it will be noted that an angle 87 is provided on the under side of side rail 41 of the cradle, and that a plurality of rollers 88 are rotatably mounted on the downwardly extending leg of angle 87. These rollers are spaced at suitable intervals longitudinally of the cradle. Plate 89 is placed on top of each channel 30 to form a track on which rollers 88 ride. The inner edge of each plate 89 is preferably turned up as shown to provide a short vertical flange to engage and guide rollers 88 to prevent them from leaving the track.

When the track and roller arrangement shown in Fig. 14 is used it will be readily understood without additional illustration how the storage compartment is modified in a similar fashion by omitting pins 15 and rollers 16 and substituting therefor a track for rollers 88 which is similar in shape and position to plate 89. This interchange of track and rollers in no way changes or affects the method of operating the apparatus as described above.

Fig. 14 also shows another modification of our

invention in which endless belts 65 on the work bed have been replaced by a plurality of roll-supporting rollers. In order to accommodate these rollers, arms 63a have been extended upwardly as compared with arms 63 in Fig. 12. One transverse pair of arms 63a carries a bar 90, and a second transverse pair of arms 63a, spaced longitudinally from the first pair, carries a second transverse bar 90. Mounted on this pair of bars 90 is a plurality of rollers 92, here shown as being five in number although more or less may be used if desired. Rollers 92 are freely and independently rotatable, and are arranged with their axes parallel and extending longitudinally of roll R and the work bed. The length of rollers 92 is approximately the same as the width of a belt 65.

Each of the several endless belts 65 may be replaced by a group of rollers such as just described, the several groups of rollers being spaced apart similarly to belts 65 and carrying the roll R on the work bed in a manner to permit it to be freely unrolled while supported on the work bed. It will be noted that the rollers are progressively higher on either side of the center one, thus forming a depression in which the roll rests. An advantage is obtained in some cases by using these rollers instead of the endless belts in that the outermost rollers 92 engage roll R when the latter is being unrolled and offer a greater resistance to movement of roll R off the work bed than do the endless belts. This change in the roll supporting means on the work bed in no way changes its operation, or any of the other operations described above.

From the foregoing description of the construction and operation of a preferred form of our invention it will be apparent that changes in the construction and arrangement of parts may be made by persons skilled in the art without departing from the spirit and scope of our invention. Consequently, we do not wish to be limited in the broader aspects of our invention by the details of the present disclosure, and consider the above description to be illustrative of rather than restrictive upon the appended claims.

We claim:

1. In apparatus for handling an elongated roll of sheet material, the combination comprising: a cradle engaging the underside of a roll for supporting the roll; a carrier adapted to transport a cradle and the roll thereon; and a work bed adapted to receive the cradle and roll from the carrier, and including means to support the roll and cradle independently of each other to permit the roll to be unrolled while supported on said work bed.

2. Apparatus as in claim 1 in which the cradle comprises a pair of transversely spaced longitudinally extending side rails, a plurality of transverse members interconnecting the side rails to maintain them in spaced relation, and a plurality of longitudinally spaced flexible slings extending between the side rails to carry the roll.

3. Apparatus as in claim 1 in which the carrier comprises a frame, and a pair of spaced hangers pivotally connected at their upper ends to the frame and adapted to engage the cradle at their lower ends to lift the cradle, the hangers being swingable outwardly to positions at which their lower ends clear the cradle.

4. Apparatus as in claim 1 in which the roll supporting means on the work bed comprises a plurality of longitudinally spaced, transversely

extending endless belts on which the roll rests above and independently of the cradle.

5. In apparatus for handling an elongated roll of sheet material, the combination comprising: a cradle engaging the underside of a roll for supporting the roll; a carrier adapted to transport a cradle and the roll thereon; travelling hoisting means for lifting and moving the carrier; and a work bed adapted to receive the cradle and roll from the carrier, and including means to support the roll and cradle independently of each other to permit the roll to be unrolled while supported on said work bed.

6. In apparatus for handling an elongated roll of material, the combination comprising: a cradle engaging the underside of a roll for supporting the roll, the cradle comprising a pair of longitudinally extending side rails, a plurality of transverse members interconnecting the side rails, and a plurality of flexible slings extending between the side rails to carry the roll; travelling hoisting means; a carrier adapted to lift and transport the cradle and the roll thereon, said carrier comprising a frame attached to the hoisting means, and a pair of spaced hangers pivotally mounted on the frame and adapted to engage the cradle to lift it; and a work bed adapted to receive the cradle and roll from the carrier, and including means to support the roll and cradle independently of each other to permit the roll to be unrolled while supported on the work bed.

7. Apparatus as in claim 6 in which the roll supporting means on the work bed comprises a plurality of longitudinally spaced, transversely extending belts on which the roll rests above and independently of the cradle.

8. Apparatus as in claim 6 in which the work bed includes longitudinally extending members engaging the transverse members of the cradle to support the cradle, and a plurality of transversely extending endless belts longitudinally spaced at positions above and between the slings on the cradle to support the roll on the work bed independently of the cradle.

9. Apparatus as in claim 6 in which the work bed has wheels engaging a floor making the work bed movable over the floor.

10. In apparatus for handling an elongated roll of sheet material, the combination comprising: a cradle engaging the underside of a roll for supporting the roll; a stationary rack having a storage compartment adapted to receive the cradle and the roll thereon by longitudinal movement of the cradle into the compartment; a carrier adapted to transport a cradle and the roll thereon and to receive the cradle from the compartment by longitudinal movement of the cradle out of the compartment onto the carrier; travelling hoisting means for lifting and moving the carrier; and a work bed adapted to receive the cradle and roll from the carrier, and including means to support the roll and cradle independently of each other to permit the roll to be unrolled while supported on said work bed.

11. Apparatus as in claim 10 in which the work bed receives the cradle by vertical movement of the carrier and cradle down onto the bed.

12. In apparatus for handling an elongated roll of sheet material, the combination comprising: a cradle engaging the underside of a roll for supporting the roll; a stationary rack having a storage compartment adapted to receive the cradle and the roll thereon by longitudinal movement of the cradle into the compartment; a carrier adapted to transport a cradle and the roll thereon

13

and to receive the cradle from the compartment by longitudinal movement of the cradle out of the compartment onto the carrier; locking means on the carrier engageable with the rack to hold the carrier in position relative to the compartment during transfer of the cradle; travelling hoisting means for lifting and moving the carrier; and a work bed adapted to receive the cradle and roll from the carrier, and including means to support the roll and cradle independently of each other to permit the roll to be unrolled while supported on said work bed.

13. In apparatus for handling and storing a plurality of elongated rolls of sheet material, the combination comprising: a plurality of cradles each engaging the underside of a roll for supporting the roll; a stationary rack having a plurality of storage compartments each adapted to receive a cradle and the roll thereon by longitudinal movement of the cradle into the compartment; a carrier adapted to transport a cradle and the roll thereon and to receive the cradle from a compartment by longitudinal movement of the cradle out of the compartment onto the carrier; travelling hoisting means for lifting and moving the carrier; and a work bed adapted to receive a cradle and roll from the carrier, and including means to support the roll and cradle independently of each other to permit the roll to be unrolled while supported on said work bed.

14. In apparatus for handling an elongated roll of sheet material, the combination comprising: a cradle engaging the underside of a roll for supporting the roll; and a work bed adapted to receive the cradle and roll, and including means to support the roll and cradle independently of each other to permit the roll to be unrolled while supported on said work bed.

15. Apparatus as in claim 14 in which the roll supporting means on the work bed comprises a plurality of longitudinally spaced, transversely extending endless belts on which the roll rests above and independently of the cradle.

16. In apparatus for handling an elongated roll of material, the combination comprising: a cradle engaging the underside of a roll for supporting the roll, the cradle comprising a pair of longitudinally extending side rails, a plurality of transverse members interconnecting the side rails, and a plurality of flexible slings extending between the side rails to carry the roll; and a work bed adapted to hold the cradle and roll, including means engaging the cradle to support the cradle, and a plurality of transversely extending endless belts longitudinally spaced at positions above and between the slings on the cradle when the cradle is so supported to support the roll independently of the cradle in a manner to permit the roll to be unrolled while supported by the work bed.

17. In apparatus for handling an elongated roll of sheet material, the combination comprising: a cradle for supporting a roll; a carrier adapted to transport the cradle, including a frame and a pair of hangers each pivotally connected at the upper end to the frame and adapted for engagement with the cradle at the lower end; a work bed adapted to receive the cradle from the carrier and to support it; and means on the work bed for spreading outwardly the lower ends of the carrier hangers to free the cradle from the carrier to permit removal of the carrier from the bed after the cradle rests upon the work bed, said means

14

including a pair of members movable laterally of the work bed at opposite sides thereof to each engage and move outwardly one of the carrier hangers.

18. In apparatus for handling an elongated roll of sheet material, the combination comprising: a cradle for supporting a roll; a carrier adapted to transport the cradle, including a frame and a pair of hangers each pivotally connected at the upper end to the frame and adapted for engagement with the cradle at the lower end; a work bed adapted to receive the cradle from the carrier and to support it; and means on the work bed for spreading outwardly the lower ends of the carrier hangers to free the cradle from the carrier to permit removal of the carrier from the bed after the cradle rests upon the work bed, said spreading means including a rotatable shaft; means for rotating the shaft; a pair of oppositely extending rods connected to the shaft and movable longitudinally by rotation of the shaft; and a pair of plates one on each side of the bed pivotally mounted to swing about a horizontal axis in response to motion of one of said rods, and engageable with a carrier hanger to move the lower end of the hanger outwardly beyond the cradle.

19. In apparatus for handling an elongated roll of material, the combination comprising: a cradle engaging the underside of a roll for supporting the roll, the cradle comprising a pair of longitudinally extending side rails, a plurality of transverse members interconnecting the side rails, and a plurality of flexible slings extending between the side rails to carry the roll; travelling hoisting means; a carrier adapted to lift and transport the cradle and the roll thereon, said carrier comprising a frame attached to the hoisting means, and a pair of spaced hangers pivotally mounted on the frame and adapted to engage the cradle to lift it; and a work bed adapted to receive the cradle and roll from the carrier, and including means for supporting the cradle and a plurality of independently rotatable rollers arranged with their axes longitudinal of the roll and the work bed for supporting the roll independently of the cradle to permit the roll to be unrolled while supported on the work bed.

DAVID S. ROBERTSON.  
LESLIE J. HIGHFIELD.

#### REFERENCES CITED

The following references are of record in the file of this patent:

#### UNITED STATES PATENTS

| Number    | Name            | Date           |
|-----------|-----------------|----------------|
| 1,317,776 | Claus           | Oct. 7, 1919   |
| 1,509,400 | Fitch           | Sept. 23, 1924 |
| 1,514,769 | Johnston et al. | Nov. 11, 1924  |
| 1,547,683 | Reid et al.     | July 28, 1925  |
| 1,613,381 | Cameron         | Jan. 4, 1927   |
| 1,643,489 | Fitch           | Sept. 27, 1927 |
| 1,669,837 | Pancoast        | May 15, 1928   |
| 1,874,859 | Been            | Aug. 30, 1932  |
| 2,096,958 | Clerc           | Oct. 26, 1937  |
| 2,220,230 | Gilbert         | Nov. 5, 1940   |
| 2,376,560 | Smith           | May 22, 1945   |

#### FOREIGN PATENTS

| Number  | Country | Date         |
|---------|---------|--------------|
| 429,703 | Germany | June 1, 1926 |