Feb. 4, 1964 K. V. JOHNSON ETAL 3,120,315

SCOOP LOADER ATTACHMENT

Filed Nov. 30, 1960 2 Sheets-Sheet 1

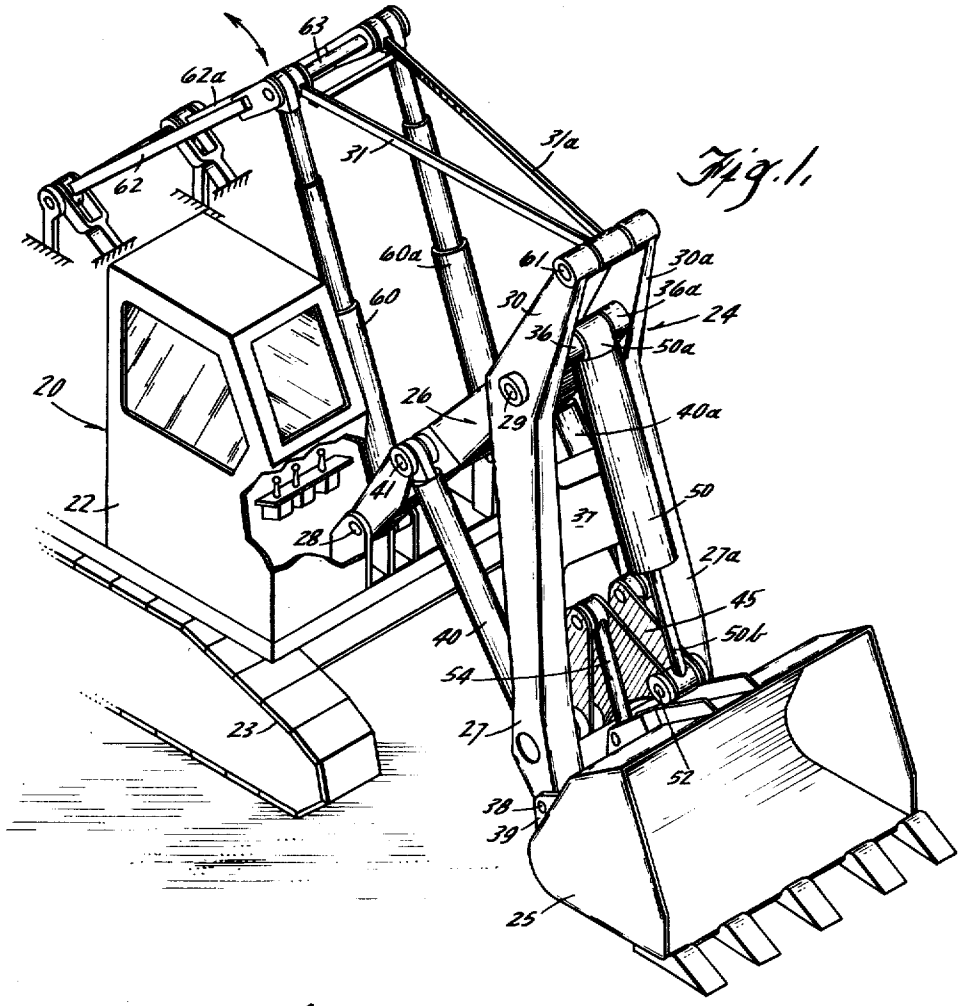

Fig. 1.

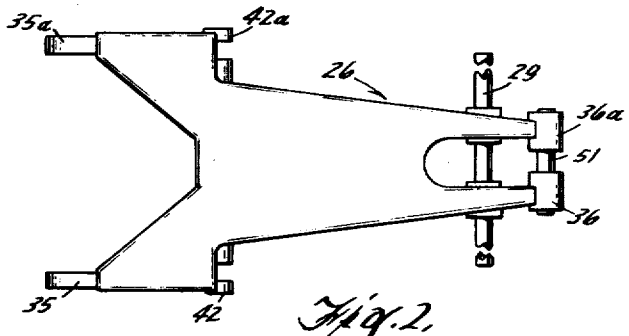

Fig. 2.

INVENTORS
CHARLES L. FLEMING
KENNETH V. JOHNSON
BY
ATTORNEY.

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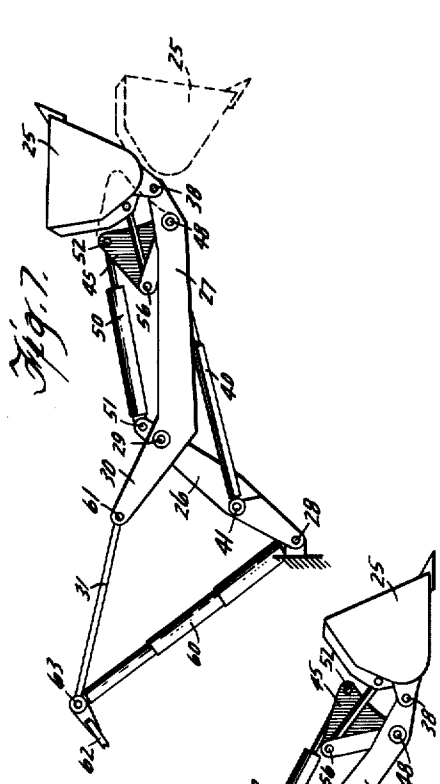

Fig. 7.

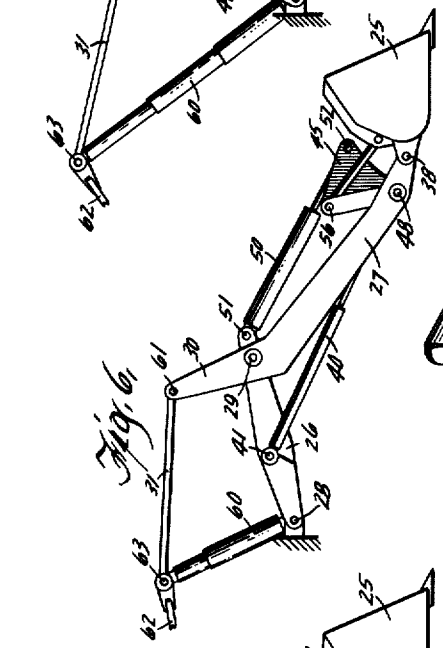

Fig. 6.

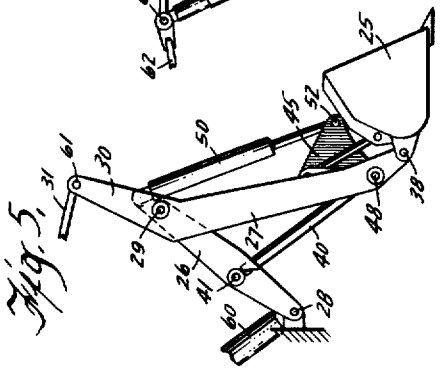

Fig. 5.

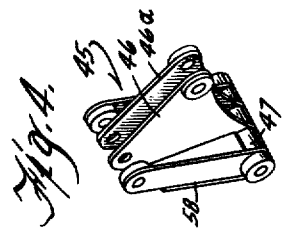

Fig. 4.

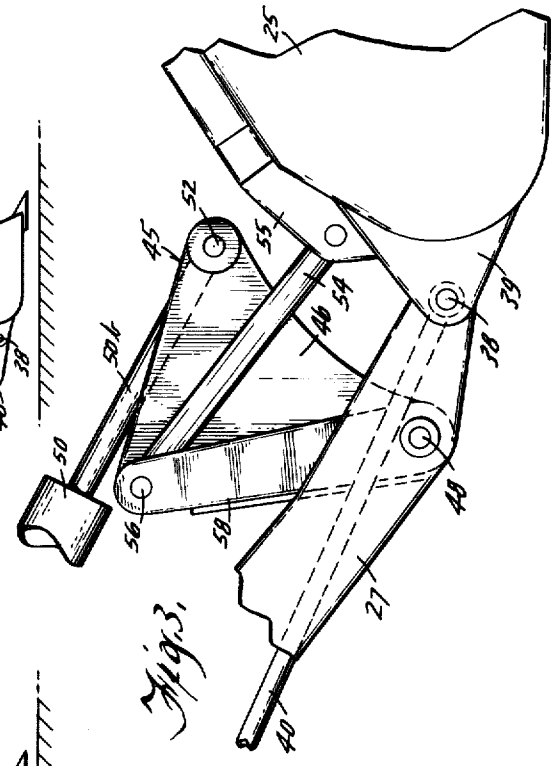

Fig. 3.

INVENTOR.
CHARLES L. FLEMING
KENNETH V. JOHNSON
BY
W. A. Denny
ATTORNEY.

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SCOOP LOADER ATTACHMENT

Kenneth V. Johnson, Milwaukee, and Charles L. Fleming, Brookfield, Wis., assignors to Kochring Company, Milwaukee, Wis., a corporation of Wisconsin

Filed Nov. 30, 1960, Ser. No. 72,632
7 Claims. (Cl. 214—138)

This invention relates to improvements in scoop loaders of the type having a boom assembly mounted on a base or supporting machine and a scoop or bucket supported at the outer end of the boom for movement in a substantially horizontal path for crowding material into the bucket without the necessity of moving the base or supporting machine. A device of this type is disclosed and claimed in United States patent application Serial No. 675,136, filed July 30, 1957, now Patent No. 2,965,253 by John W. Poulter and Kenneth V. Johnson, assigned to a common assignee.

In the accompanying drawings,

FIGURE 1 is a perspective of a scoop loader embodying the present invention;

FIGURE 2 is a plan view of the inner boom member;

FIG. 3 is a fragmentary side view showing an enlargement of the assembled bucket tilt mechanism;

FIG. 4 is a perspective of the bell crank of the tilt mechanism; and

FIGS. 5–7 diagrammatically show in side elevation the boom assembly at various sequential portions of movement.

While the invention is shown and described in some detail with reference to a particular embodiment thereof, there is no intention that it thus be limited to such detail. On the contrary, the intention is to cover all alternatives, modifications, and equivalents falling within the spirit and scope of the invention as defined by the appended claims.

The overall construction of a scoop loader embodying the present invention is illustrated in FIG. 1 of the drawings. As there shown, the machine has an upper turntable assembly 20, including a cab 22, pivotally mounted for horizontal swinging on mobile support members such as endless track 23. Also mounted with the cab 22 is a suitable source of power, such as an internal combustion engine (not shown), and a source of hydraulic pressure fluid of conventional type (not shown).

Mounted on the turntable is a boom assembly 24 for supporting the scoop 25 for crowding or digging movement in a substantially horizontal path as described in detail in the above identified patent application Serial No. 675,136. The boom assembly 24 includes an inner boom 26 pivotally supported at its inner end to a lower point 28 on the base machine and in turn pivotally supports, on its outer end at 29, the inner end portion of an outer boom 27. In order to provide a substantially horizontal forward movement of the bucket, an extension 30 on the outer boom 27 projecting above the pivotal support connection 29 is connected by a tension member, comprising a pair of tension links 31, 31*a*, to an elevated point on the base machine. With this linkage, the pivotal connection 29 between the inner and outer booms is gradually lowered as the outer boom 27 swings away from the base machine 20 to offset the arcuate swing of the outer boom 27 and thus guide the bucket 25 in a substantially horizontal path of movement.

In more detail, the inner boom 26 is formed as a unitary or integral part and has its inner end portion of increased lateral dimension to provide a pair of widely spaced apart support legs 35, 35*a* for receiving the pivotal connections 28 on the base machine. The central and outer end portions of the inner boom 26 taper gradually toward its outer end to form a pair of closely spaced legs 36, 36*a*.

The outer boom assembly is also formed as a unitary or integral part and includes a pair of spaced apart, longitudinal, rigid members 27, 27*a* having upward extensions 30, 30*a* on their inner ends. Interconnecting the side members or legs 27, 27*a* midway of their length is a transverse member 37 which spaces the inner end portions of the side members or legs 27, 27*a* to fit along the outsides of the outwardly projecting legs 36, 36*a* of the inner boom 26. The leg members 27, 27*a* diverge from each other toward their outer ends for direct attachment of the bucket or scoop 25 at laterally spaced points substantially in alinement with the supporting pivots 28 on the base machine. To accomplish this, the rear of the bucket 25 has two pairs of ears 39, the ears of each pair being spaced to lie alongside the outer end of the respective outer boom leg 27, 27*a* and pivotally connected thereto by pivot pins 38.

Crowding the bucket outwardly and returning it toward the base machine is accomplished by a pair of double acting hydraulic crowding rams 40, 40*a* mounted parallel to each other between the inner boom and the outer boom members below the pivotal support connection 29. The inner end of each hydraulic ram 40, 40*a* is pivotally connected by a pivot pin 41 to a laterally alined bifurcated shoulder 42, 42*a* formed on the inner boom intermediate the lower end of the boom and the pivot 29. The forward end of each crowding ram 40, 40*a* extends into vertical slots in the outer ends of the respective side members 27, 27*a* of the outer boom and are pivotally connected thereto by the bucket supporting pins 38.

As best shown in FIGS. 3 and 6, the angle of the bucket as it moves throughout a work cycle is controlled by first and second linkages which include, as a common member, a generally triangularly shaped bell crank 45. The bell crank 45 is formed by two identical, generally triangular plates 46, 46*a* spaced laterally from each other in parallel relation and fixed at their lower corner to a transverse tubular bearing member 47. Passing through the bearing member and serving to support and fulcrum the crank 45 is a fulcrum or pivot pin 48 whose ends are received in apertures in the outer boom members 27, 27*a* immediately behind the bucket support pivots 38.

The first bucket control linkage combines the action of the outer and inner boom members and the bucket tilting mechanism to maintain the bucket at a selected digging angle with respect to the ground during horizontal movement. For this purpose, a hydraulic tilt ram 50 is arranged to provide a link between the inner boom extension 36 and the bell crank 45. The hydraulic tilt ram, which is double acting, has its upper or cylinder end 50*a* pivotally connected, at 51, to the outer ends of the leg extensions 36, 36*a* on the inner boom 26. The lower or rod end 50*b* of the tilt ram 50 extends pivotally connected, at 52, to the forward, upper corner of the bell crank plates 46, 46*a*.

The second bucket control linkage comprises a force multiplying linkage for transmitting the control forces of the first linkage to the bucket 25. To accomplish this, tilt links 54 are pivotally connected at one end to the upper rear corner of each bell crank plate 46, 46*a* and at the other end to alined lugs 55 on the rear of the bucket above the bucket support pivot 38. Forming the connection to the crank plates 46, 46*a* is a coupling pin 56 which is pivotally received in the upper end of a rigid link 58 fixed to the crank support member 47 outwardly of the plates 46, 46*a*, the rear end of the tilt link 54 and the upper rear corners of the crank plates 46, 46*a*.

The operation of the bucket control linkages is best described in connection with FIGS. 5–7 of the drawings.

At the beginning of the cycle, the empty bucket **25** is moved close to the base machine by retraction of the hydraulic rams **40**, **40***a* to jackknife the booms **26**, **27** and is positioned up or down by adjusting the vertical position of the outer boom extension **30**. The bucket **25** is at the same time tilted to the desired angle for digging by actuating the tilt ram **50** which rocks the bell crank **45** about its fulcrum to angle the bucket **25** upwardly or downwardly about its supporting pivots **38**. After the desired angle is obtained, the tilt ram **50** is locked and serves thereafter as a rigid link. Hydraulic pressure fluid is then directed to the crowding rams **40**, **40***a* causing them to extend and move the outer boom **27** and bucket **25** away from the base machine **20** in a substantially horizontal path.

With the hydraulic tilt ram **50** locked to function as a rigid link, the angular relationship of the bucket **25** with respect to the ground is automatically maintained through the pair of linkages associated with the bell crank **45**. The first linkage, which comprises the extension legs **36** on the inner boom **26**, the outer boom **27**, the bell crank **45**, and the tilt ram **50**, transforms relative angular movement between the booms **26**, **27** as they swing away from each other to a forward push on the locked tilt ram **50** which in turn rocks the bell crank **45** forwardly. The second linkage, which comprises the bell crank **45**, the outer end portion of the outer boom **27**, the rear of the bucket **25** and the tilt links **54**, in turn transmits the rocking movement of the bell crank through the tilt links **54** to the bucket **25**. This causes the bucket to rock forwardly relative to the outer boom **27** in proportion to the outward swing of the boom and thus maintain a relatively constant digging angle.

For vertically positioning and lifting the bucket **25**, telescoping rams **60**, **60***a* are provided for raising and lowering the upper end of the outer boom extension **30**, although a mechanical hoist and extension cable means may be used for this purpose if desired. To transmit vertical movement of the hoist rams **60**, **60***a* to the boom assembly, the tension support links **31**, **31***a* are pivotally connected at their forward ends to the outer boom extensions **30**, **30***a* by a common pivot pin **61** and at their rear ends to the upper ends of the hoist rams. A pair of tension braces or guys **62**, **62***a* also interconnect the upper ends of the hoist rams with a rearward point on the base machine. A transverse connecting pin **63** is provided in the illustrated machine to form a common pivotal connection for the rear ends of the tension support links **31**, **31***a*, the upper ends of the hoist rams **60**, **60***a* and the forward ends of the braces **62**, **62***a*.

Operation of the hoist and tilt rams for lifting and dumping the bucket is illustrated in FIG. 7 of the drawings. The bucket **25** is there shown in solid outline in lifted position. The tilt ram **50** has been retracted to swing the bucket to an upward position to avoid spilling the contents and the hoist rams **60**, **60***a* have been extended to raise the entire boom assembly **24** to dump position. After raising the boom **24** and bucket **25**, as shown, the tilt ram **50** is extended rocking the bucket forwardly to the position shown in dash outline for discharging or dumping. The hoist and crowding rams are then retracted to return the bucket **25** to the position of FIG. 5, and the tilt ram adjusted to give the desired digging angle for beginning another cycle of operation.

We claim as our invention:

1. A scoop-loader attachment for use with a base machine having movable support links, said attachment comprising, in combination, inner and outer booms pivotally interconnected for relative swinging movement; means on said inner boom for effecting pivotal mounting of the attachment on a base machine; an outwardly opening bucket pivotally mounted on the outer end of said outer boom; a bell crank pivoted on the outer end portion of said outer boom; a rigid link interconnecting said crank with said bucket; and a hydraulic ram means positioned above said outer boom and pivotally connected at its ends to an outwardly extending portion of said inner boom and said crank respectively for maintaining said bucket at a predetermined angle relative to its path of movement and selectively varying said angle upon actuation of said ram; and means on said attachment for effecting a supporting and lifting connection between said booms and the movable support links on a base machine whereby said movable support links may be used for support of the attachment during filling movements of the bucket and for raising the attachment for elevated dumping of the bucket; said support and lifting connection cooperating with said hydraulic ram means, bell crank and rigid link for guiding the digging edge of said bucket in a substantially horizontal path upon outward relative movement of said outer boom.

2. A scoop-loader machine comprising a pair of inner and outer booms pivotally connected together and having the inner end of said inner boom pivotally connected to a lower portion of said machine; an outwardly opening bucket pivotally mounted directly to the outer end of said outer boom; hydraulic ram means connected between said inner and said outer booms for swinging said booms relative to each other and effecting outward and inward movement of said bucket; means including a tension support member attached at one end to an upper portion of said machine and at the other end to an extension of said outer boom for effecting and guiding movement of the outer end of said outer boom in substantially a straight path upon relative movement of said booms; a bell crank fulcrumed on the outer one of said booms; a tilt controlling hydraulic ram interconnecting an outward extension of said inner boom and said bell crank; and means including a rigid link interconnecting said bell crank and a point in said bucket offset above the pivotal mounting of said bucket for maintaining said bucket at a substantially constant angle during outward movement of said bucket and varying the tilt angle upon actuation of said tilt ram.

3. A scoop-loader machine comprising, in combination, inner and outer booms pivotally interconnected for relative swinging movement, the inner end of the inner boom being pivotally supported on a lower portion of said machine, means including an upward extension on said outer boom and a tension support member attached to an upper portion of said machine for effecting and guiding movement of the outer end of said boom; an outwardly opening bucket pivotally supported on the outer end of said outer boom; a bell crank formed by a pair of laterally spaced plates; a transverse pivotal connection for supporting said crank plates on an outer portion of said outer boom for fore-and-aft unison rocking movement; a pair of spaced bucket links pivoted at their outer ends to said bucket above said bucket support and pivoted at their inner ends to said bell crank; and a hydraulic ram positioned above said outer boom and having its outer end pivotally connected to said bell crank and its inner end pivotally connected to said inner boom outwardly of said pivotal connection between said booms for maintaining said bucket at a predetermined angle during movement of said bucket and for selectively varying said angle upon actuation of said ram.

4. A scoop-loader machine comprising a pair of inner and outer booms pivotally connected together and pivotally attached at the inner end of said inner boom to a lower point on said machine; a bucket pivotally connected directly to the outer end of said outer boom and facing outwardly from said machine; power means for swinging said booms relative to each other from a closed jacknife relation to an extended open position; a tension means connected between said outer boom and an upper point on said machine for guiding said bucket in a substantially horizontal path; a hydraulic ram and a bell crank fulcrumed on said outer boom adjacent its outer end to form with said outer boom and an extension on said inner boom

a control linkage; and a rigid link interconnecting said bell crank and said bucket to form with the outer end portion of said outer boom and said bucket a force multiplying linkage for maintaining said bucket at a substantially constant angle during horizontal movement upon holding said ram at a constant length and for tilting said bucket upon actuation of said ram.

5. A scoop-loader machine comprising, in combination, inner and outer booms pivotally interconnected for relative swinging movement, the inner end of the inner boom being pivotally supported on a lower portion of said machine; an adjustable tension support member mounted on said machine and connected to said outer boom for support thereof; an outwardly opening bucket pivotally supported on the outer end of said outer boom; means for effecting bucket movement relative to said machine; a bell crank formed by a pair of laterally spaced triangular plates and a pair of upright links spaced from respective sides of said plates; a laterally extending tubular bearing member rigidly interconnecting said plates and links; a pivot pin extending through said tubular member for supporting said crank on an outer portion of said outer boom for fore-and-aft rocking movement; a pair of spaced tilt links pivoted at their outer ends to said bucket above the bucket support and each extending respectively between a plate and its adjacent upright link for pivotal connection thereto; and hydraulic ram means having its outer end positioned between said plates and pivotally connected therebetween and having its inner end pivotally connected to said inner boom outwardly of said pivotal connection between said booms for maintaining said bucket at a predetermined angle upon bodily movement thereof and for selectively varying said angle upon actuation of said ram.

6. A scoop-loader machine comprising a jackknifing boom pivotally connected to a lower point on said machine; an outwardly opening bucket pivotally mounted directly to the outer end of said boom; a first hydraulic ram means connected between said inner and said outer booms for effecting swinging movement of said bucket; a second hydraulic ram means mounted on said machine and projecting upwardly therefrom; a tension member interconnecting said boom and the upper end of said second ram means for raising said bucket upon extending said second ram means and for guiding said bucket in a substantially straight path upon holding said second ram means at a fixed length; a third hydraulic ram means operatively interconnecting said bucket and a point on the inner portion of said boom for selectively maintaining said bucket at a constant angle during bodily movement thereof and for selectively varying the bucket angle for unloading and loading thereof.

7. A loading machine comprising, in combination, a unitary inner boom having on its inner ends a pair of laterally spaced supporting legs pivotally connected to said machine and having an outer end portion of reduced lateral dimension; an outer boom having a pair of spaced apart longitudinal members integrally interconnected, said members being pivotally connected to opposite sides of said outer end portion of said inner boom and being spread apart at their outer ends in lateral alinement with the respective supporting legs on said inner boom; an outwardly opening bucket pivoted directly on the outer ends of said outer boom members; a pair of laterally spaced, parallel hydraulic rams in lateral alinement with the respective inner boom supporting legs and connected between said inner and outer booms for swinging the said booms relative to each other; a bell crank pivotally mounted between said outer boom members for fore-and-aft rocking movement; a link interconnecting said bell crank and said bucket for tilting said bucket upon rocking of said bell crank; a hydraulic tilt ram having its outer end connected to said bell crank and its inner end pivotally connected to the outer end of said inner boom outwardly of said outer boom connection for maintaining said bucket in a predetermined angle relative to the ground when said tilt ram is fixed and selectively varying said angle when said tilt ram is actuated; and means including an adjustable tension member for supporting said booms during loading movements of said bucket and for elevating said booms for dumping movements of said bucket.

References Cited in the file of this patent

UNITED STATES PATENTS

2,753,059	Pilch	July 3, 1956
2,774,496	Dorkins	Dec. 18, 1956
2,965,253	Poulter et al.	Dec. 20, 1960