United States Patent [19]

Suter

[11] **3,732,990**

[45] **May 15, 1973**

[54] TURNOVER DEVICE

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[73] Assignee: **United States Steel Corporation,** Pittsburgh, Pa.

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[21] Appl. No.: **142,865**

[52] **U.S. Cl.** .....**214/1 QG**

[51] **Int. Cl.** **B65q 7/08**

[58] **Field of Search**.....214/1 Q, 1 QA, 1 QG; 198/33 AC, 33 AD

[56] **References Cited**

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Primary Examiner—Gerald M. Forlenza
Assistant Examiner—Frank E. Werner
Attorney—Robert J. Leek, Jr.

[57] **ABSTRACT**

A turnover device for rotating a longitudinal member having a center of gravity and carried by a supporting member having a supporting surface is disclosed. The turnover device has a frame disposed adjacent the supporting member, a tilting member on one side of the frame and a receiving member adjacent the tilting member on the side of the frame. The tilting member and receiving member are movable on the frame. Drive means are connected to the tilting member and the receiving member for moving the tilting member and the receiving member from a normal rest position coincident with or below the supporting surface to a longitudinal member tilting position so that the tilting member engages the longitudinal member and rotates the longitudinal member beyond the center of gravity, thereby causing the longitudinal member to fall back onto the support member during the retracting movement of the tilting member and the receiving member.

12 Claims, 22 Drawing Figures

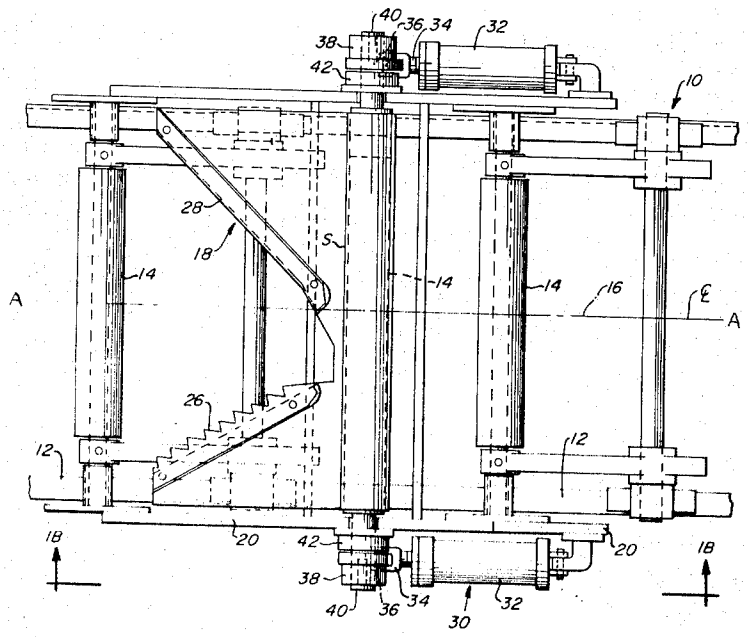


FIG. 1A

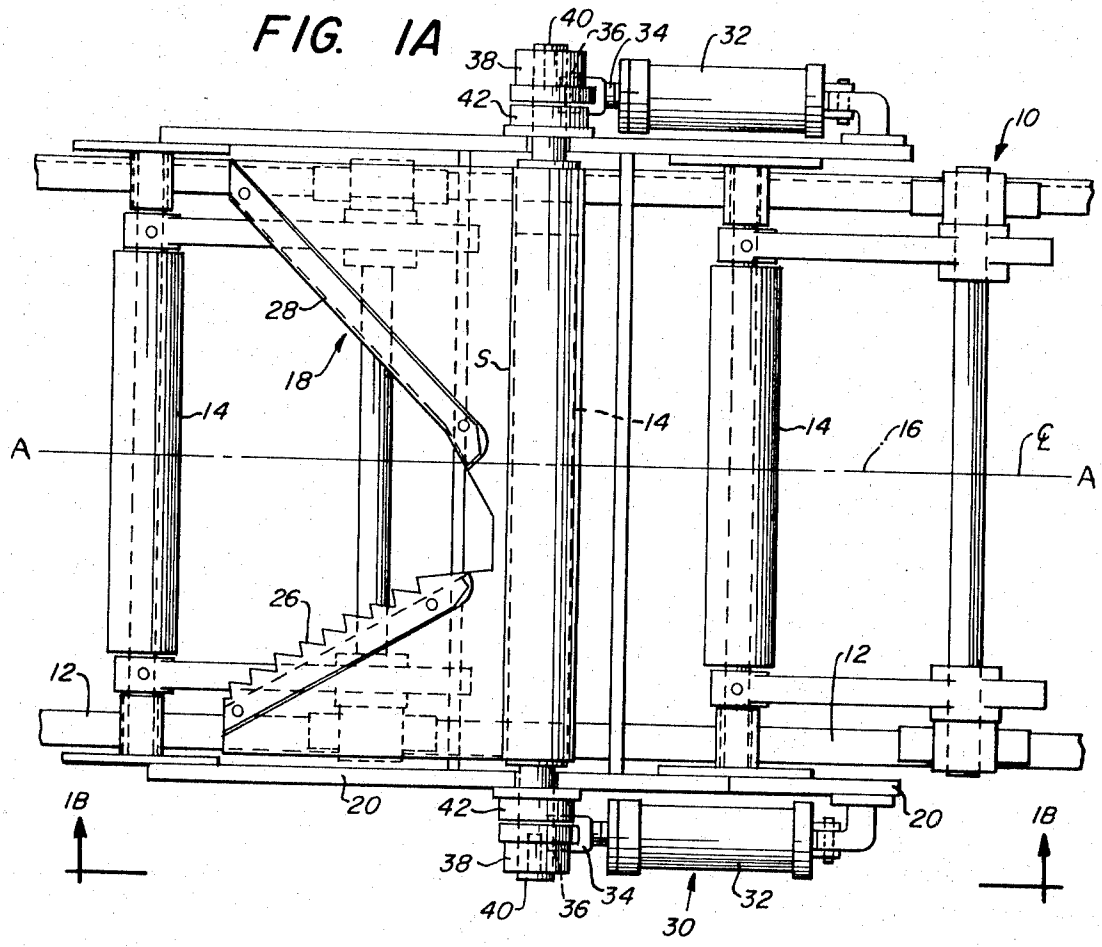
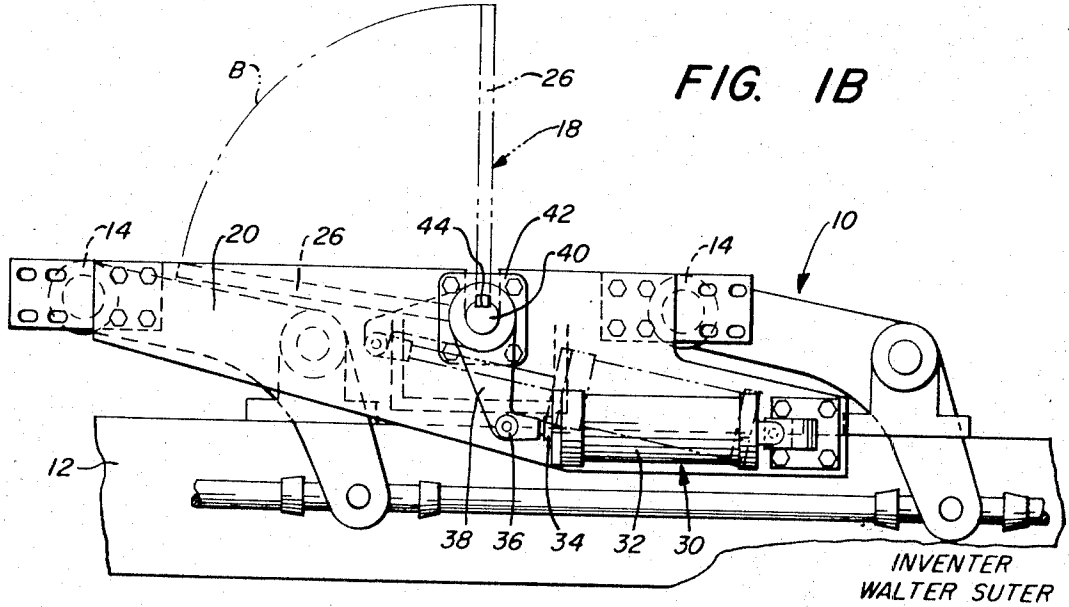


FIG. 1B



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FIG. 1C

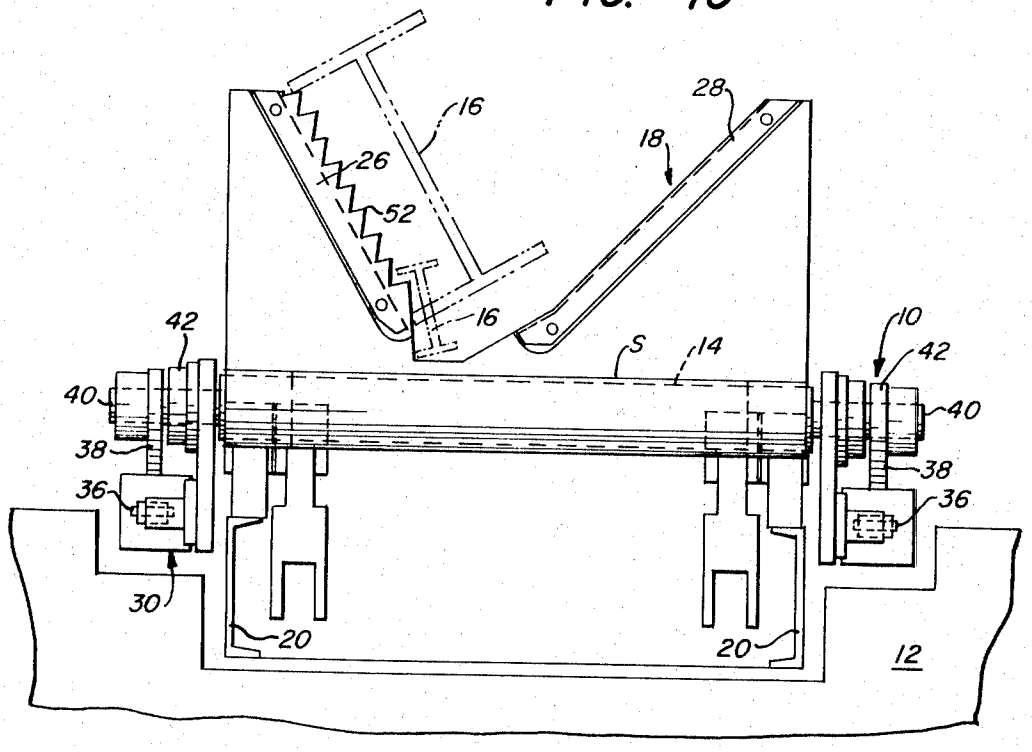


FIG. 2A

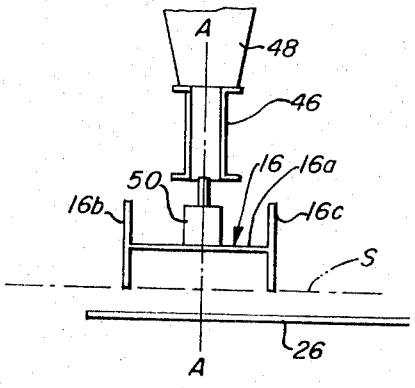


FIG. 2B

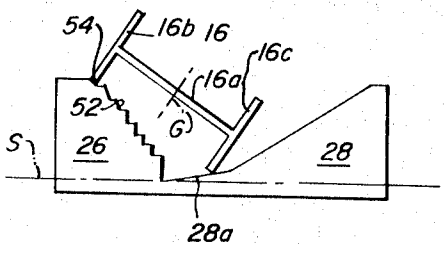
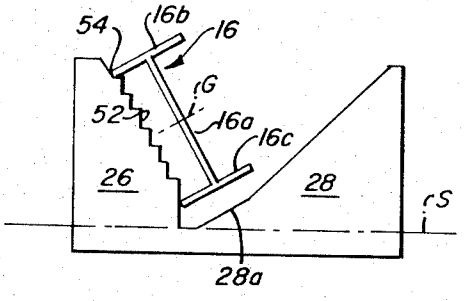


FIG. 2C



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FIG. 2D

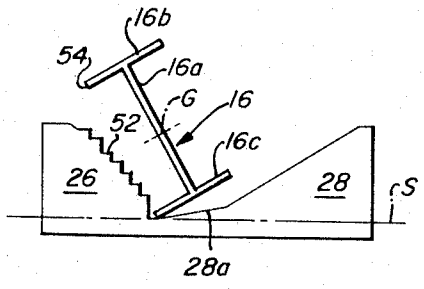


FIG. 2E

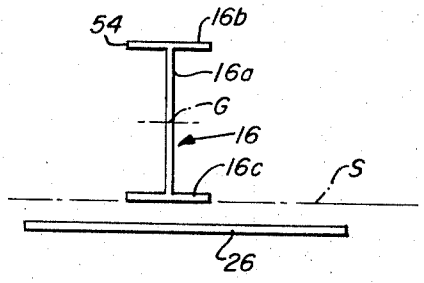


FIG. 2F

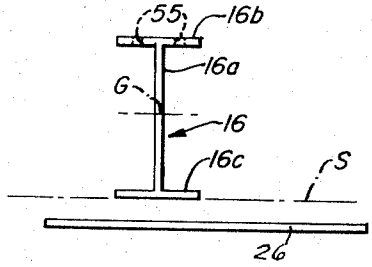


FIG. 2G

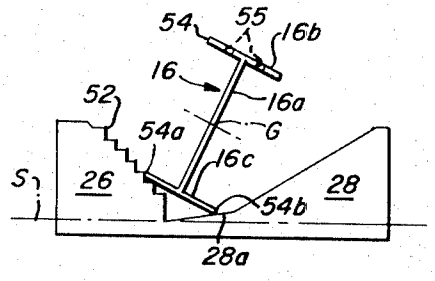


FIG. 2H

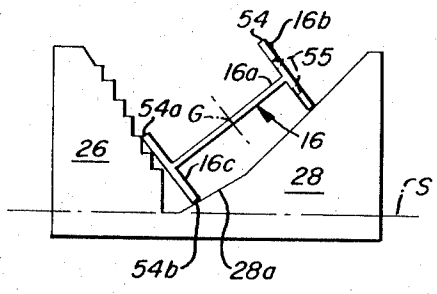


FIG. 2J

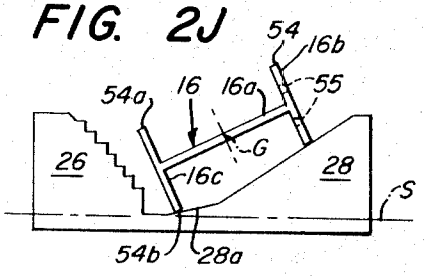


FIG. 2K

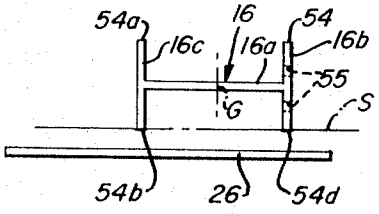


FIG. 3A

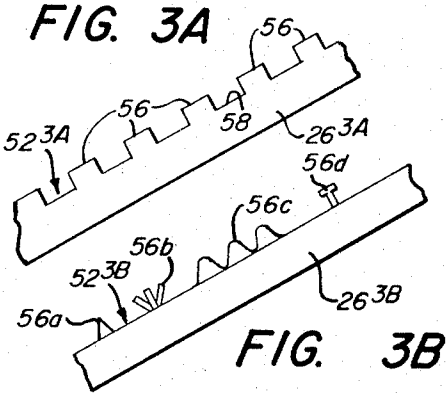


FIG. 3B

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FIG. 2L

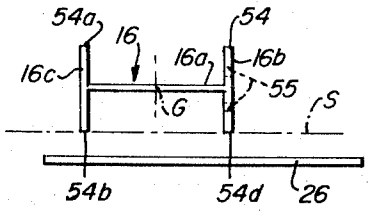


FIG. 2M

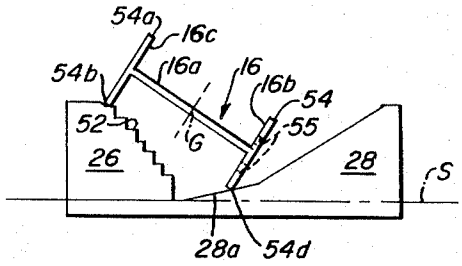


FIG. 2N

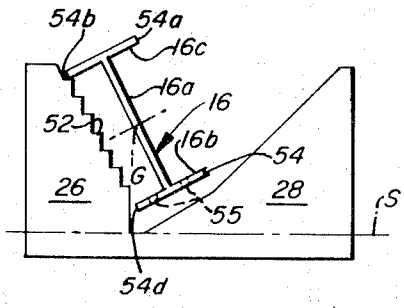


FIG. 2P

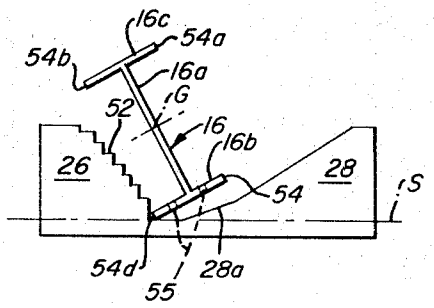


FIG. 2R

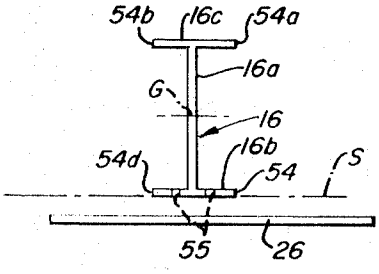


FIG. 4

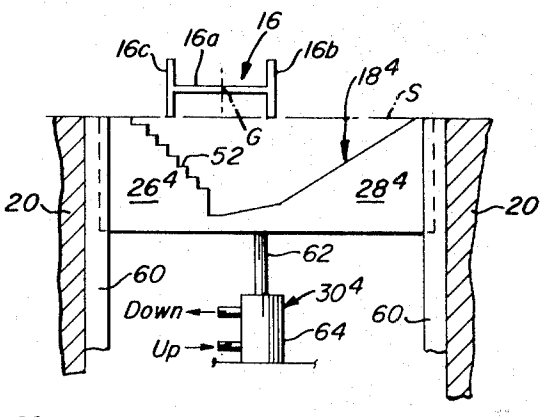
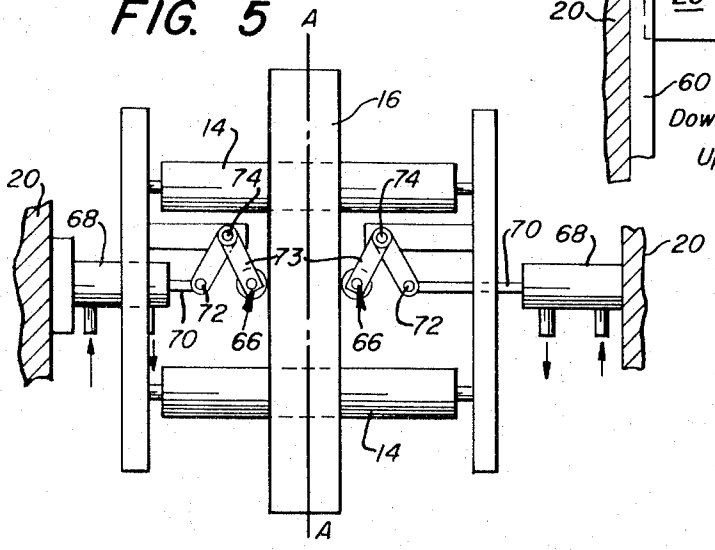


FIG. 5



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TURNOVER DEVICE

BACKGROUND OF THE INVENTION

Heretofore, turnover devices employed in conjunction with punches, shears, drills, welders, sandblasting equipment, painting apparatus and the like have rotated longitudinal members, such as wide flange sections, I-beams, channels, angles and the like by cranes with special hooks, pry bars, chain turnover devices and the like. These conventional turnover devices require additional manpower, are time consuming and are not safety oriented.

OBJECTS OF THE INVENTION

It is the general object of this invention to avoid and overcome the foregoing and other difficulties of and objections to prior art practices by the provision of an improved turnover device for a longitudinal member, which improved turnover device:

1. is positive in its action;
2. requires only one operator;
3. rotates the longitudinal member in less time than the time required by conventional turnover devices;
4. is more safety oriented than conventional turnover devices;
5. reduces operating and maintenance costs; and
6. is simple and rugged in construction.

BRIEF SUMMARY OF THE INVENTION

The aforesaid objects of this invention and other objects which will become apparent as the description proceeds are achieved by providing an improved turnover device for rotating a longitudinal member about 90°. This turnover device has a frame disposed adjacent the supporting member, a tilting member on one side of the frame and a receiving member adjacent the tilting member on one side of the frame. Drive means are connected to the tilting member and the receiving member for moving the tilting member and the receiving member from a normal rest position coincident with or below the supporting surface to a longitudinal member tilting position so that the tilting member engages the longitudinal member and rotates the longitudinal member beyond the center of gravity, thereby causing the longitudinal member to fall back onto the support member during the retracting movement of the tilting member and the receiving member.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS

For a better understanding of this invention, reference should be had to the accompanying drawings, wherein like numerals of reference indicate similar parts through the several views and wherein:

FIG. 1A is a plan view of a roller table, an embodiment of the improved turnover device of the oscillating type and a longitudinal member, such as an I-beam or the like, which I-beam is to be rotated about 90° by the turnover device;

FIG. 1B is a side elevational view taken along the line 1B–1B of FIG. 1A in the direction of the arrows;

FIG. 1C is another side elevational view taken along the line 1C–1C of FIG. 1B in the direction of the arrows but showing the tilting member and receiving member in the tilting position;

FIGS. 2A–2R are diagrammatic and elevational views showing the operation of the turnover device;

FIG. 3A is a fragmentary plan view of an alternative embodiment of the tilting member having a plurality of protuberances and cavities thereon;

FIG. 3B is a view similar to FIG. 3A showing another embodiment of the tilting member;

FIG. 4 is a view similar to FIGS. 2A–2R of an alternative embodiment of the turnover device of the reciprocating type; and

FIG. 5 is a plan view of a centering device for aligning the rotated longitudinal work piece along the centerline of the work tool.

Although the principles of this invention are broadly applicable to the rotation of a longitudinal member disposed on a supporting member through an angle of about 90°, the invention is particularly adapted for use in conjunction with a turnover device for rotating I-beams or the like being processed through apparatus such as a punch, shear, drill, welder, sand blasting equipment, painting equipment, and the like, and hence it has been so illustrated and will be so described.

DETAILED DESCRIPTION

With specific reference to the form of the invention illustrated in the drawings and referring particularly to FIGS. 1A–1C, a supporting member, such as a roller table or the like, is indicated generally by the reference numeral **10.** This roller table **10** has a frame **12** (FIGS. 1A–1C) on which are disposed a plurality of rollers **14** (FIGS. 1A–1C) for supporting a longitudinal member, such as an I-beam **16** (FIGS. 1C, 2A–2R) or the like. The rollers **14** define a supporting surface S (FIGS. 1A,1C,2A–2R) for the I-beam **16.** Disposed adjacent the I-beam **16,** supported on the roller table **10,** is an improved turnover device **18** (FIGS. 1A–1C) of the present invention.

TURNOVER DEVICE 18

This turnover device **18** has a frame **20** (FIG. 1A,1C) and is provided with a tilting member **26** (FIGS. 1A–1C,2A–2R) and a receiving member **28** (FIGS. 1A,1C,2A–2R). As shown in FIG. 1A, the tilting member **26** is disposed on one side (i.e., the lower portion) of the frame **20** and the receiving member **28** is disposed on the other side (i.e., the upper side) of the frame **20.** In order to reverse the clockwise tilting movement of the tilting device **18** shown in FIGS. 2A–2R, the tilting member **26** and the receiving member **28** will be mounted on opposite sides of the frame **20** from the positions shown in FIG. 1A.

Drive means **30** (FIGS. 1A–1C) are connected to the tilting member **26** and the receiving member **28.** Such drive means **30** has a pair of hydraulic cylinders **32** (FIGS. 1A,1B) having their pistons **34** (FIGS. 1A,1B), each pivotably connected at **36** (FIGS. 1A–1C) to a bell crank **38** (FIGS. 1A–1C) mounted on a shaft **40** (FIGS. 1A–1C) journaled in a bearing **42** (FIGS. 1A–1C) on the frame **20** of the tilting device **18.** The bell cranks **38** are connected at **44** (FIG. 1B) to the tilting member **26** and the receiving member **28** thereby causing oscillating movement through an angle B (FIG. 1B) of the tilting member **26** and the receiving member **28** between a normal rest position (FIGS. 1A,1B) coincident with or below the supporting surface S of the rollers **14** to a longitudinal member tilting position shown in FIGS. 1C,2C.

OPERATION

Referring now to FIGS. 2A–2R, the I-beam **16** is centered on the centerline A—A (FIGS. 1A,2A) of the work tool (not shown) by means of a spreader beam **46** (FIG. 2A) supported by a hoist **48** (FIG. 2A) and carrying magnets **50** (FIG. 2A), which magnets **50** engage the web **16*a*** of the I-beam **16** to center it with respect to the turnover device **18.** As the I-beam **16** is centered in alignment with respect to the turnover device **18,** the drive means **30** moves the tilting member **26** and the receiving member **28** from the rest position (FIGS. 1A,1B) through the arc B (FIG. 1B) to the position shown in FIG. 2B where the tilting surface **52** (FIGS. 1C,2B) on the tilting member **26** (suitably a serrated surface or the like) engages a corner **54** (FIG. 2B) of the flange **16b** thereby moving the I-beam **16** from the position shown in FIG. 2A to the position shown in FIG. 2B.

When the tilting member **26** has moved the corner **54** to the position shown in FIG. 2C, the I-beam **16** has moved beyond its center of gravity G (FIGS. 2B,2C,2R) and the I-beam **16** begins to fall, as shown in FIG. 2D, backwardly toward the supporting surface S formed by the rollers **14** and the lower supporting surface **28**a (FIG. 2D) of the receiving member **28.** Simultaneously, the drive means **30** retracts the tilting member **26** and the receiving member **28** through the angle B (FIG. 1B) from the position shown in FIG. 2C through the position shown in FIG. 2D to the normal rest position shown in FIGS. 1B,2A. Meanwhile, the I-beam **16** has fallen back onto the supporting surface S of the rollers **14** (FIG. 2D) so that the flange **16*c*** rests thereon as shown in FIG. 2E.

After, for example, the punching of the flange **16*b*** to provide flange holes **55** (FIG. 2F) or the like by a punching apparatus (not shown), the drive means **30** once again oscillates the tilting surface **52** into contact with another corner **54*a*** (FIG. 2G) of the flange **16*a*** of the I-beam **16,** and the opposite corner **54*b*** of the flange **16*c*** rests on lower supporting surface **28*a***, as shown in FIGS. 2F and 2G, so that once again the I-beam **16** is moved beyond the center of gravity G (FIG. 2H). The flange **16*b*** rests on the receiving member **28** (FIG. 2H) during the retraction of the turnover device **18,** such flange **16*b*** being lowered by the receiving member **28** through the position shown in FIG. 2J to the position on the rollers **14** shown in FIG. 2K. Thereafter, after the completion of another operation, such as the sand blasting of the web **16*c*** (not shown) or the like, the drive means **30** (FIG. 2M) once again elevates the tilting member **26** and the receiving member **28** to cause engagement by the tilting member **26** with the corner **54*b*** of the flange **16*c*** (FIG. 2M) and the corner **54*d*** to engage the lower supporting surface **28*a***, once again causing the I-beam **16** to move, as shown in FIGS. 2N and 2P beyond the center of gravity G so that the flange **16*b*** rests on the supporting surface S formed by the rollers **14** as shown in FIG. 2R.

ALTERNATIVE EMBODIMENTS

It will be understood by those skilled in the art that, alternatively as shown in FIG. 3A, the tilting surface **52**^{3} on the tilting member **26**^{3} may be formed by a plurality of square or rectangular protuberances **56** and cavities **58.** FIG. 3B shows pointed protuberances **56*a***, pronged protuberances **56*b***, corrugations **56*c***, lipped protuberances **56*d***, or the like.

Alternatively, as shown in FIG. **4,** the turnover device **18**^{4} may be of the reciprocating type. Such turnover device **18**^{4} has the tilting member **26**^{4} and the receiving member **28**^{4} mounted in suitable guides **60** and formed into an integral member driven by the piston **62** of the cylinder **64.**

It will be understood by those skilled in the art that the longitudinal members **16** vary in length from about 10 feet to about 45 feet and that depending on such length, one or more turnover devices **18** (FIGS. 1–3B) and **18**^{4} (FIG. 4) are connected in tandem to perform the turnover operation.

In FIG. **5,** a centering device **66** is employed to return the rotated beam **16** to the centerline A—A of the work tool (not shown). Hydraulic cylinders **68** have their pistons **70** connected at **72** to bell cranks **73** pivoted at **74** on the frame **20.** Rollers **66** on the free end of the bell cranks **73** center the beam **16** on the work tool centerline A—A.

SUMMARY OF THE ACHIEVEMENTS OF THE OBJECTS OF THE INVENTION

It will be recognized by those skilled in the art that the objects of this invention have been achieved by providing an improved turnover device **18** (FIGS. 1A–2R) and **18**^{4} (FIG. 4) which turnover devices **18,18**^{4} are positive in their action, require only one operator, rotate the longitudinal member, such as an I-beam **16** or the like, in less time than the time required by conventional turnover devices (not shown), are more safety oriented than conventional turnover devices, reduce operating and maintenance costs, and are simple and rugged in construction.

While in accordance with the patent statutes, preferred and alternative embodiments of this invention have been illustrated and described in detail, it is to be particularly understood that the invention is not limited thereto or thereby.

I claim:

1. A turnover device for rotating a longitudinal member having a center of gravity and carried by a supporting member having a supporting surface, said turnover device having:

a. a frame disposed adjacent said supporting member;

b. a tilting member on one side of said frame;

c. a receiving member adjacent said tilting member and on the other side of said frame;

1. said tilting member and said receiving member being movable on said frame;

d. drive means connected to said tilting member and said receiving member for moving said tilting member and said receiving member from a nominal rest position coincident with or below said supporting surface to a longitudinal member tilting position above said supporting surface so that said tilting member engages said longitudinal member to lift said longitudinal member off said supporting surface during the rotation of said longitudinal member and rotates said longitudinal member beyond said center of gravity thereby causing said longitudinal member to fall back onto said supporting member during the retracting movement of said tilting member and said receiving member.

2. The turnover device recited in claim 1 wherein said tilting member has a serrated surface.

3. The turnover device recited in claim 1 wherein said receiving member has a smooth surface.

4. The turnover device recited in claim 1 wherein said drive means oscillates said tilting member and said receiving member between said rest position and said tilting position.

5. The turnover device recited in claim 1 wherein said drive means reciprocates said tilting member and said receiving member between said rest position and said tilting position.

6. The turnover device recited in claim 1 wherein said tilting member has a tilting surface provided with a protuberance.

7. The turnover device recited in claim 1 wherein said tilting member has a tilting surface provided with a cavity.

8. The turnover device recited in claim 1 wherein said tilting member has a tilting surface provided with a pointed protuberance.

9. The turnover device recited in claim 1 wherein said tilting member has a tilting surface provided with a pronged protuberance.

10. The turnover device recited in claim 1 wherein said tilting member has a tilting surface provided with a corrugation.

11. The turnover device recited in claim 1 wherein said tilting member has a tilting surface provided with a lipped protuberance.

12. The turnover device recited in claim 1 and having:

a. a centering device disposed adjacent said supporting member and engageable with said longitudinal member after rotation of said longitudinal member by said turnover device for returning said longitudinal member to the centerline of said supporting member.

* * * * *