April 18, 1933. J. L. ANDERSON 1,903,953

WIRE FEED DEVICE

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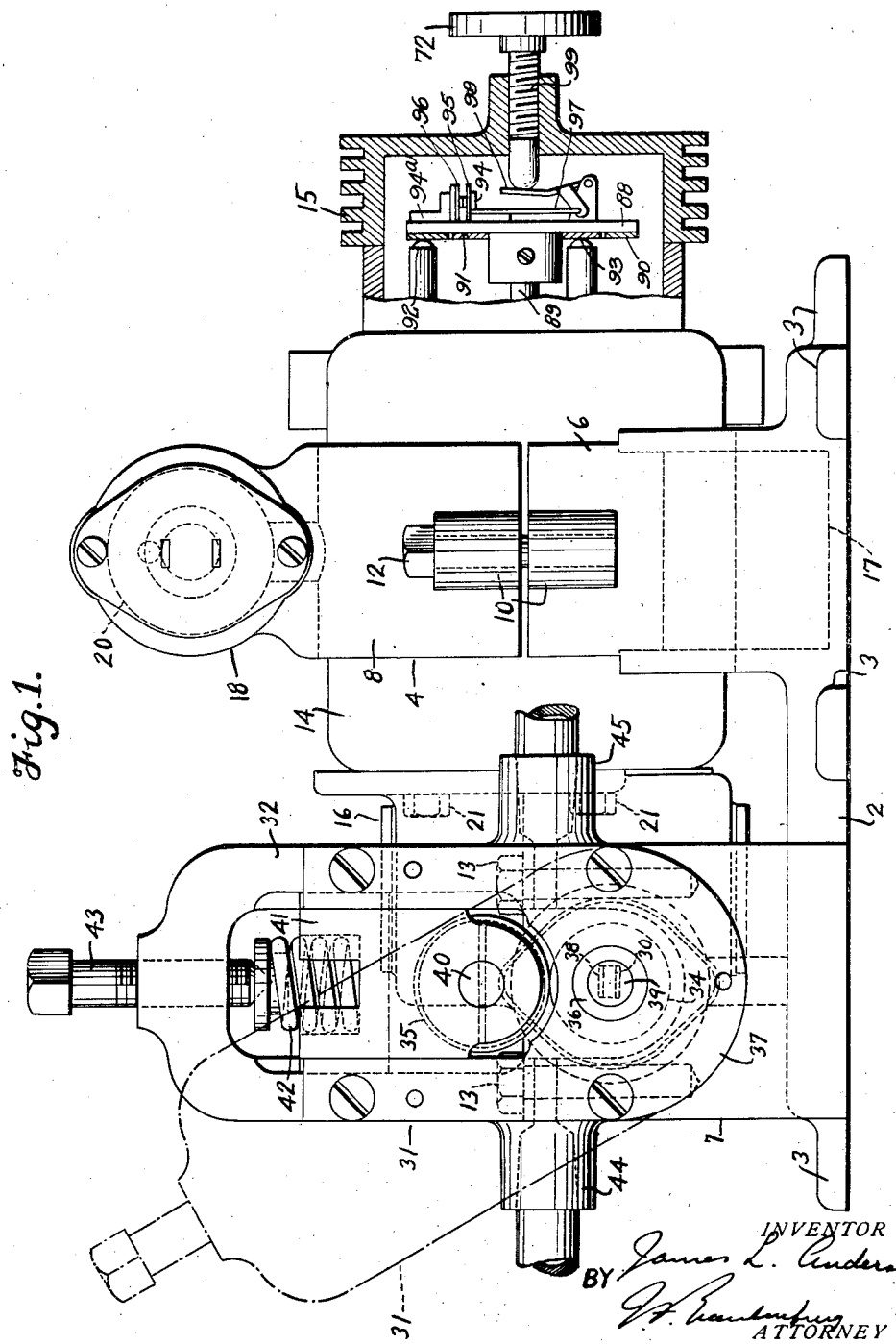


Fig. 1.

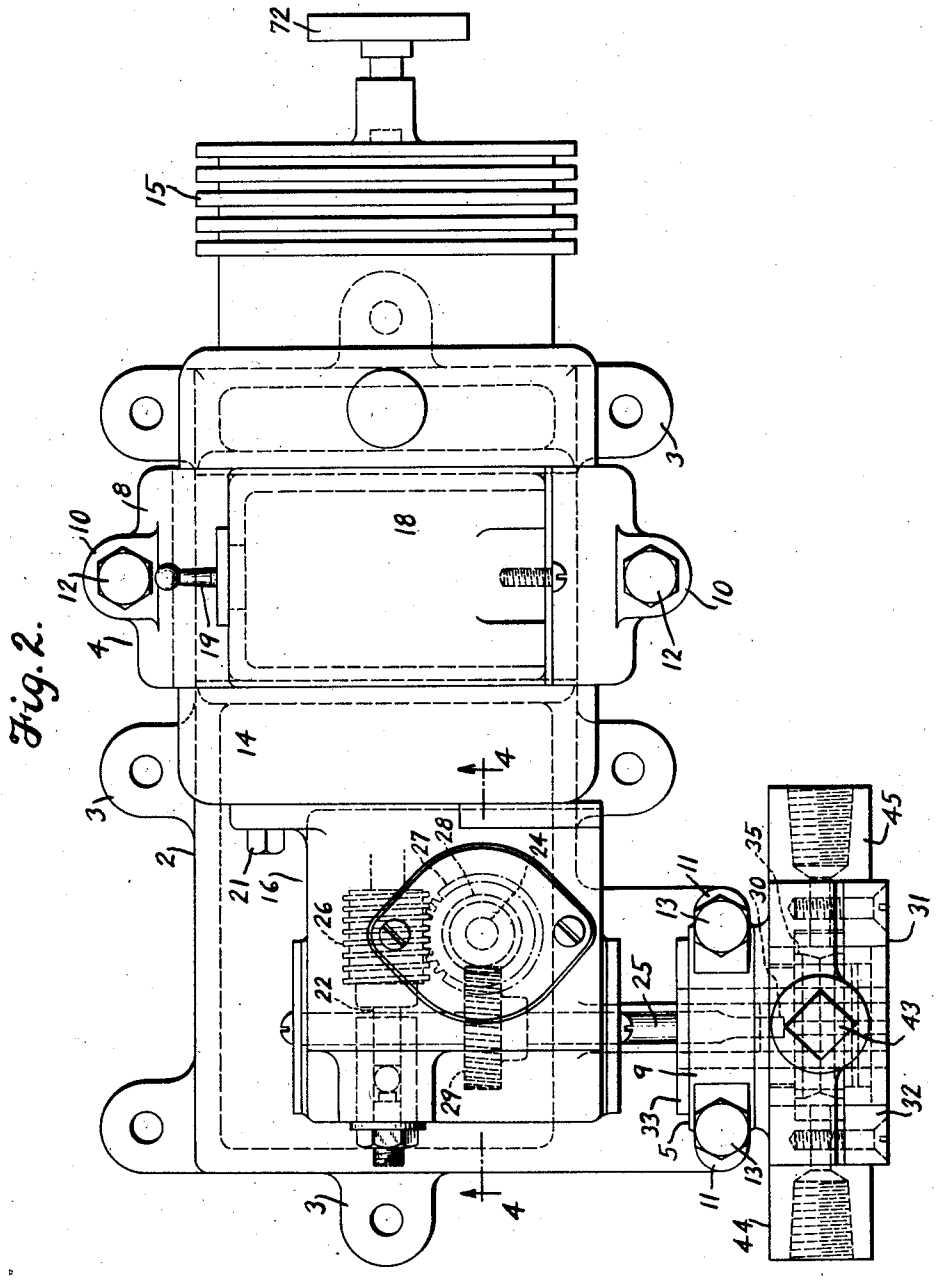
INVENTOR
James L. Anderson
BY
ATTORNEY

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Fig. 2.



INVENTOR
James L. Anderson
BY
J. F. Randenberg
ATTORNEY

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Fig. 3.

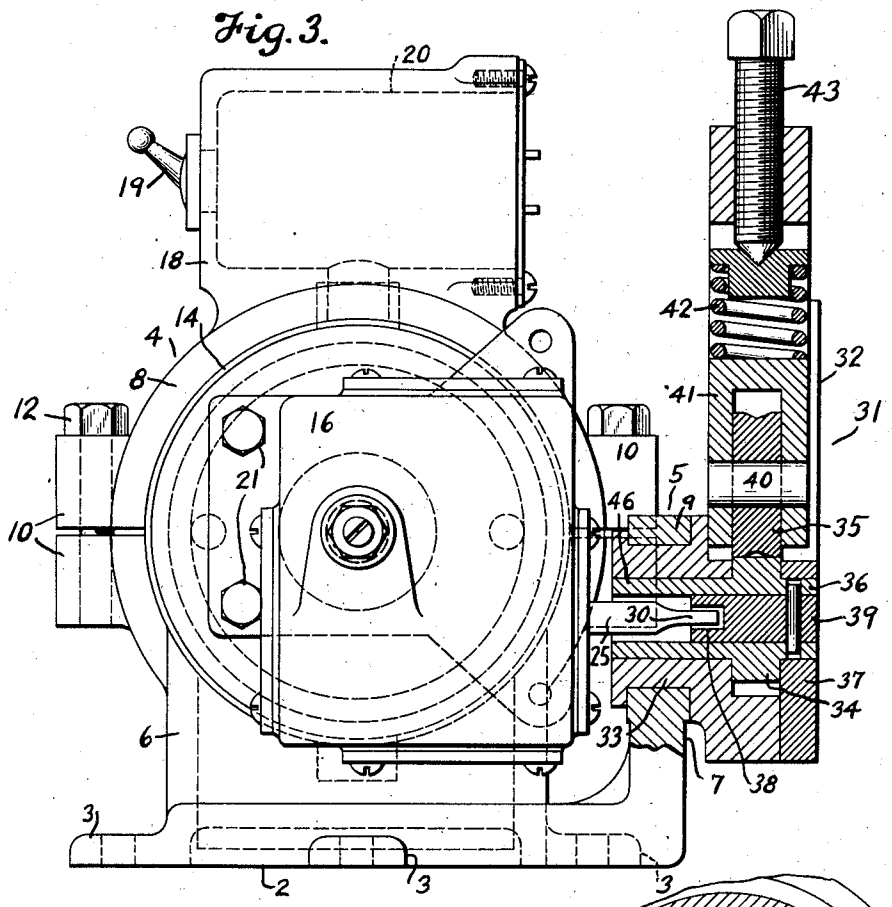


Fig. 5.

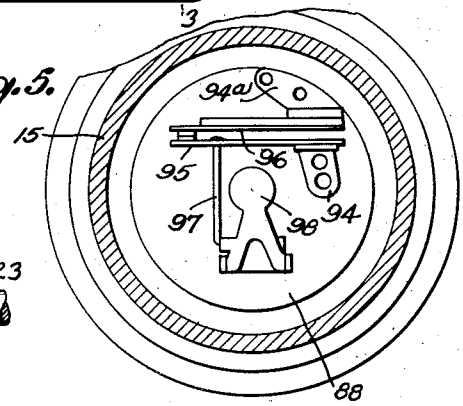
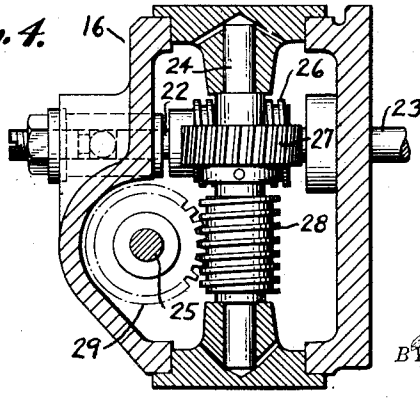


Fig. 4.



INVENTOR
James L. Anderson
BY
J. F. Vandenburg
ATTORNEY

Patented Apr. 18, 1933 1,903,953

UNITED STATES PATENT OFFICE

JAMES L. ANDERSON, OF TENAFLY, NEW JERSEY, ASSIGNOR TO AIR REDUCTION COMPANY, INCORPORATED, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK

WIRE FEED DEVICE

Application filed April 8, 1930. Serial No. 442,701.

The particular object of this invention is to provide a simple, small, compact, self-contained, positive, adjustable, easily controlled and efficient means of feeding wire into a fusion weld. The wire may be either the weld metal wire used with oxyacetylene welding or the electrode wire used in arc welding.

A further object of the invention is to feed the weld metal wire into the weld at any rate which is required and which is kept truly uniform for any operation.

The nature of the invention can best be brought out in the following description, reference being had to the accompanying drawings of the preferred embodiment of the invention.

In these drawings:

Fig. 1 is a side elevation of the preferred form of apparatus embodying the invention, broken lines being used to indicate the possibility of adjustment of the roll assembly, and the casing of the governor unit being in broken section to show the governor within;

Fig. 2 is a plan view;

Fig. 3 is an end elevation with the roll assembly in vertical section;

Fig. 4 is a vertical section taken on the line 4—4 of Fig. 2; and

Fig. 5 is a transverse section through the governor casing, showing the governor in face view.

The device has a base 2, which is provided with apertured lugs 3 enabling it to be secured to a suitable part of a welding machine or other fixture.

The base carries two girdle clamps, namely a large clamp 4 and a small clamp 5, these clamps being disposed at right angles to each other. The lower halves 6 and 7 of the clamps are cast in one with the base, and the upper halves 8 and 9 are secured to the lower halves by means of pairs of lugs 10 and 11 and screws 12 and 13.

The large clamp clasps the case 14 of an adjustable speed electric motor, this motor being provided at one end with an adjustable speed control unit 15, and at the other end with a reduction gear unit 16, these units being supported by the motor case, which in turn is held by the clamp, the speed control unit and the reduction gear unit being free of the base. A recess cast in the bottom part of this clamp holds a condenser 17, which is used with this type of adjustable speed motor. A cylindrical boss 18 for carrying the motor switch 19 and pony plug receptacle 20 is cast integral with the clamp, making a neat solid unit. All electrical wiring has been omitted in the drawings, as the wiring is conventional.

The case of the reduction gear unit is fixedly applied to the end of the motor case by screws 21 in a position which alines a horizontal shaft 22 of the reduction gear unit with the motor shaft 23, to which it is coupled. The reduction gear unit case contains also a vertical shaft 24 and a horizontal shaft 25, the last lying in a vertical plane at right angles to the vertical plane of the first shaft 22. The shafts are geared together in this three dimensional disposition by two sets of reduction gears consisting of a worm 26 on the shaft 22, engaging a worm wheel 27 on the vertical shaft 24, and a second worm 28 on the latter shaft engaging a worm wheel 29 on the shaft 25. The last-mentioned shaft extends laterally beyond the case of the gear reduction unit and terminates in a flat tongue 30, for a purpose which will appear.

The smaller clamp 5 holds a wire feeding roll assembly or unit 31. This assembly has a yoke 32 provided at one end with a laterally projecting grooved neck 33, which is encircled by the clamp, like a journal in a bearing which can be tightened to hold the neck at any position to which it may be turned. In this way it is possible to revolve the roll assembly through 360° and to clamp it in any angular position in a plane.

In this yoke two rolls are mounted, one roll 34 being knurled for driving the wire and the other roll 35 being grooved for guiding the wire. The roll 34 is provided with hollow hubs 35 and 36, one being journaled in the yoke and the other in a guide plate 37, which latter is fastened to the yoke by screws after the parts are assembled. The roll 34 and the neck 33 are coaxial, so that angular adjustment of the roll assembly has no effect

on the alinement of the roll with the shaft 25, which extends into the hollow hub 36 so that the flat tongue 30 will engage a slot 38 cut in the end of an internal shaft 39 which is pinned to the hub 36. By making the groove wider than the tongue a universal joint action is obtained that compensates for any slight misalinement of the shafts 25 and 39, the latter shaft being in effect an axial part of the feed roll.

The grooved roll 35 is loosely mounted on an axle 40 passing through and carried by a U-shaped guide 41, this guide being slidable in ways formed by the yoke and the guide plate. The grooved roll is held in contact with the wire by a spring 42, the compression of which is adjustable by means of a set-screw 43. This method of holding the wire against the feed roll makes it possible to feed any size wire within the range of the device. The method of holding the wire against the knurled roll also makes it possible to have sufficient friction to feed the wire without causing the knurl formations on the roll to throw up a burr large enough to interfere with the passing of the wire through the guide tube and welding tip.

The yoke is provided with two bosses 44 and 45 for inserting tubes to guide the wire from a reel to the wire feed device and thence to the welding tip or welding region.

The manner of mounting the motor with its reduction gear unit and the roll assembly in clamps which are rigid with the base and in part preferably integral therewith enables alinement of the respective driving and driven axes to be easily obtained, and also makes it possible to set the roll assembly in position for feeding the wire in any desired direction. By turning the motor casing in its clamp and by moving it endwise therein, the lateral shaft 25 is adjustable up and down and horizontally with reference to the feed roll, and the flexible coupling afforded by the tongue and groove insures satisfactory transmission of power notwithstanding any minor deviation from true alinement which may be made necessary in effecting the adjustment or by reason of manufacturing tolerances, or inaccuracies which otherwise could not be tolerated.

The motor is preferably a series-wound motor, though this is not essential. The encased speed control unit 15 is of the centrifugal electrical type having a set of electrical contacts mounted eccentrically on a suitable part rotated by the armature of the motor, these contacts, which are included in a circuit of the motor, being urged together by spring force and being separated by the centrifugal effect when the speed tends to exceed a predetermined value. The position of one of the contacts, or the effect of the spring, is made adjustable so that the control may be set for any desired speed by manipulating a projecting knob 72. Such governor controls are known, but the combination of such a control with feeding means for a welding wire is of signal importance, since the success of the welding operation depends on introducing the wire into the weld at a definite rate in inches per minute. The combination makes the rate of feed independent of variations in line voltage, which are often substantial, and enables the rate of feed to be adjusted to any value since the adjustment is not by steps but is continuous from the lowest to the highest feed rate that may be required. In this connection it may be explained that different welding operations call for the addition of different quantities of metal per unit of time.

Thus, the range may be from less than a foot of wire per minute to as much as twenty or thirty feet a minute, and the ability to feed different sizes of wire with the apparatus increases the range in terms of weight of metal added. Because of the precision with which the feed of the wire can be adjusted and the certainty of holding it constant when adjusted, it becomes possible to govern the contour of the weld with exactitude and uniformity, to obtain either a flush weld of great smoothness, for example, or raised welds representing any desired degree of reinforcement.

Details of the governor are shown in Figs. 1 and 5. This governor has a plate 88 which is secured to the upper end 89 of the armature shaft and which carries on its under side two conductor rings 90 and 91 contacted by two brushes 92 and 93 included in the motor circuit.

Two brackets 94 and 94a on top of the plate 88 are electrically connected with the rings 90 and 91, respectively, and secured to these brackets are two spring blade arms 95 and 96 having contact points at their ends which normally touch each other. The blade 95 is limited in its movement by a link 97 connected to a bell-crank lever 98, one arm of which is acted upon by the speed-adjusting screw 99 threaded through the top of the casing 15 and having the readily accessible operating knob 72.

When the motor is in operation centrifugal force acts on the make-and-break arms 95 and 96 of the governor, and when the speed is high enough, depending upon the adjustment of the screw 99, the arm 96 is moved away from the arm 95, momentarily breaking the motor circuit. The result of this is to keep the speed from increasing or to cause it to slacken imperceptibly, whereupon the contact points of the arms touch each other again, restoring the circuit and sustaining the speed. By these slight fluctuations in the circuit, the speed of the motor is held remarkably uniform at any value to which the governor may be adjusted by the screw.

While the preferred embodiment of the invention has been described in detail, it will be understood that various changes may be made and that parts of the invention may be used without others, without departing from the scope of the claims.

I claim:

1. A wire feed device comprising a base having two clamps, a roll assembly having a neck held in one of said clamps, an electric motor having a case held in the other of said clamps and a reduction gear unit between said motor and said roll assembly, said clamps enabling both said motor and said roll assembly to be adjusted relatively to each other and to the base.

2. A wire feed device comprising a base having two clamps, a roll assembly having a neck held in one of said clamps, an electric motor having a case held in the other of said clamps and a reduction gear unit between said motor and said roll assembly, said clamps enabling both said motor and said roll assembly to be adjusted relatively to each other and to the base, said reduction gear unit being united to the motor case and supported thereby free of said base.

3. A wire feed device comprising a base having two clamps, a roll assembly having a neck held in one of said clamps so that the roll assembly can be turned to feed the wire in various directions in a plane, an electric motor having a case held in the other of said clamps, and an interposed reduction gear unit having a case united to said motor case.

4. A wire feed device comprising a base having two clamps, a roll assembly having a neck held in one of said clamps, enabling said assembly to be clamped at any angle in a plane and the wire to be fed at any angle in a plane, an electric motor having a case held in the other of said clamps, a reduction gear unit driven by said motor, and means affording a flexible coupling between said reduction gear unit and a roll of said roll assembly.

5. A wire feed device comprising a base having two clamps, a roll assembly having a neck held in one of said clamps, enabling said assembly to be clamped at any angle in a plane and the wire to be fed at any angle in a plane, an electric motor having a case held adjustably in the other of said clamps, and an interposed reduction gear unit supported by said motor case in operative relation to said roll assembly.

6. A wire feed device comprising a base having two clamps disposed at right angles with relation to each other, a roll assembly having a neck held in one of said clamps so that the roll assembly can be turned to feed the wire in various directions in a plane, an electric motor having a case held adjustably in the other of said clamps, and an interposed reduction gear unit supported by said motor case and having a lateral shaft in driving relation to a roll of said roll assembly.

7. A wire feed device comprising a base having two clamps disposed at right angles with relation to each other, a roll assembly having a neck held in one of said clamps, enabling said assembly to be clamped at any angle in a plane and the wire to be fed at any angle in a plane, an electric motor having a case held adjustably in the other of said clamps, an interposed gear reduction unit supported by said motor and having a laterally projecting shaft, and means affording a flexible coupling between said shaft and a roll of said roll assembly.

8. A wire feed device comprising a base having two clamps disposed at right angles with relation to each other, a roll assembly having a neck held in one of said clamps so that the roll assembly can be turned to feed the wire in various directions in a plane, an electric motor having a case held in the other of said clamps, and an interposed reduction gear unit having a shaft connected in line with the shaft of the motor and a lateral shaft coupled with a roll of said roll assembly.

9. A wire feed device comprising a base having two clamps disposed at right angles with relation to each other, a roll assembly having a neck held in one of said clamps, an electric motor having a case held in the other of said clamps, and an interposed reduction gear unit having three shafts disposed in three-dimensional relation and connected by two sets of reduction gears, the first of said shafts being connected in line with the shaft of the motor and the third or lateral shaft being coupled to a roll of said roll assembly.

10. A wire feed device comprising driving means, a clamp, a roll assembly having a neck held in said clamp and a feed roll coaxial with said neck to be driven by said driving means, said clamp and neck enabling said roll assembly to be clamped at various angles in order to feed the wire in desired directions.

11. A wire feed device comprising a base having a clamp, a motor having a case held adjustably in said clamp, a roll assembly supported on said base independently of the motor, and an interposed reduction gear unit united with said motor case and supported thereby free of the base.

12. A wire feed device comprising a base having a clamp, a motor having a case held in said clamp and capable of being turned therein about the axis of the motor, a roll assembly supported on said base independently of the motor, and a reduction gear unit supported by said motor case and having a lateral shaft to be disposed in driving relation to a roll of said roll assembly.

13. A wire feed device comprising a base,

a motor clamp consisting of a lower part, which is integral with the base, and an upper part, the latter having an integral boss carrying a motor switch and a plug receptacle, an electric motor the case of which is held in said clamp, a roll assembly and an interposed reduction gear unit.

14. A wire feed device comprising a base, a clamp thereon, a motor having a case held adjustably in said clamp and supporting at its opposite ends and free of the base a speed control unit and a reduction gear unit, the latter having a lateral shaft, and a roll assembly comprising a feed roll and a guide roll, the former driven by said shaft.

15. A device of the kind described comprising a support, a wire-feed roll assembly, means for driving a roll of said assembly, said assembly having a circular portion coaxial with said roll and a clamp which connects said roll assembly to said support and in which said circular portion can be rotated whereby the roll assembly can be turned about the axis of said roll relatively to the support and the driving means and be clamped at any desired angle in a plane to feed the wire at any desired angle.

JAMES L. ANDERSON.