Nov. 12, 1929. P. R. HAHNEMANN 1,735,243

SLIP ROLL FORMING MACHINE

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Fig. 1.

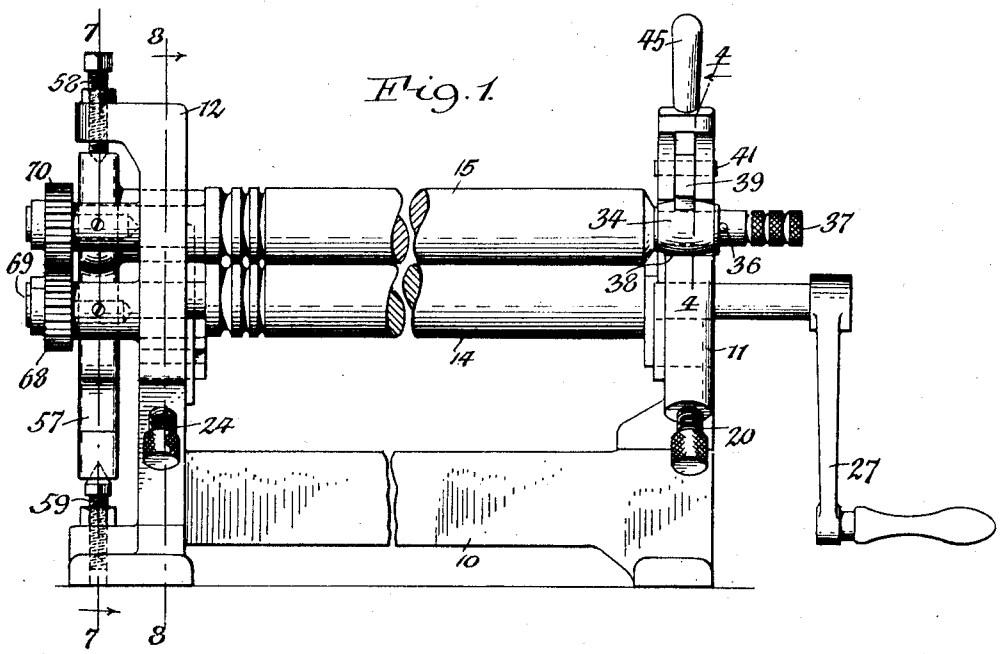


Fig. 2.

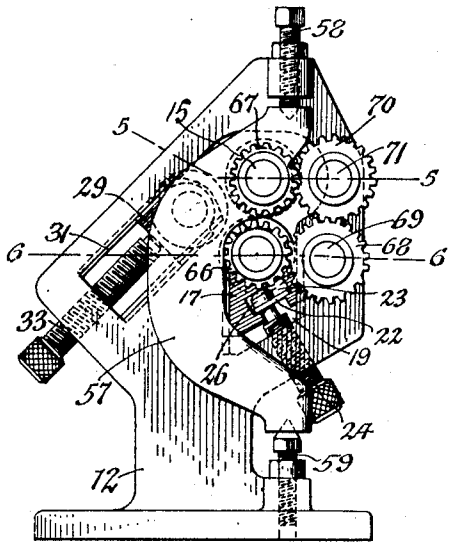


Fig. 3.

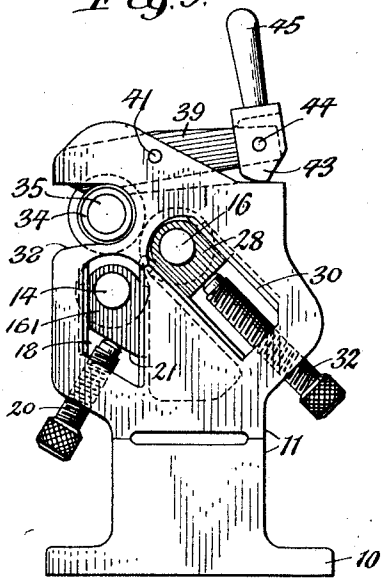
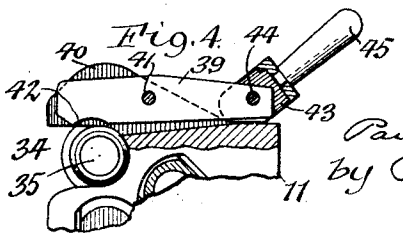


Fig. 4.



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Fig. 5.

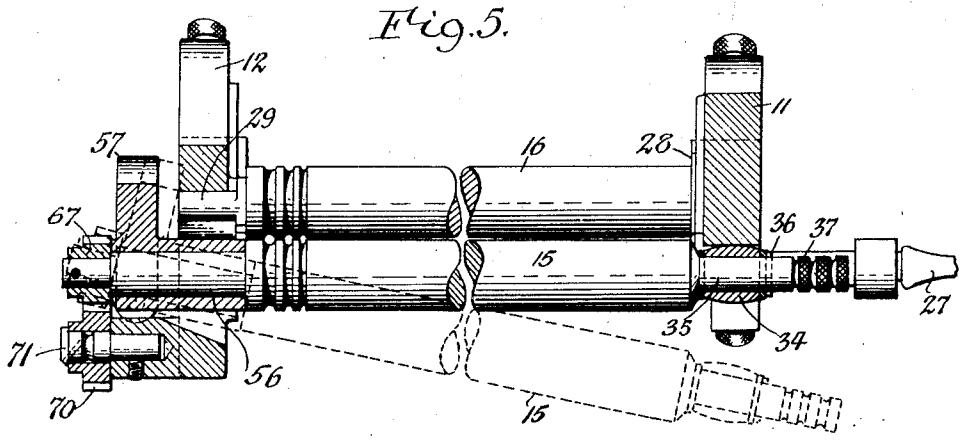


Fig. 6

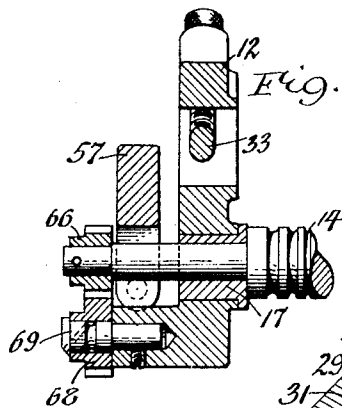


Fig. 8.

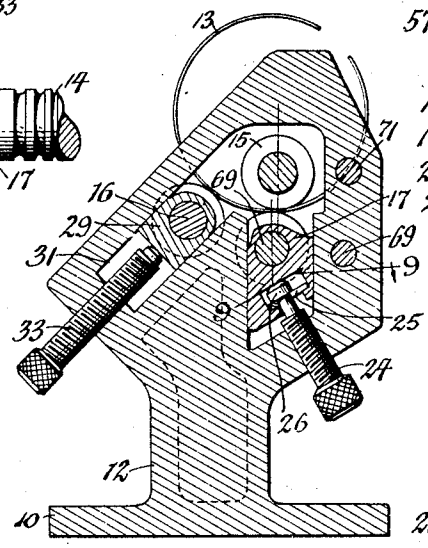


Fig. 7.

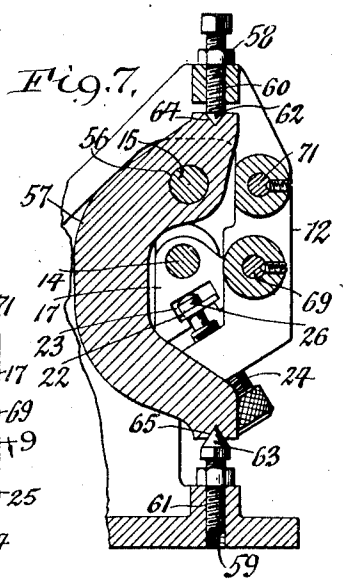


Fig. 10.

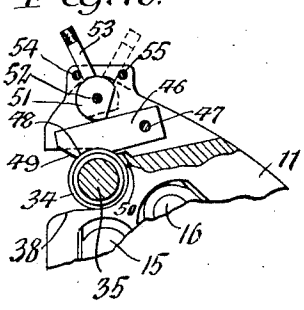
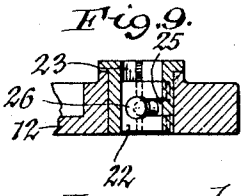


Fig. 9.



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UNITED STATES PATENT OFFICE

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SLIP-ROLL-FORMING MACHINE

Application filed May 8, 1928. Serial No. 276,021.

This invention relates to a slip roll forming machine whereby sheets of metal are bent into the form of a pipe or tube and in which the roll about which the pipe is formed may be moved away from the companion rolls whereby the bending operation is performed in order to permit the finished or completed pipe to be slipped from the respective roll. A device of this general character is shown in the co-pending application Serial No. 275,586.

It is the object of this invention to provide an improved machine of this character in which the so-called slip or laterally movable roll is so mounted that the same is moved horizontally toward and from its operative position and the operator manipulates all the parts from the head end of the machine, while the gearing which operatively connects the several rolls is arranged at the tail end of the machine where the pivot is located about which the slip roll is moved into and out of its working position.

More particularly, this invention relates to improved means for supporting and locking the head end of the slip or upper roll in its operative position, and an improved form of gearing for operatively connecting the lower and upper rolls at the tail end thereof without interfering with the freedom of motion of the upper roll laterally at its head end toward and from the companion lower end rear rolls.

In the accompanying drawings:—

Figure 1 is a front elevation, partly broken away, of a slip roll forming machine embodying my improvements.

Figure 2 is an end elevation of the same viewed from the left or tail end of the machine.

Figure 3 is an end elevation thereof viewed from the head end of the machine.

Figure 4 is a fragmentary vertical transverse section taken on line 4—4 of Fig. 1, but showing the holding means for the head end of the upper or slip roll unlocked in order to permit of moving the slip roll toward and from the lower rear rolls.

Figures 5 and 6 are horizontal sections taken on the correspondingly numbered lines in Fig. 2.

Figures 7 and 8 are vertical transverse sections taken on the correspondingly numbered lines in Fig. 1.

Figure 9 is a fragmentary vertical section taken on line 9—9 of Fig. 8.

Figure 10 is a fragmentary transverse section similar to Fig. 4, but showing a slight modification in the construction of the fastening mechanism for the head end of the upper or slip roll.

In the following description like characters of reference indicate corresponding parts in the several views of the drawings:

Although the main frame of this machine may be variously constructed, the same, in the present case, comprises a horizontal longitudinal base 10, a head standard 11 rising from the head end of the base, and a tail standard 12 rising from the tail end of the base, these parts being preferably, though not necessarily, made of cast metal.

Within this frame are mounted the rolls whereby a sheet of metal is bent into the tubular form indicated at 13 in Fig. 8, these rolls comprising a lower longitudinal driving roll 14, an upper longitudinal slip roll 15, and a rear longitudinal bending roll 16, the upper roll being arranged above the lower roll, and the rear roll being arranged opposite the pass between the lower and upper rolls, in a manner well-known in this class of machines.

The lower roll 14 is journaled at its head and tail ends in bearings formed in bearing blocks 161 and 17 which are adjustable vertically in upright guide ways 18, 19 formed in the lower parts of the head and tail standards 11, 12.

Vertical adjustment of the head bearing block 161 is effected by means of an inclined screw 20 working in the lower front head part of the standard 11 and engaging with an inclined face 21 at the lower end of the head bearing block 161, as shown in Fig. 3. Vertical adjustment of the tail bearing block 17 is effected by means of a coupling plate 22 arranged in an inclined position within the enlarged upper part 23 of a T-

shaped channel in the lower end of the bearing block 17 and engaging with the lower side of said enlargement, and an inclined adjusting screw 24 working in the lower front part of the tail standard 12 and passing through the narrow part of the T-shaped channel, and also through a transverse slot 25 in the coupling plate and provided at its upper end with a head 26 which bears with its upper side against the top of the T-shaped channel and with its lower side against the upper side of said coupling plate 22.

By turning this adjusting screw 24 in one direction or the other the tail bearing block 17 will be positively raised and lowered and held in its adjusted position, and during such adjustment the coupling plate 22 slides transversely relatively to the axis of this adjusting screw.

In Figs. 1 and 5 the lower roll 14 is provided at its right hand or head end with a crank 27 whereby this roll may be turned manually, but if desired the same may be driven by power.

The rear or bending roll 16 is journaled at its opposite ends in bearings formed in bearing blocks 28, 29 which slide in inclined guide ways 30, 31 formed in the rear parts of the head and tail standards 11, 12, and inclined adjusting screws 32, 33 working in threaded openings in the rear parts of these standards and engaging with the lower ends thereof, as best shown in Figs. 2, 3 and 8.

The upper or slip roll 15 is mounted at its tail end so as to be capable of turning about its own axis and also capable of swinging horizontally about a vertical axis which is arranged adjacent to the tail end of the several rolls, and the head end of the slip roll is adapted to be connected with and disconnected from the head standard to permit of opening the machine and removing the finished tube from the slip roll after the operation of bending a sheet of metal into tubular or pipe form has been completed.

The preferred means for thus connecting and disconnecting the head end of the slip or upper roll with the head standard, as shown in the drawings, are constructed as follows:—

The numeral 34 represents a bearing sleeve preferably of bilge form mounted on the reduced part 35 at the head end of the upper roll 13 and held against longitudinal movement thereon by means of a transverse retaining pin 36 passing through this reduced part on the outer side of this sleeve. The extremity of the upper roll at the right or head end thereof preferably forms a handle 37 which is suitably knurled to permit the operator to conveniently manipulate the upper roll when moving the same horizontally into and out of its operative position.

This bearing sleeve 34 is adapted to move into and out of a locking slot 38 formed in the upper part of the head standard 11 and extending to the front side thereof. When this bearing sleeve engages the rear end of the slot 38, the same is in its operative or working position and the same may be locked or held in this position by a fastening mechanism which, as shown in Figs. 1, 3 and 4, comprises a vertically swinging latch 39 arranged in a recess 40 on the upper part of the head standard and pivoted between its front and rear ends to the same by means of a horizontal longitudinal pivot pin 41.

On the underside of the front part of this latch the same is provided with a jaw 42 which is adapted to move downwardly and engage the upper side of the bearing sleeve 34, as shown in Fig. 3, and thereby hold this sleeve and the head end of the upper roll in its operative position on the head standard. The latch 39 is turned into its locking position and held with its front jaw in engagement with the sleeve 34 by a cam 43 which is preferably of bifurcated or forked form and pivoted by means of a horizontal longitudinal pin 44 on the rear end of the latch 39 and adapted to engage with the adjacent upper rear part of the head standard 11, the turning movement of this cam being preferably effected by means of a handle 45 projecting upwardly therefrom.

Upon turning the cam 43 so that its high part engages with the adjacent part of the head standard 11 below the same, as shown in Fig. 3, the front end of the latch 39 is moved downwardly for engaging its jaw with the bearing sleeve 34 and locking the head end of the slip roll in its operative position.

Upon turning this cam 43 so that the low part of its face is presented to the adjacent part of the head standard 11, as shown in Fig. 4, the jaw at the front end of the latch may be raised out of engagement from the bearing sleeve 34 and thereby permit the head end of the slip roll to be moved out of the locking slot 38 and returned thereto for the purpose hereinbefore mentioned.

In the modified form of this slip roll holding mechanism shown in Fig. 10, the latch 46 is pivoted by means of a horizontal longitudinal pin 47 to the upper part of the head standard 11 and provided at its front end with a jaw 48 for engagement with the upper side of the bearing sleeve 34 and also with a beveled nose 49, whereby, upon moving the bearing sleeve 34 into the notch 38, the latch 46 will be lifted to permit the bearing sleeve to enter this slot and be engaged by the jaw of the latch.

While the bearing sleeve 34 is disengaged from the slot 38 this latch is prevented from dropping down too far by means of a stop 50 formed on the upper part of the head standard 11 and adapted to engage with the underside of the latch 46. The latch 46 is locked in engagement with the bearing sleeve 34 by

means of a rotary cam 51 pivoted by means of a horizontal longitudinal pin 52 to the head standard 11 and provided with an upwardly projecting handle 53 for manipulating the same.

Upon turning this cam 51 so that its high face engages with the upper side of the latch 46, as shown by full lines in Fig. 10, the latch will be secured in its lower operative position, but when this cam is turned so as to present its low face to the latch, as shown by dotted lines in Fig. 10, then the latch will be unlocked and the bearing sleeve 34 will be free to move into and out of the locking slot 38.

The rocking movement of this cam 51 is limited by means of stops 54, 55 mounted on the head standard 11 in position to be engaged by the handle 53 at the end of its forward and backward movements.

The tail end of the slip or upper roll 15 is journaled in a bearing 56 formed in the upper part of a swiveling bracket 57 which is arranged adjacent to the outer side of the tail standard and pivotally supported so that the same turns about a vertical axis arranged adjacent to the tail end of the several rolls.

This pivotal connection preferably consists of upper and lower pivot screws 58, 59 which are arranged vertically in line and work in threaded openings 60, 61 formed in the upper and lower parts of the frame at the tail end thereof and provided at their inner ends with conical points 62, 63 which engage with correspondingly shaped sockets 64, 65, on the upper and lower ends of the swiveling bracket 57, as shown in Figs. 1, 2 and 7.

The swiveling bracket 57 is preferably constructed in the form of a C-shaped yoke which has a central part deflected rearwardly relatively to the upper and lower ends thereof, as shown in Figs. 2 and 7, and thereby clears the space adjacent to the tail end of the lower or driving roll 14.

In order to cause the lower driving and the upper slip roll to rotate in unison, a compensating gearing is provided which operatively connects the tail ends of these rolls and which is so organized that the members of this gearing always remain in mesh not only when the parts are in their normal operative position, but also when the slip or upper roll is moved horizontally forward into a position in which the finished pipe is removed therefrom.

In the preferred construction of this compensating gearing shown in Figs. 1, 2, 5 and 6, the same consists of a driving gear wheel 66 secured to the tail end of the lower roll, a driven gear wheel 67 secured to the tail end of the upper roll, a pair of intermeshing intermediate gear wheels arranged one above the other, the lower one 68 of said intermeshing gear wheels being pivoted on the outer side of the front part of the tail standard 10 by means of a pin 69 and meshing with the front side of the driving gear wheel 66, and the upper one 70 of said intermediate gear wheels being pivoted to the tail standard by means of a pin 71 and meshing with the front side of the driven gear wheel 67. By this means motion is transmitted from the lower or driving roll 14 to the upper or slip roll 15 at the tail end thereof, so that the same are turned in unison at a point remote from the place where the operator manipulates the various parts of the machine and at the same time enables the upper or slip roll to be moved horizontally into and out of its operative position.

Such horizontal movement of the slip roll is much easier and can be accomplished with less effort on the part of the operator than is required when this slip roll has to be raised and lowered, and as the several gears in the present case remain constantly in mesh with one another there is no liability of deranging these gears and at times interfering with the free re-engagement of the same, as is the case in the gear driving mechanism of slip roll forming machines of the type heretofore in use in which the members of the gearing were engaged and disengaged while moving the slip roll out of and into its operative position.

In the present case the driving and intermediate gear wheels do not change their axial position while shifting the upper slip roll horizontally toward and from the lower and rear rolls, and the driven gear wheel 67 merely slides laterally with its teeth to a limited extent on the opposing teeth on the upper intermediate gear wheel 70 when opening and closing the upper slip roll, but at no time are the teeth of the driven gear wheel 67 disengaged from the upper intermediate gear 70.

The extent of throw of the upper slip roll is shown by full lines in Fig. 5, in its normal operative position, and by dotted lines in its open position, and the swiveling bracket 57 is also shown by full lines in its normal position, and by dotted lines in its shifted position, and the extent of lateral tilt of the driven gear wheel 67 is represented by full and dotted lines so as to clearly indicate that the teeth of the same are at no times out of mesh with those of the upper intermediate gear wheel 70.

By thus maintaining the several gear wheels of the compensating gearing constantly in mesh with each other and still permitting the upper slip roll to be moved horizontally into and out of its operative position, it is possible for this machine to be operated more conveniently and expeditiously with less labor and thereby insuring a larger output of the same.

I claim as my invention:—

1. A slip roll forming machine comprising a main frame provided at its head end with a standard having a horizontal forwardly

opening slot, a lower roll mounted on said frame, an upper roll pivotally mounted at its tail end on said frame to swing horizontally and movable with its head end into and out of said slot, and means for holding the head end of said upper roll in said slot comprising a latch pivoted on said standard to swing vertically and having a jaw adapted to engage over the head end of said upper roll, and a cam for holding the latch in its operative position.

2. A slip roll forming machine comprising a main frame provided at its head end with a standard having a horizontal forwardly opening slot, a lower roll mounted on said frame, an upper roll pivotally mounted at its tail end on said frame to swing horizontally and movable with its head end into and out of said slot, and means for holding the head end of said upper roll in said slot comprising a latch pivoted between its front and rear ends on said standard and provided at its front end with a jaw adapted to engage said upper roll, and a cam pivoted on the rear end of the latch and adapted to engage said standard for holding the latch in its operative position.

3. A slip roll forming machine comprising a main frame, a lower roll mounted on said frame, an upper roll pivoted at its tail end to swing horizontally into and out of its operative position, a swiveling bracket turning about a vertical axis on said frame adjacent to the tail end of said rolls and having a bearing in which the tail end of said upper roll is journaled, and gearing operatively connecting said lower and upper rolls including a driving gear wheel secured to the tail end of said lower roll, a driven gear wheel secured to the tail end of said upper roll, and a pair of intermeshing intermediate gear wheels which are pivoted on the main frame and one of which meshes with said driving gear wheel and the other of which meshes with said driven gear wheel.

4. A slip roll forming machine comprising a main frame, a lower roll mounted on said frame, an upper roll pivoted at its tail end to swing horizontally into and out of its operative position, a swiveling bracket turning about a vertical axis on said frame adjacent to the tail end of said rolls and having a bearing in which the tail end of said upper roll is journaled and having its central part deflected rearwardly around the lower shaft, and gearing operatively connecting said lower and upper rolls including a driving gear wheel secured to the tail end of said lower roll, a driven gear wheel secured to the tail end of said upper roll, and a pair of intermeshing intermediate gear wheels which are pivoted one above the other on the main frame and the upper intermediate gear wheel meshing with the front side of said driven gear wheel and the lower intermediate gear wheel meshing with the front side of said driving gear wheel.

In testimony whereof I hereby affix my signature.

PAUL R. HAHNEMANN.