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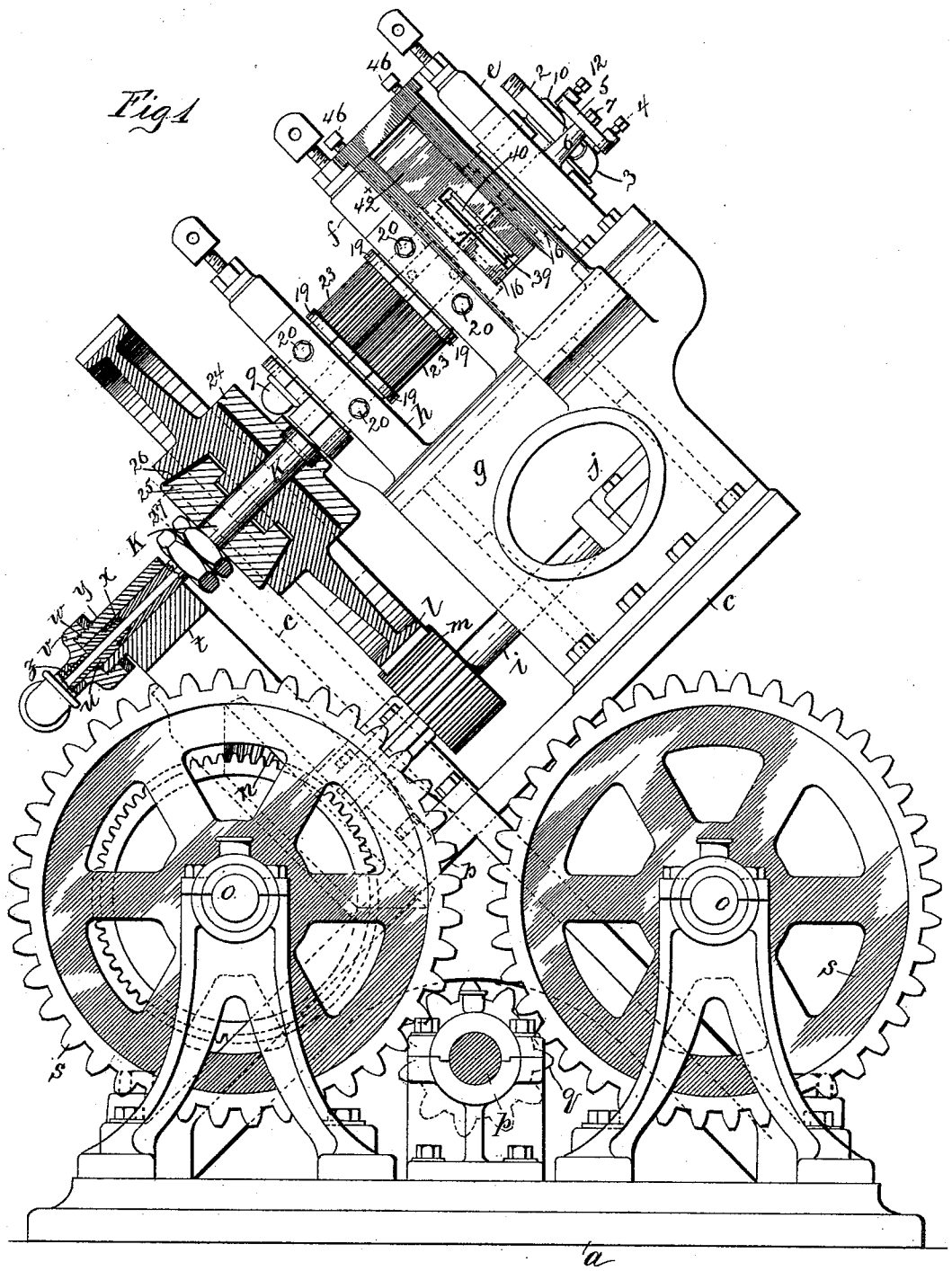
H. A. WILLIAMS.

WIRE ROLLING MILL.

No. 500,108. Patented June 20, 1893.

Fig 1



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By his Attorney
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H. A. WILLIAMS.

WIRE ROLLING MILL.

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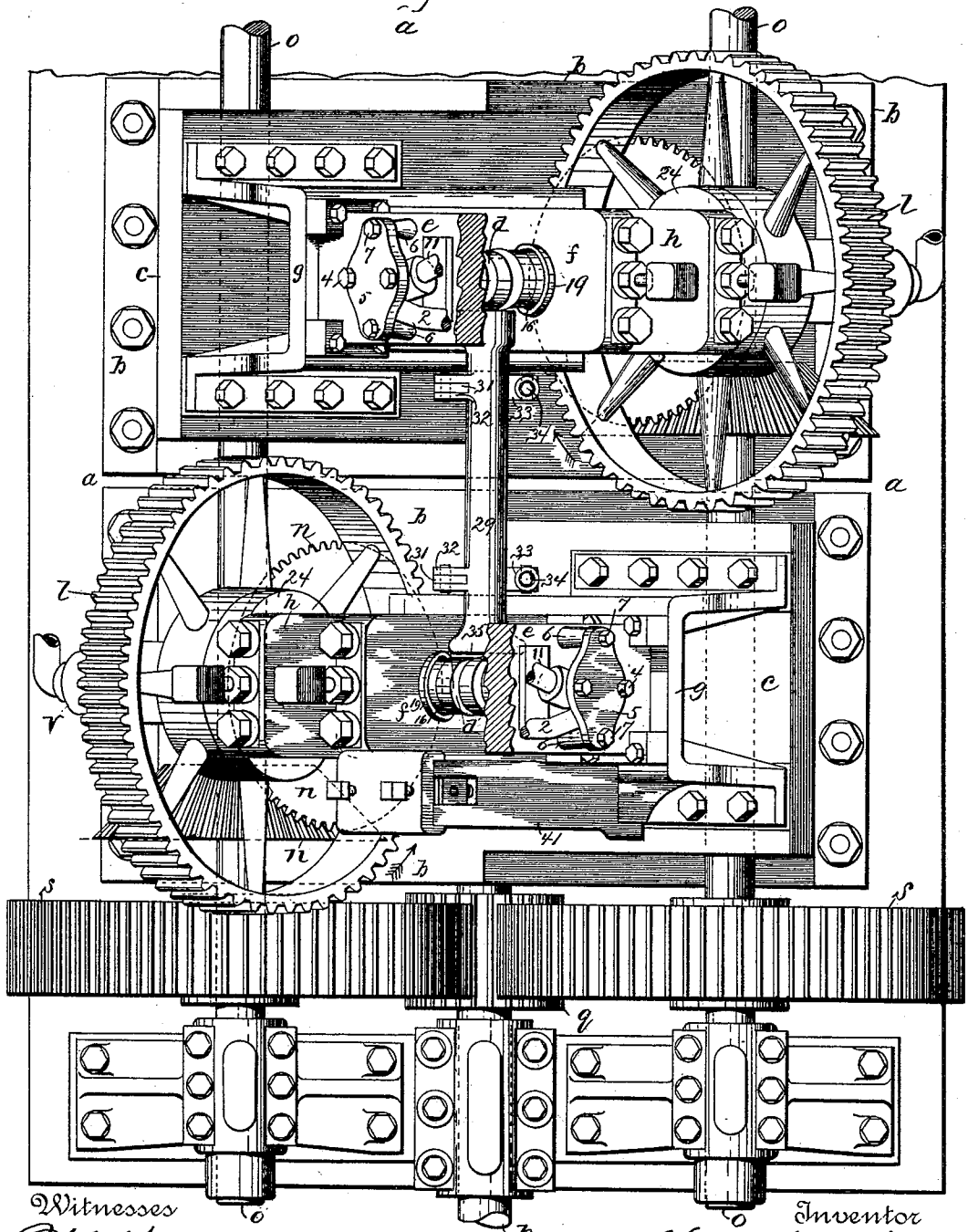
Fig 2



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(No Model.) 4 Sheets—Sheet 3.

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WIRE ROLLING MILL.

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Fig. 3.

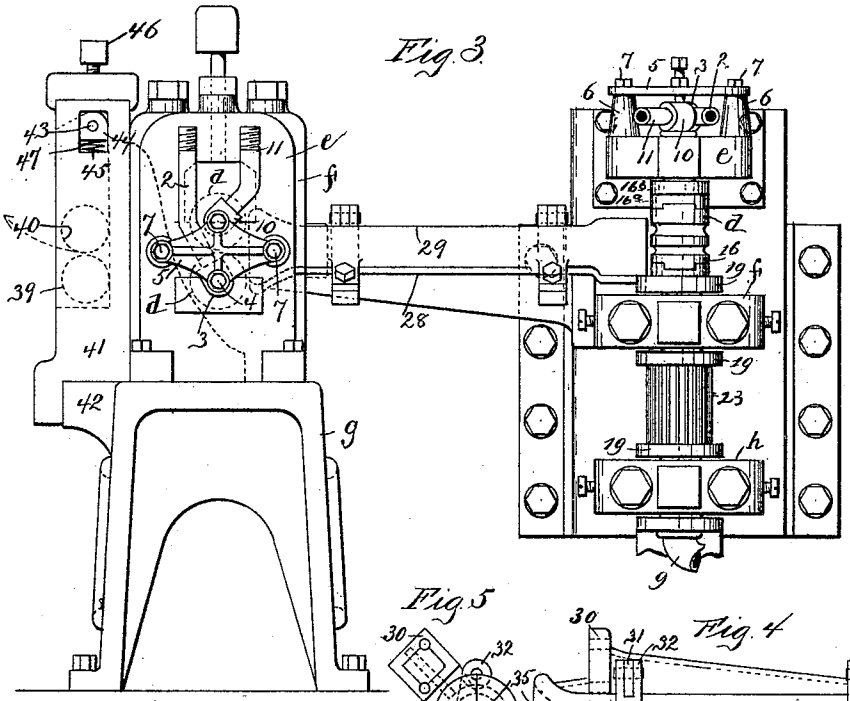

Fig. 5

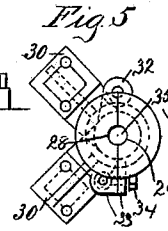

Fig. 4

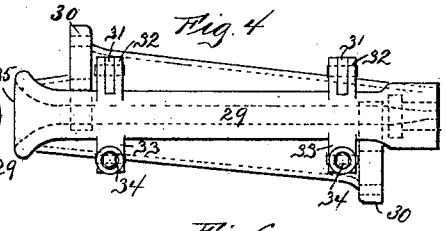

Fig. 11

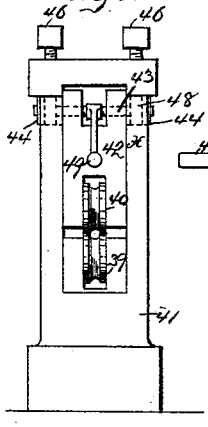

Fig. 12.

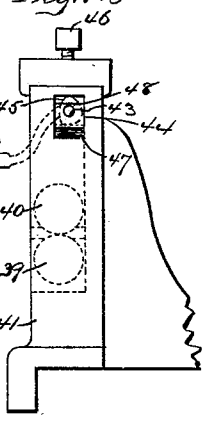

Fig. 7

Fig. 6

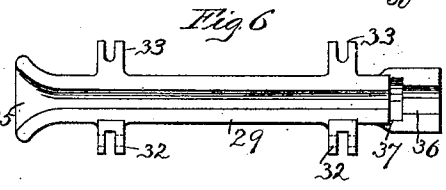

Fig. 9

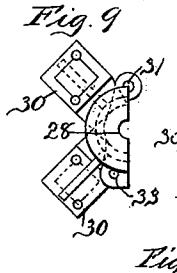

Fig. 8

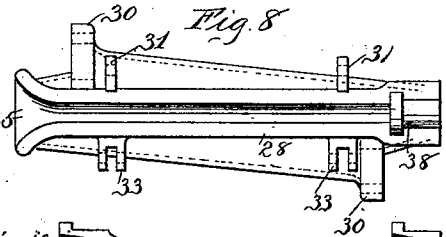

Fig. 10

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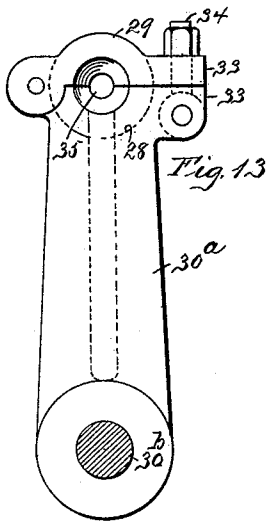

Fig. 13

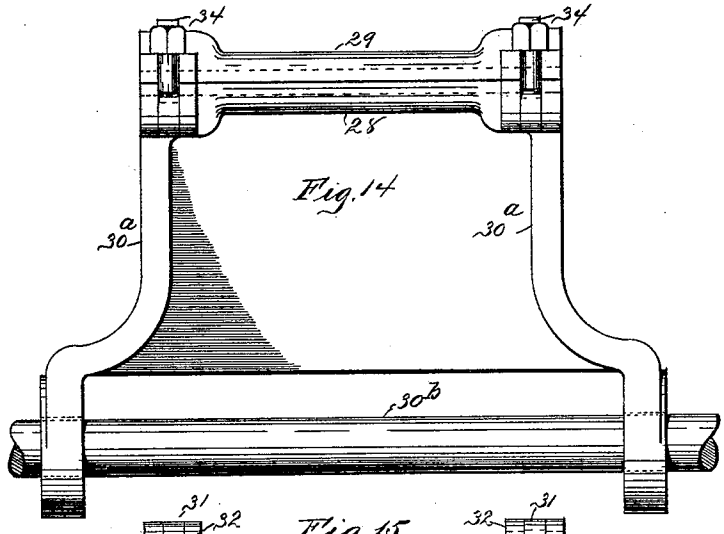

Fig. 14

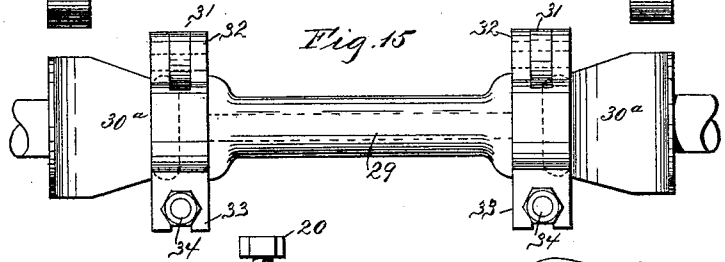

Fig. 15

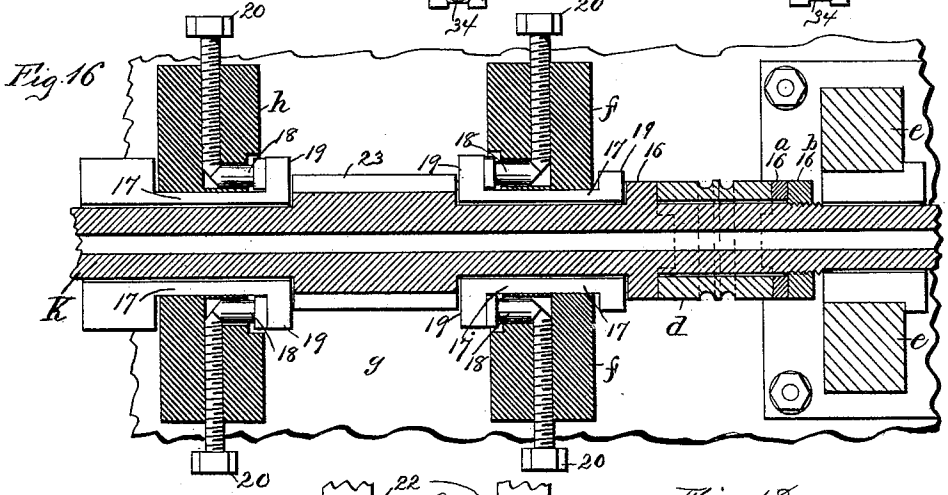

Fig. 16

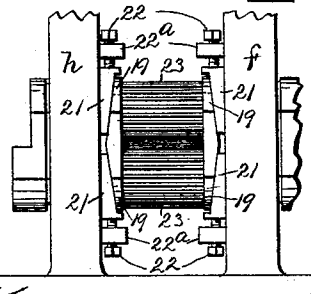

Fig. 17

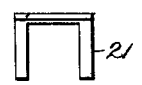

Fig. 18

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UNITED STATES PATENT OFFICE.

HENRY ALEXIS WILLIAMS, OF TAUNTON, MASSACHUSETTS.

WIRE-ROLLING MILL.

SPECIFICATION forming part of Letters Patent No. 500,108, dated June 20, 1893.

Application filed January 17, 1891. Renewed June 14, 1892. Serial No. 436,661. (No model.)

To all whom it may concern:

Be it known that I, HENRY ALEXIS WILLIAMS, a citizen of the United States, and a resident of Taunton, in the county of Bristol, State of Massachusetts, have invented new and useful Improvement in Wire-Rolling Mills, of which the following is a specification.

My invention relates to so-called continuous train rolling mills in which the rolls are arranged alternately in oppositely inclined planes for being placed at right angles to each other successively, and is designed more especially for facilitating the reduction of wire rods to small wires in the cold rolling process, but is applicable also in various respects for roughing or breaking down rolls such as are employed for reducing blooms or billets to wire rods as hereinafter fully described, reference being made to the accompanying drawings in which—

Figure 1 is a front elevation of my improved wire rolling mill with some parts in section. Fig. 2 is a plan view of a portion of the mill including two pairs of rolls and the gearing for applying the driving power, with some parts in horizontal section. Fig. 3 is a side elevation of two pairs of rolls as seen looking in the direction of the axis of the rolls of one pair. Fig. 4 is a plan view of a guide for conducting the rods or wires from one pair to another of the rolls. Fig. 5 is an end elevation of said guide. Fig. 6 is a plan view of the upper part of the guide inverted. Fig. 7 is an end elevation of said part represented in Fig. 6. Fig. 8 is a plan view of the lower part of the guide with a reducing guide at the delivery end, half of which is shown detached and inverted. Fig. 9 is an end elevation of the part represented in Fig. 8. Fig. 10 is a plan view of part of the reducing guide modified so as to extend into the angle between the rolls. Fig. 11 is a front elevation, and Fig. 12 a side elevation of a modified form of the rod-gaging attachment. Fig. 13 is an end elevation, Fig. 14 a side elevation, and Fig. 15 a plan view of a modified form of guide to be used between the respective pairs of rolls. Fig. 16 is a longitudinal section of one of the roll shafts and transverse section of the roll housings showing the means of adjusting the rolls lengthwise for alignment of the passes. Fig. 17 is a front elevation of housings and toothed wheels coupling a pair of rolls showing a modified arrangement of adjusting devices for the rolls. Fig. 18 is a front elevation of an adjusting key employed in the arrangement of Fig. 17.

On the bed plate or frame *a*, which is to be of sufficient length for the entire train of rolls of which there may be twelve to fifteen pairs or sets more or less, I place at intervals corresponding to the distance apart which it is desired to have the pairs of rolls, the transverse triangular base supports *b*, for the individual pairs or sets of rolls, the sides of which are at right angles to each other and forty five degrees to the horizontal plane, and one side of each is extended at *c*, above the apex of the two sides a suitable length for supporting the roll housings on the upper side of the incline so as to be geared at the lower side with the driving shaft said base supports being placed with their extending sides *c*, in the opposite inclinations alternately. These base supports may be cast together with the bed plate *a*, if desired, but for convenience of handling it will probably be preferred to make them separately and bolt them to said bed plate.

On the upper part *c*, of each base support is a pair of grooved reducing rolls *d*, mounted in housings *e*, *f*, of which the part *f*, is preferably made integral with the bench *g*, the other *e*, being detachably fastened to said bench for facilitating the application and removal of the rolls. The gear housing *h*, is also supported on this bench and is also preferably made integral with it. The bench is used to support the housings at a suitable height above the supporting base *c*, to afford space between the housings and the said supporting base for the intermediate shaft *i*, and its upper bearing *j*, said shaft being geared with the lower roll shaft *k*, by the spur wheel *l* on the latter and the pinion *m*, on shaft *i*, and itself being geared by the bevel wheels *n*, with the line-shaft *o*, at one side of the base, two such shafts being employed one on each side for gearing with the rolls of the different inclines, and both being geared with the main driving shaft *p*, through the pinion *q* on said driving shaft and the spur wheels *s*, on the said line shafts. The roll housings are thus mounted on the intermediate bench, and the

intermediate shaft is used to gear the rolls with the line shafts to facilitate the application of the step bearing and the water circulating connection, and also the friction device all in connection with the lower roll shaft described farther on, which could not well be employed if the said shaft were geared directly with the line shaft. The lower roll shaft *k*, has its lower end bearing in the standard *t*, resting on one of the sides of the triangular base supports *b*, and below the apex of the same, said shaft having the pinion 23 fast on or made integral with it and being continuous through the lower roll and having its upper bearing in the removable roll housing *e*, with the adjustable end thrust or step bearing *u*, for the lower end, in the bored hole of the standard and confined by the cap *v*, screwed on the neck *w*, of the standard for a means of adjusting the step as the shaft is shifted lengthwise from time to time for alignment of the pass grooves with packing rings at *x* and *y*, adapted for making water tight joints between the end of the rotating shaft and the step bearing *u*, said bearing and die shaft being bored for the circulation of water to cool the rolls and the journals, which is to be supplied from any source by a pipe 2, and is to be discharged through the waste pipe *z*, at the lower end of the shaft. Pipe 2, is connected with one end of the elbow 3 the other end of which bears against the end of the shaft and is held thereon by a set screw 4 with sufficient power to make a tight joint and to serve for the upper end thrust bearing of the shaft, said set screw being fitted in the yoke 5, secured to the studs 6 of the upper roll housing by the screws 7. The upper roll shaft is also continuous and has its pinion 23 fast on it, same as the lower one, and is bored for the circulation of water which enters the upper end through pipe 11, and escapes from the lower end through the thrust bearing elbow 9. Pipe 11 is secured by screw 12 in like manner as elbow 3 is secured, screw 12 being supported in the same yoke 5. The rolls *d*, are detachably fitted to the shafts for removal to renew the pass grooves and to reverse them for alignment of each of the two pass grooves with the guide. They are fitted between the fixed collar 16 and the detachable collar 16^a, and the nut 16^b, which clutches the roll fast and being removed allows the roll to be changed.

For adjusting the rolls I propose to utilize the upper and lower journal boxes 17, in the housings *f* and *h*, which I arrange so that they can shift lengthwise along the shaft to a limited extent with means for forcing the outer ends against the pinions 23, which may consist of the cone pointed thrust studs 18 placed in suitable chambers in the housings with their heads behind the side flanges 19 of the bearings overlapping the housings, with the cone pointed adjusting screws 20, screwing in through the sides of the housings against said points of the studs so as to thrust them against the flanges of the boxes and cause them to shift the clutch collars and the rolls, or the same can be done by making the box flanges taper as represented in Fig. 17 and using wedge yokes 21, that may be forced in between the housings and the flanges by adjusting screws 22 carried in suitably projecting lugs or flanges 22^a, of the housings. It will be seen that the cone pointed thrust studs with the cone pointed set-screws entering through the outsides of the housings is a device that may be used when it is not feasible to use set screws in the plane of the thrust studs and extending through the housings, owing to the close proximity to the boxes where it would be difficult to work the set screws.

The spur wheel *l*, by which the lower roll shaft *k*, is driven, is made fast to the shaft by a friction device consisting of the friction collar 24 and cone 25, the cone socket 26 in the hub of the wheel, and the adjusting nuts 27 screwed on the shaft to adjust the cone, the object of which is to allow the wheel to shift and avoid stretching the rod or wire too much when it may happen that the elongation of the rod or wire is not equal to the increased speed of the rolls to which the rod or wire is moving, over the speed of the rolls from which it is issuing. With such a friction clutch to each pair of rolls except the first it is designed to speed the rolls a little faster than the speed of the rods or wires so that they will always be taut between the rolls and will run through straight tubular guides from one pair of rolls to another, but as it will sometimes happen that the rods or wires will get stalled in the guides so that ready access for clearing out the obstruction is desirable, I have constructed a guide consisting of two half tubes 28 and 29, of which the part 28 has arms 30 for bolting on the housings so as to support the guide way in line with the pass grooves said part also having the hinge joint lugs 31, and the other has the forked lugs 32 for hinging them together, and both have forked lugs as 33 by which to fasten them with the bolts 34 hinged in the forks of the part 28 and adapted to swing into the forks of part 29, to be clamped fast with said bolts 34, when closed in a manner adapted for readily fastening and unfastening them. The receiving end of the guide is bell mouthed as at 35 and the other end has an enlargement of the bore 36 and a collar groove 37 for reception of reducing guide 38 made in two parts to be held in position by the closed guide, and so as to be opened readily when the guide is opened, said guide being to reduce the guide way to the exact size of the wire at the point of issue from the guide way for effectually directing the rods or wire into the pass of the rolls. The receiving end of this reducing guide is flared to the full size of the guide way before it, so there will be no obstruction of the rods or wires entering it. The delivery end may be tapered as in Fig.

10 to extend into the angle between the rolls close to where the rods or wires enter the passes. With such reducing guides of different sizes the guide ways may have the bore large enough for the largest sizes, and be adapted for all sizes.

Instead of the arms 30 for fastening the guide to the housings it may have the standard 30^a, as in Figs. 13 and 14 mounted on a shaft 30^b, that may be extended along the train of rolls in suitable bearings under the benches or formed together with them.

It will be seen that whenever any obstruction occurs in the guide way it may be quickly and easily unfastened for opening by slacking the nuts 24 and swinging down the bolts.

The chief difficulty in the way of uniformity of reduction and elongation of the rods or wires, and the consequent variations in the tension and occasional overrunning and clogging of the wires in the guides is mainly due to the variations in the sizes of the rods as they come from the rod mill, but to some extent also to the different qualities and conditions of the metal which I have found can be greatly relieved by the employment of one or more pairs of gaging or sizing rolls in advance of the drawing rolls, by which I mean rolls that are not geared and through which the rods are pulled by the reducing rolls behind them, and I have therefore represented in this case a pair of such rolls at 39 and 40 immediately in front of the first pair of rolls *d*, said rolls being in this case mounted in a housing frame 41, seated on the projecting edge 42 of the bench *g*, the upper roll 40 being fitted in a frame $42^\times$, which is suspended by pivots 43 from the boxes 44 fitted in the vertical slide ways 45 in the upper part of the housing with the adjusting screws 46 to set said boxes, and the said upper roll, with springs 47 under the boxes to hold them up to the screws. The purpose of this swinging device is to allow of opening the rolls to enter the rods to begin with without changing the adjusting screws, as must be done when the screws are the only means of opening them, and which is very objectionable because of the difficulty of restoring them to the exact gage as before with the screws, while in this arrangement the gage having once been fixed by the screws the roll returns to exactly the same position and the gage remains the same. In this case the rods are inserted through the open gaging rolls into the first pair of reducing rolls so as to be gripped sufficiently to be drawn forward after the gaging rolls are closed. I have in this example only represented one pair of gaging rolls but it is obvious that two or more pairs may be employed if desired, in which case they will be placed in the same line and also at right angles to each other like the reducing rolls. I have represented the upper sizing or gaging roll as the one adapted for swinging open, but it is obvious that it may be the lower one if preferred.

It is not necessary to have the roll swing for opening and I do not limit myself to that arrangement because it may slide back and forth as well, as I have represented it in Figs. 11 and 12 where the eccentric rolls 48 are interposed between the adjusting screws 46 and boxes 44, suitably for being shifted by lifting the handle 49 so that the spring 47 may lift the roll to the desired extent for opening them, and the fall of the handle will shift said eccentric rolls and close the sizing rolls. It is obvious that other means of opening and closing said sizing rolls may be employed.

I claim—

1. The combination of the bed frame, a plurality of triangular base supports for the housings having one side extended beyond the other, and set upright on said bed frame with the extended sides in the reverse inclinations alternately, the housing supporting benches on said sides, roll housings and rolls supported on said benches, the intermediate driving shaft located between said sides and benches, and line shafts along the lower sides of each range of rolls and geared therewith through the intermediate shafts respectively and the friction device of the roll shaft, said lower roll shaft having the step bearing and the water circulating connection at the lower end, substantially as described.

2. The combination in a train of rolls, of a plurality of triangular base supports for the roll housings, having one side extended beyond the other, and set upright on a suitable bed frame, with the extended sides in the reverse inclinations alternately, the roll housings located on the upper parts of said base supports, the rolls mounted in said housings, the intermediate shafts between the roll housings and said base supports, said rolls and the line shaft geared through the friction clutch on the roll shaft, the line shafts along the lower sides of the base supports geared with the intermediate shafts and rolls and said line shafts geared with the intermediate driving shaft, substantially as described.

3. The combination with the roll housings and rolls, of the lower roll shaft extended through the driving gears and rolls, and having the adjusting step bearing at the lower end, and the adjusting thrust bearing at the upper end, substantially as described.

4. The combination with the lower roll shaft having the water circulating passage through it, of the axially perforated step bearing for the lower end having the pipe connecting nipple, the cap, and the extension of the bearing standard having the cap secured to it for securing said step substantially as described.

5. The combination with the lower roll shaft having the water circulating passage through it, of the axially perforated step bearing for the lower end having the pipe connecting nipple, the packing rings between the shaft and said step bearing, the cap and the extension of the bearing standard having the cap secured to it for securing said step substantially as described.

6. The combination with the roll shafts having a water circulating passage through them of the adjusting end thrust bearings consisting of pipe elbows and adjusting screws substantially as described.

7. The combination with the roll shafts and rolls of the flanged lengthwise adjustable journal bearings, pointed adjustable studs in the recesses of the housings, and the pointed adjusting screws acting against the points of the adjusting studs to adjust the rolls for alignment of the passes substantially as described.

8. The combination with two pairs of rolls arranged in line, of the rod or wire guide consisting of the funnel mouthed divided tube extending from one to the other of the said pairs of rolls in a direct line, one part of which guide is fastened in position, and the other part is hinged to the fixed part, and fastening devices to secure the two parts together when closed substantially as described.

9. The combination with two pairs of rolls arranged in line, of the rod or wire guide consisting of the funnel mouthed divided tube extending from one to the other of the said pairs of rolls in a direct line, one part of which guide has arms and is fastened thereby in position, and the other part is hinged to the fixed part, and fastening devices to secure the two parts together when closed substantially as described.

10. The combination with two pairs of rolls arranged in line, of the rod or wire guide consisting of the funnel mouthed divided tube of which one part has arms and is fastened thereby in position and the other part is hinged to the fixed part, and the detachably fixed reducing guide in the leaving end of said tube consisting of a plurality of parts which are secured in the tube when closed, said guide tube having fastening devices to secure it when closed substantially as described.

11. The combination with the reducing rolls, of the sizing rolls located in advance of the reducing rolls, the swinging frame, adjusting screws, adjusting boxes and the springs under said boxes, one of said rolls being mounted in the swinging frame, and the boxes being subject to the adjusting screws and the springs substantially as described.

In testimony that I claim the foregoing as my invention I have signed my name, in presence of two witnesses, this 26th day of November, 1890.

HENRY ALEXIS WILLIAMS.

Witnesses:
W. J. MORGAN,
W. B. EARLL.