

H. R. GEER.
 ROLLING MILL COUPLING SPINDLE.
 APPLICATION FILED NOV. 14, 1910.

1,041,772.

Patented Oct. 22, 1912.

Fig. 1.

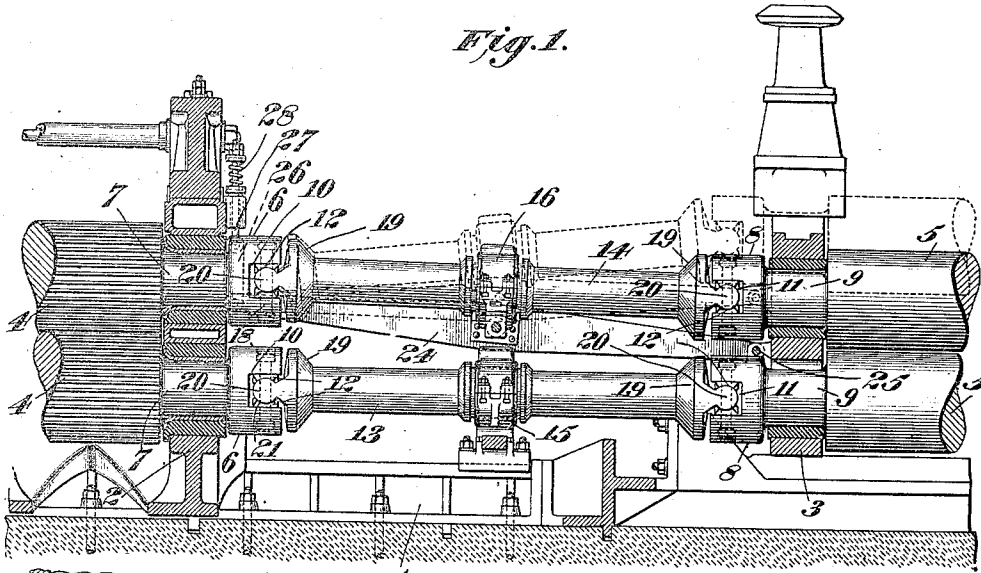


Fig. 2.

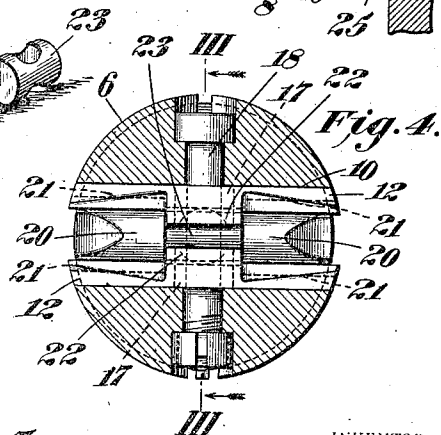
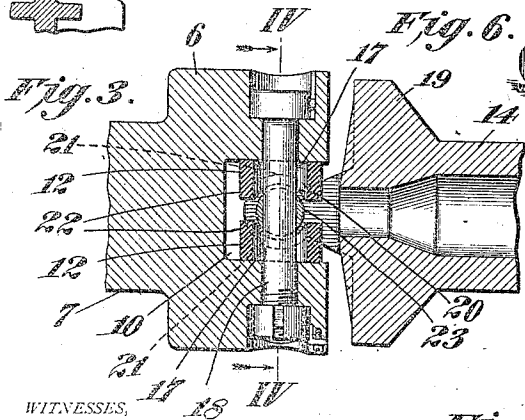
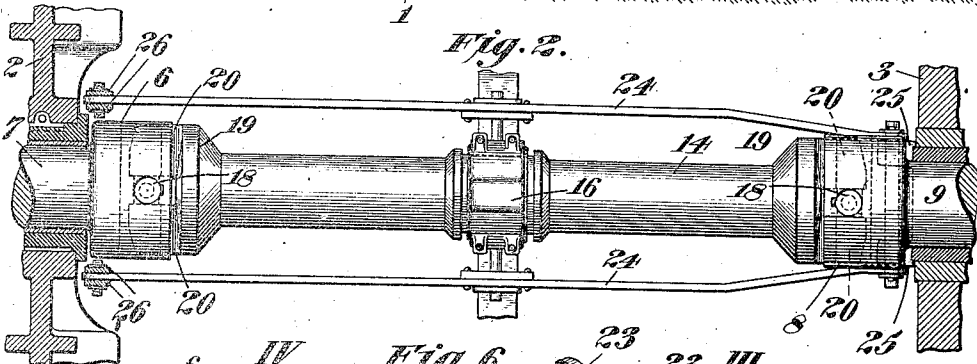
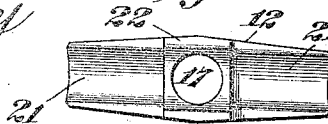


Fig. 5.



WITNESSES,

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UNITED STATES PATENT OFFICE.

HARRY R. GEER, OF JOHNSTOWN, PENNSYLVANIA.

ROLLING-MILL COUPLING-SPINDLE.

1,041,772.

Specification of Letters Patent.

Patented Oct. 22, 1912.

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To all whom it may concern:

Be it known that I, HARRY R. GEER, a citizen of the United States, residing in the city of Johnstown, in the county of Cambria and State of Pennsylvania, have invented certain new and useful Improvements in Rolling-Mill Coupling-Spindles; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to rolling mill apparatus and particularly to the coupling-spindles thereof which connect the driving shafts or customary pinions to the roll-necks, for the purpose of rotating the rolls.

My invention is particularly adapted for use in connection with metal-rolling mills of the two-high, or three-high type, the rolls of which require frequent adjustment in a vertical direction to accommodate the different sizes of bars, blooms, plates or other products being operated upon, while maintaining at the same time operative rotative connection with the pinions or source of power.

Heretofore it has been generally customary to drive a pair or a set of three pinions by driving one of the same through the connection of one of its necks with the continuously or reversely rotating shaft of a steam engine, or other motor, while the other ends or so-called necks of the pinions are provided with similar connections for driving the rolls as hereinafter described.

The ordinary old styles of pinion-necks and roll-necks are substantially cylindrical in form, and the outer portions of the same which project from the bearings or housings are provided with three or four flutes, each flute being a semi-circular or semi-oval longitudinal groove. The old style coupling-boxes as at present used, are composed, generally speaking, of a cylindrical annulus provided on its interior surface with projections of semi-circular or semi-oval cross section, corresponding to the flutes in the necks of the pinions and rolls.

The ordinary old style spindle consists generally of a cylindrical shaft provided at each end with flutes similar to those provided in the pinion-necks and roll-necks,

and the pinions and rolls are thereby rotatively connected by the use of said coupling-boxes and spindles. Owing to the rude construction of these pinion-necks, roll-necks, spindles and coupling-boxes, and the necessary large amount of clearance in same to allow for irregularities and adjustments of the pinions and rolls, this construction is very noisy in operation, and on account of the backlash in operation, is very destructive to the parts directly involved and to the other portions of the mechanism connected therewith, by reason of the jarring and hammering action occasioned by said loose connections. This is particularly true on what are known as two-high reversing mills where the backlash of a set of old style spindles and couplings frequently amounts to one-third or one-half of a complete revolution of a rolling mill engine or motor. In other words, when reversing an engine or motor for the purpose of operating a mill, this frequently has to turn around through about one hundred and eighty degrees before the rolls begin to move and the momentum thus acquired by the heavy parts, rolls, engines, spindles, coupling-boxes, fly-wheels, and other parts, causes very severe and destructive percussion on the spindles and couplings and also jars the other parts of the apparatus with frequent disastrous results. This effect is repeated at very short intervals of time as in two-high mills the reversal of their rotation is made after each pass. As an example of this, it has been found by experience on some mills that a set of spindles and coupling-boxes will only last a week, as, by the end of that time, the fluted ends of the spindles and the corresponding projections in the coupling-boxes are so worn as to be useless, thereby necessitating their rejection and replacement by new ones, which is therefore, a constant source of labor and expense, besides which, such spindles and coupling-boxes frequently break in use.

It is one of the principal objects of my invention to provide a coupling-spindle which will be practically noiseless in operation, without backlash or excessive clearance and my device is particularly applica-

ble to reversing rolling-mills and those in which the rolls have to be moved upward or downward frequently during the process of their operation, as customary and necessary in plate mills, blooming mills, slabbing mills and the like.

My invention consists essentially of a spindle of general cylindrical form, provided at each end with projections which are partially cylindrical in cross section and secured to, or integral with the spindle, the axis of each projection being substantially at right angles to the main axis of the spindle in general; these projections therefore serving as pivots about which the spindle can oscillate in a certain plane.

In my invention the pinion-necks and roll-necks each have bifurcated ends, the two opposing interior surfaces of which are provided with a so-called slipper, or bearing piece of bronze or other material, substantially flat where it bears on the interior surface of the bifurcated end of the roll or pinion-neck, while the other side of said slipper has a partial cylindrical surface to conform to the corresponding pivotal end of the spindle, thereby forming a support and bearing for the same. A large bolt passes through the roll or pinion-neck and the centers of said slippers, which latter are provided with larger holes to admit said bolt, and to permit said slippers to slide slightly on the interior flat surfaces of the bifurcated ends of the roll or pinion-necks in order to give flexibility of joint in either direction. This construction can be made to fit quite accurately, thereby reducing all lost motion and backlash, while at the same time the details are such that my improved spindle can drive a roll even though the angular position of said spindle may be varied by the moving of the roll.

My construction is cheaply made and permits easy access for lubrication, inspection and replacement of parts, if necessary. The sliding movement of the slippers also allows for the greater effective length of the coupling required, owing to the angularity when the roll is lifted, as will be readily understood.

Having thus given this general description of my invention, I will now, in order to make the matter more clear, refer to the accompanying sheet of drawings in which like numbers and characters indicate like parts:—

Figure 1 is a side elevation of a pair of pinions, a pair of two-high adjustable rolls, the driving connection between which consists of my improved coupling-spindle; the upper one of said spindles being what is generally known as the vibrating spindle, the amplitude of its movement being as indicated by dotted lines in this figure. Fig. 2 is an enlarged top plan view of the spindle

shown in Fig. 1 showing the pinion and roll-necks in plan and the housings in cross section. Fig. 3 is a vertical longitudinal sectional elevation of my improved spindle-coupling taken on the line III—III of Fig. 4. Fig. 4 is a vertical transverse sectional elevation taken on the line IV—IV of Fig. 3. Fig. 5 is a plan view of one of my slippers showing the cylindrical bearing faces thereof. Fig. 6 is a perspective view of the central cylindrical spacing-block 23 showing the hole therethrough to receive the bolt 18.

Referring now to the various characters of reference on the drawings 1 represents part of the bed-plates of a rolling-mill, 2 one of the pinion housings thereof; 3 is one of the roll housings; 4 are the pinions, shown in this case for a two-high mill.

5 are the rolls of a two-high mill, the upper one of which is shown by full lines in its lowered position, while the dotted lines above, indicate its higher position.

6 are the bifurcated ends of my improved coupling, which are secured to, or form part of the pinion-necks, 7 are the journal portions of the pinion-necks, 8 are the bifurcated ends of my improved coupling which are attached to, or form part of the roll-necks, while 9 are the journal portions of the roll-necks.

10 are the grooves in the pinion ends of my improved coupling, which grooves form the bifurcation of the said coupling, while 11 are similar grooves in the roll coupling.

12 are slippers preferably made of brass or bronze, which fit and slide, to a certain extent, within the grooves 10 and 11.

13 represents the bottom spindle of a two-high rolling-mill, 14 represents the top spindle in its lowered position, while the upper position of said top or vibrating spindle is indicated by the dotted lines in Fig. 1.

In order to make the illustrations complete for this particular style of construction, I have included therein center-bearings 15 and 16, for the spindles in question, the bearing 16 being what is known as a compensating or balanced bearing, provided with carrying bars 24, connections 25, links 26, eye-bolts 27 and a compensating or balancing spring 28, although these particular parts Nos. 15, 16, and 24 to 28 both inclusive, do not form any essential feature of my invention.

Each of the slippers 12 is provided with a hole 17 in the center thereof, said hole being of greater diameter than the bolt 18 which passes therethrough and which is secured within the bifurcated ends of the pinion and roll couplings, as shown. The bolts 18 are secured in the bifurcated coupling extensions of the pinion and roll-necks as shown and serve to hold the slippers 12 and central spacing-blocks 23 in operative position, and thereby couple the spindle to the

rolls and pinions, while allowing the necessary freedom to the moving parts of the construction.

19 represents a hub or enlarged end of the spindles 13 and 14 and projecting from, and forming part thereof, are the pivot portions 20 which, in general, are of cylindrical form as shown, in order to provide for the oscillating movement of the spindles in a direction about the axis of said cylinders. The pivot portions 20 are formed in two parts on each end of the spindle with a space between the said parts, which space is occupied by a short central spacing-block 23 having a hole therethrough at right angles to its axis to accommodate the supporting bolt 18. This central spacing-block 23 has a diameter somewhat less than the corresponding bore of the central portion of the slippers which it adjoins, thereby allowing the slippers to move backward or forward, as required, without being obstructed by said spacing-block. This central spacing-block, however, fits between the two cylindrical ends 20 with its ends bearing against the same, and thereby assists in maintaining the spindle in position as it revolves.

21 represents the concave cylindrically curved bearings of the slipper 12, said bearings 21 fitting on and conforming to the cylindrical surfaces 20 of the pivot portions of the spindles. 22 are the raised central portions of the said slippers positioned between the pair of projecting pivotal ends 20 of the spindle, these projecting portions 22 of the slippers having a concave cylindrical curvature on one side, of a diameter somewhat greater than that of the spacing-block 23 as heretofore described. The exterior outer ends of the cylindrical portions 20 are beveled or cut away as shown by dotted lines in Fig. 2 and as shown by full lines and shading in Fig. 4, the object of this being to allow the spindles to oscillate as required, without interference with the coupling portions of the pinion and roll-necks.

In operation my improved coupling spindle has approximately tight, or working fits, where one part adjoins the other, in-so-far as the transmission of rotative force is concerned.

By reason of the pivotal projecting ends 20 of my spindles, and the corresponding slippers 12 thereof, which are slidably fitted within the bifurcated ends of the pinion and roll-neck projections, this permits the spindles to oscillate as desired in any direction, without loosening the working contacts of the essential parts. In one direction the spindle is maintained in position by the slippers; while in the other direction, it is maintained by the contact of its partially cylindrical pivotal ends with the spacing-block 23 and the bolt 18 passing therethrough and through the bifurcated coupling ends of the

pinion and roll-necks. This therefore forms a jointed connection of particular and powerful construction, which has been proved by actual experience to be very well adapted for the purpose intended.

While my invention is shown and illustrated in connection with a two-high rolling-mill, it is equally applicable to a three-high, or other style of rolling-mill, and in fact to any apparatus or machine in which it is desired to transmit rotating motion, where, from lack of rigidity, necessity for automatic adjustment, or otherwise, an absolutely stiff coupling should not be used.

I do not limit my invention to the precise details of construction herein shown and described, as it is capable of considerable structural variation, and I may use such substitutions, modifications, equivalents or alterations therein, as fall within the scope of my invention and set forth in the claims.

What I claim as new and desire to secure by Letters Patent is:—

1. A spindle provided with a pair of partially cylindrical projections spaced apart and arranged transversely at the end thereof, a bifurcated coupling having a corresponding transverse groove of substantially rectangular cross section adapted to receive said projections; slippers fitting the cylindrical surfaces of said projections and adapted to allow the same to partially rotate thereon, the opposite sides of said slippers being in sliding contact with the sides of the groove of the bifurcated coupling, a spacing-block located in the space between the interior ends of said partially cylindrical projections adapted for flat sliding contact therewith; and a bolt secured through said bifurcated ends and passing through larger holes in said slippers and through said spacing block, whereby the aforesaid parts are maintained in operative position.

2. A spindle provided with a pair of cylindrical pivots spaced apart, arranged transversely of, and projecting from, the end thereof, a bifurcated coupling having a corresponding transverse groove of substantially rectangular cross section adapted to receive said pivots, slippers fitting the curved surfaces of said pivots, the opposite sides of said slippers being in sliding contact with the sides of the groove of the bifurcated coupling; a spacing block located in the space between the ends of said pivots; and a bolt passing through said bifurcated coupling and through larger holes in said slippers, and through a corresponding hole in said spacing block, thereby holding the parts in operative position.

3. A spindle provided with a projecting pivot arranged transversely at the end thereof and provided with a slot or space in its intermediate portion, a corresponding bifurcated coupling adapted to receive said pivot,

bearings located within said bifurcation and adapted for rotative contact with said pivot and for sliding contact with the interior surfaces of said bifurcation, a spacing block
5 located within the intermediate slot of the pivot adapted for flat bearing against the surfaces thereof; and a bolt passing through said bifurcated coupling, through larger

holes in said bearings and through a corresponding hole in said spacing block. 10

In testimony whereof I hereto affix my signature in the presence of two witnesses.

HARRY R. GEER.

Witnesses:

ELMER SEAVEY,
ROBERT A. BEER.
