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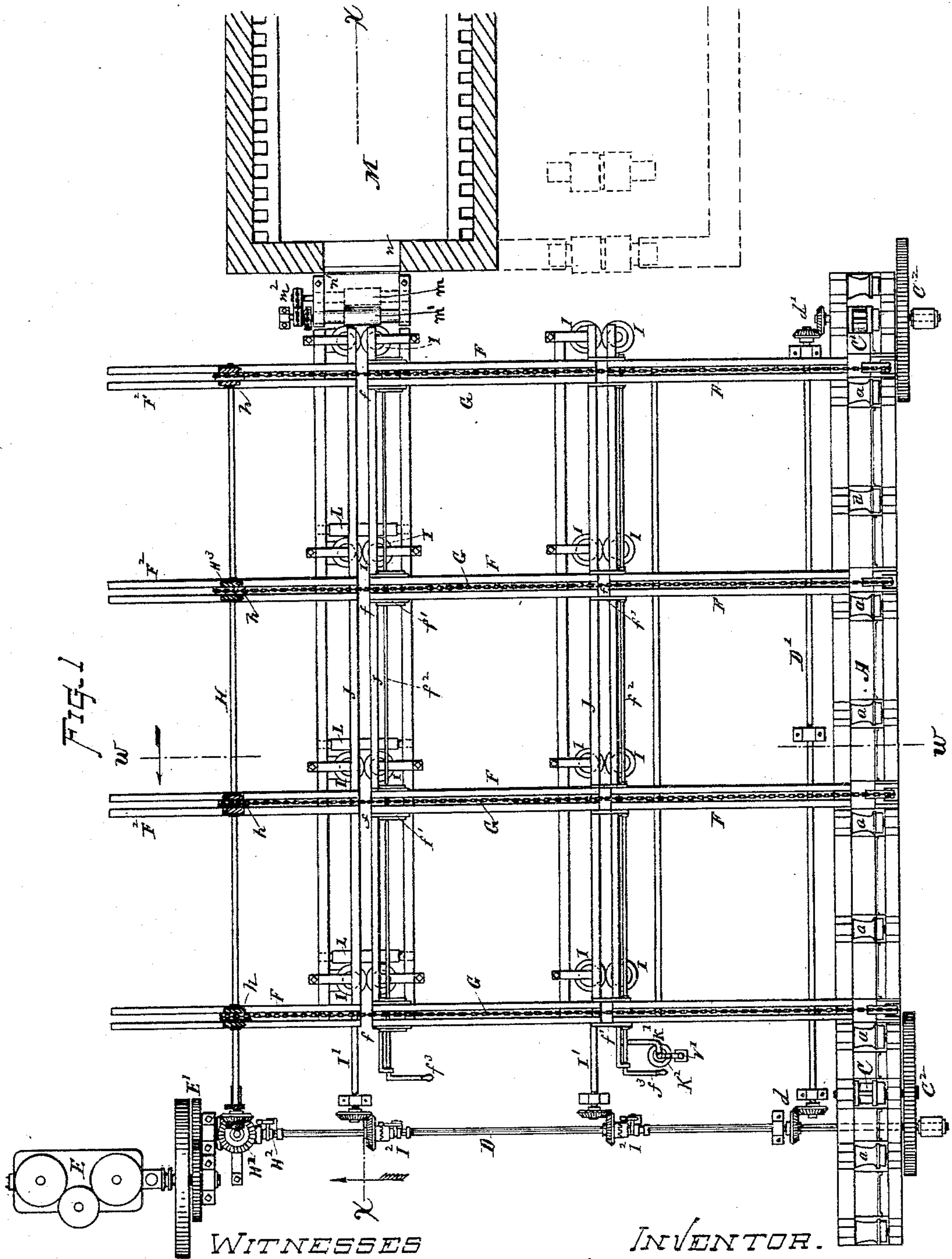
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F. H. DANIELS.

APPARATUS FOR TRANSFERRING THE PRODUCTS OF METAL ROLLS.

No. 369,503.

Patented Sept. 6, 1887.



WITNESSES
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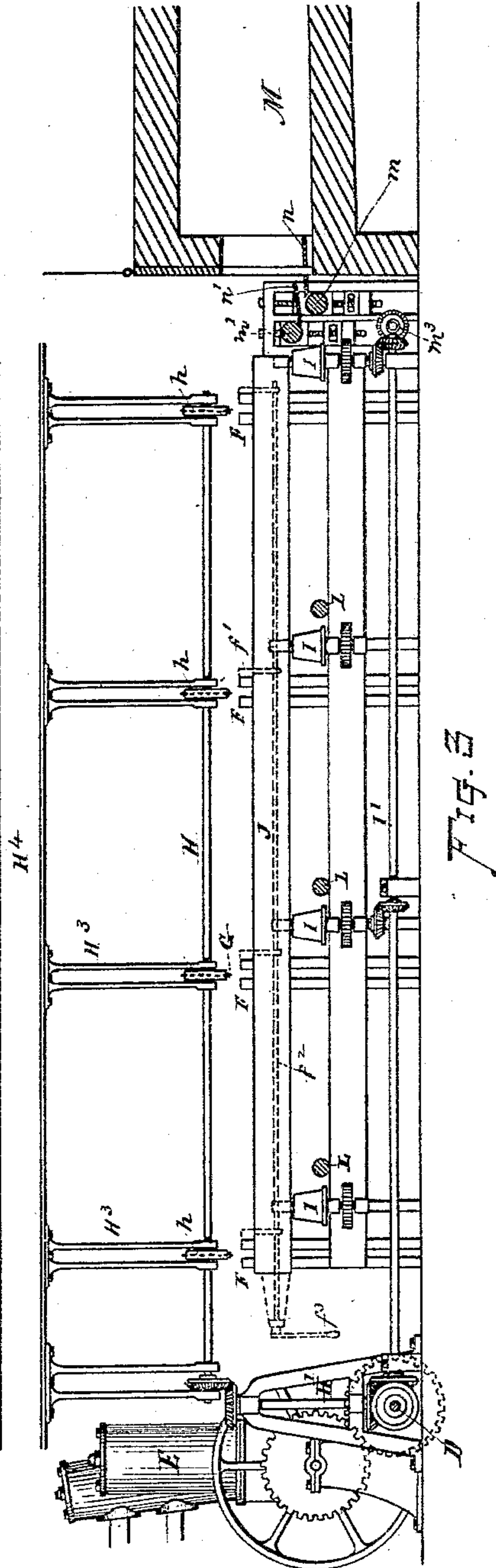
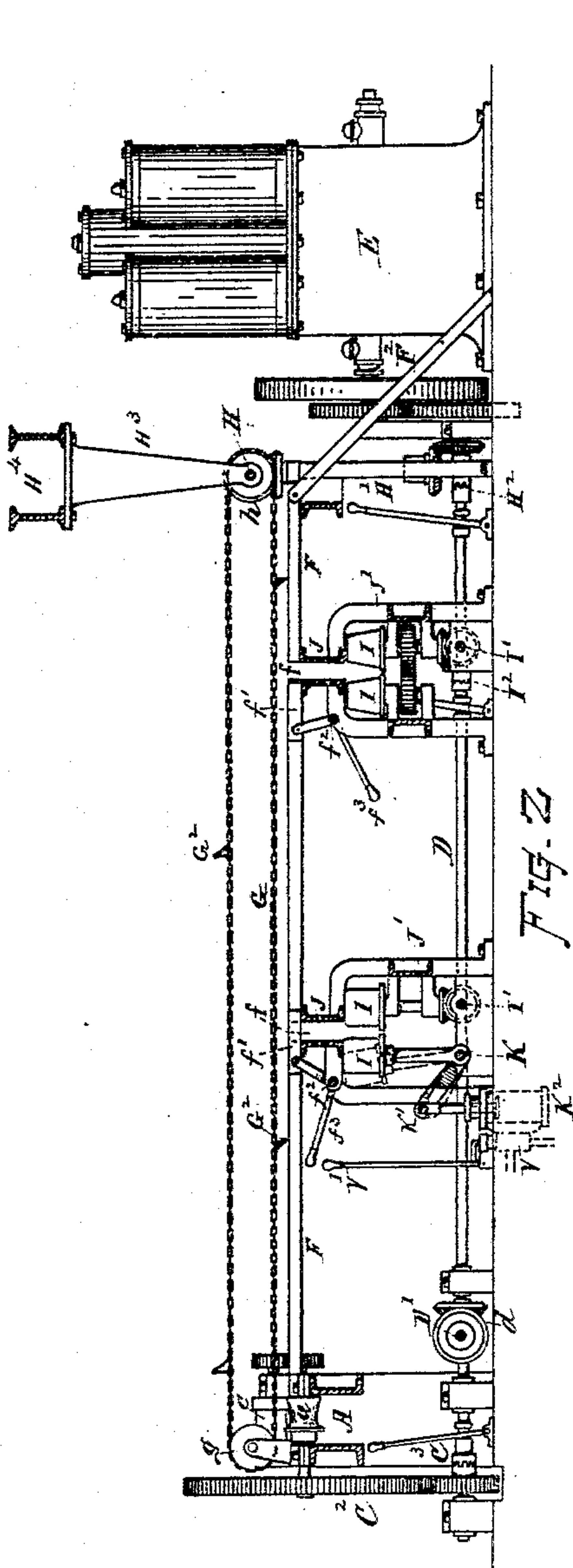
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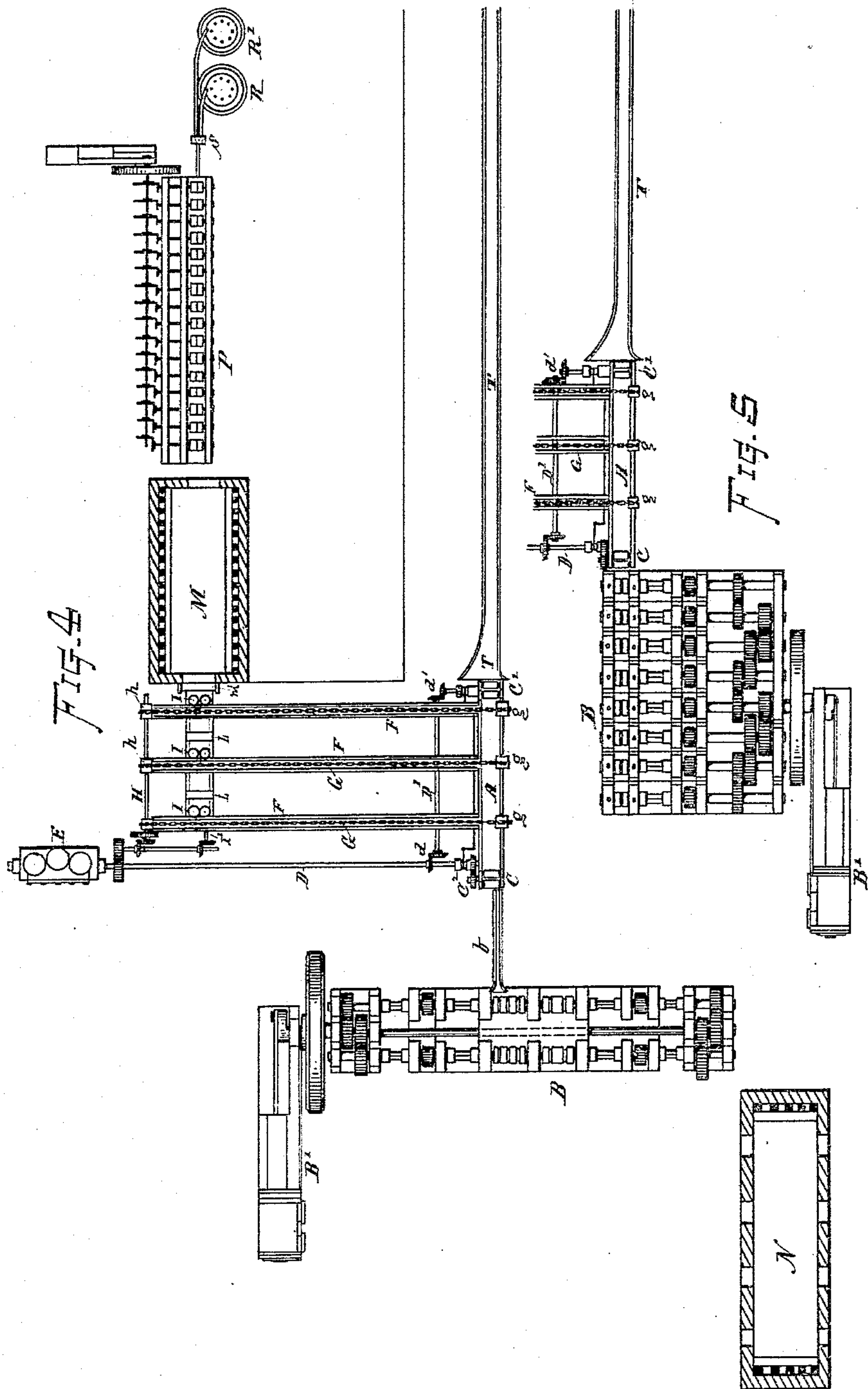
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UNITED STATES PATENT OFFICE.

FRED H. DANIELS, OF WORCESTER, MASSACHUSETTS.

APPARATUS FOR TRANSFERRING THE PRODUCTS OF METAL ROLLS.

SPECIFICATION forming part of Letters Patent No. 369,503, dated September 6, 1887.

Application filed February 9, 1887. Serial No. 227,004. (No model.)

To all whom it may concern:

Be it known that I, FRED H. DANIELS, a citizen of the United States, residing at Worcester, in the county of Worcester and State of Massachusetts, have invented certain new and useful Improvements in Rolling-Mill Transfer and Charging Apparatus, of which the following, together with the accompanying drawings, is a specification sufficiently full, clear, and exact to enable persons skilled in the art to which this invention appertains to make and use the same.

The objects of this my present invention are, first, to provide a practical and efficient mechanism for mechanically transferring billets or bars of metal from the discharge-table of a rolling-mill or other delivery to a designated place of deposit; second, to provide means for mechanically transferring billets or bars of metal from a delivery-bed and automatically charging the same into a heating-furnace; third, to provide means for separating, shearing, or cutting up bars or billets as they are delivered from a rolling-mill into sections of desired length, and automatically transferring and delivering the sections into a heating-furnace, or depositing them at such other place of deposit as required; fourth, to provide a billet-conveyer or transferring mechanism having intermediate delivery-passes and adjustable gates at intervals along the transfer-way to afford facilities whereby the billets or bars can be delivered at several different positions; fifth, to afford a charging mechanism with a system of rolls or adjacent advancing surfaces which, when the billet is deposited between them, act to impel the billet longitudinally forward to the position of discharge; sixth, to provide a mechanism for longitudinally charging billets or bars, consisting of a system of convergent rolls supported by upright shafts, between the advancing surfaces of which the billet is gripped, combined with devices for guiding and directing the bar into the mouth of the heating-furnace; seventh, to afford means for the economical production of wire rod or other small shapes from blooms by reducing the bloom in rolls to a billet or partially-formed product, cutting the same to convenient length, and mechanically transferring and charging said billet-sections into a furnace for reheating, and then

continuing their reduction to a finished product by further passage through reducing-rolls or train of rolls; eighth, to provide an apparatus or plant for rolling bars or billets from blooms, cutting the billets or partially-reduced product into sections, and automatically transferring and charging the same into a reheating-furnace, and then reducing said billets by rolling into wire rods and reeling the finished product, the operation being performed by direct or continuous process. These objects I attain by mechanism the nature, construction, and operation of which are illustrated in the accompanying drawings, and explained in the following description, the particular subject-matter claimed being hereinafter definitely specified.

In the drawings, Figure 1 is a plan view illustrating the nature of my improved mechanism for cutting up, transferring, and automatically charging metal bars or billets. Fig. 2 is a transverse section at the position of line *ww* on Fig. 1, looking in the direction indicated by the arrow. Fig. 3 is a longitudinal section at the position of line *xx* on Fig. 1. Fig. 4 is a plan view showing my invention as employed in a plant for reducing and cutting up blooms into billets, automatically transferring the billets into a reheating-furnace, and reducing the same to wire rods. Fig. 5 is a view of a portion of a similar plan, showing a modified arrangement of the rolls in the billet-forming mill.

In accord with the practice contemplated in my present invention, the metal is primarily heated in the form of blooms of any convenient size, which blooms are then rolled down or reduced into billet-bars of, say, about one inch square (more or less) by a series of reducing-passes in properly-arranged rolling apparatus. The bars are delivered longitudinally onto a roller-bed or receiving-table as they come from the billet-forming apparatus. In connection with this roller bed or table, I arrange means for cutting the bars into billets of convenient length, which preferably consists of rotary shears or cutters disposed at the head and foot of the receiving-table, and having suitable clutches connected with their driving mechanism for throwing the cutters into and out of action at the required intervals of time. These clutches may, if desired, be

arranged for automatic action to operate when a given length of billet has been delivered from a rolling-mill, or be worked by hand, if preferred. At one side of the roller-bed, and
 5 extending laterally therefrom, I arrange a series of rails, tracks, or transfer-ways, and above said rails, and running parallel therewith, a series of chains or belts operated by suitable sprockets or driving-pulleys. Said
 10 chain belts are provided with hooks, lugs, or prongs that engage the billet and drag it laterally from the delivery-bed along the transfer-way until it reaches a position where it can drop away from the chain. Openings or pass-
 15 way-spaces are provided at intervals in the rails of the transfer-way at such positions as it is desired to deliver the billets, and movable gates are combined with the rails for closing said openings, so that the billets will pass
 20 across them, or for opening the passways to permit the billets to fall through the space.

Combined with the transfer-way and means for moving the billet along the same at the position or positions of delivery I arrange
 25 charging mechanism provided with oppositely-converging advancing surfaces, between which the billet is thrown or falls by gravity, which surfaces, acting by gripping and friction, project the billet forward as required. This
 30 charging mechanism is preferably a series of rolls arranged in pairs, and made of conical form or upwardly tapered, fixed to or running on upright axial shafts, and rotated by power driving mechanism, so that when the billet
 35 falls from the transfer-way it will be immediately caught or gripped between the roll-surfaces, and thereby projected forward into the furnace by rotative action of the rolls. Guide-rolls or guide-plates are provided for support-
 40 ing and directing the billet as required to properly project it into the furnace.

The mechanism for transferring, shearing, and charging the billets is provided with suitable driving-shafts and gears, and a motor or
 45 engine is provided for imparting the operative power and motion. Suitable clutches are arranged in connection with the driving-shafts and gearing for throwing the different parts of the mechanism into and out of action.

50 The transfer-rails may extend any required distance, and any desired number of delivery intervals and gates may be employed, and the transfer-way may embrace any number of tracks or supporting-rails and carriers or belts
 55 in the series, according to the length of the billets which it is desired to handle.

In referring to parts, A indicates the bed or table onto which the billets are delivered from the billet-forming mill B. Said table is pref-
 60 erably provided with a series of rolls, a , mounted in suitable bearings to run loose, so that the billet will run forward upon the table without undue friction.

C indicates a shearing device located near
 65 the head of the table for severing the billet into sections, and C' indicates a similar shear

at the foot of the table for cutting off the crop ends of the billets.

D indicates a driving-shaft operated by the engine E, and D' a shaft for transmitting
 70 power and motion to thesecond shear devices. The respective shears, C and C' , are provided with suitable operating-gearing, C^2 , and with clutches C^3 for throwing them into and out of
 75 action. The shaft D' is provided with suitable connecting-gears, as at d d' .

F indicates the laterally-extended rails or tracks upon which the billets are supported and transferred from the roller-bed A. Said
 80 rails are preferably arranged in pairs, as indicated, the pairs being disposed at such intervals apart as will suitably support the billets from sagging. In the present instance four tracks or pairs of rails are employed, the
 85 apparatus being designed for transferring billets of about twenty-five feet length, (more or less,) or such billets as are employed for rolling into wire rods. Above each of the tracks or
 90 pairs of rails is arranged an endless traveling chain belt, G, supported by a guide-pulley, g , at the front of the roller-bed, and by a driving-sprocket, h , fixed to an overhanging operat-
 95 ing-shaft, H, at or near the rear end of the transfer-tracks. Said shaft H carries the sprockets or pulleys for the entire series of chain belts, which are all simultaneously and uniformly operated thereby. The shaft H is
 100 connected by suitable gearing and the upright shaft H' with the driving-shaft D, which latter receives motion from the engine E, and a clutch, H^2 , is provided for throwing the
 105 chain mechanism into and out of action. The traveling chains or belts G are provided with lugs, hooks, or projecting fingers G^2 , which engage the billet and move it along the tracks F, the said fingers on the several belts being
 110 at corresponding position, so as to move the billet parallel. The shaft H is supported by hangers H^3 from an overhead beam or frame, H^4 , so as to allow the billets to pass off the
 115 rear end of the tracks. The rear end of the tracks are preferably inclined downward, as indicated at F^2 , so that the billets can be delivered therefrom and piled onto a car or onto
 120 the floor by sliding them down the incline. The portion F^2 of the track is preferably made to swing up and down for delivering the billets at any desired height from the floor. At
 125 corresponding intervals along the several tracks passways or openings are formed, as at f , and suitable gates, f' , are provided for closing said passways when it is desired to transfer the billets beyond the position of the same. In the present instance the gates are made as
 130 sliding bars, and are operated by arms connected with a rocker-shaft, f^2 , which is provided with a hand-lever, f^3 , by means of which any series of the gates can be opened and closed.

The tracks F are supported on beams or
 130 girders J, in connection with frames or standards J' , near the passways f .

I indicates the series of rolls for charging the billets into the furnace. Said rolls are preferably mounted on upright shafts rotated by means of suitable gearing from an operating-shaft, I', which in turn is operated by the driving-shaft D. Clutches I² are provided for throwing the roll mechanism into and out of action. The rolls I are disposed in pairs, one, two, or more pairs being employed, as preferred. In the present instance I have shown a series of four pairs in each of the charging devices, two pairs being geared for operation by the shaft I' and two pairs arranged to run loose or to serve simply as guide-rolls, power being applied only to the geared pairs, as indicated in Fig. 3. It is obvious, however, that all of the pairs of rolls I might be geared and operated from the shaft, if preferred. The rolls I serve to grip the bar between advancing surfaces as it falls from the tracks F through the passways *f* into the space between the rolls. The rolls I can be made either as shown in the right-hand series, Fig. 2, or in the left-hand series. In one case the rolls are made conical or tapering upward to give oppositely-convergent surfaces, so that the billet will wedge between the surfaces as it is dropped between the rolls. In this instance the rolls are supported in stationary bearings and geared together in pairs to cause the surfaces to move with uniform velocity. In the case of the rolls illustrated at the left-hand series, Fig. 2, the rolls are shown of cylindrical form, and one roll of each pair is mounted to run loose on a movable axis or swinging shaft that is fixed to a rocker-shaft, K, which latter shaft is furnished with a lever, K', connected with the piston of a hydraulic cylinder, K², so that the rolls can be moved to or from each other for gripping and releasing the billet between the roll-surfaces by action of the hydraulic piston under control of the valve V and its operating-lever V', which valve and valve-operating lever may be placed at any convenient position adjacent to or at a distance from the cylinder, suitable pipe-connections being provided for conducting the water from the valves to the cylinder.

L indicates horizontal rolls that are provided for supporting the bar and preventing it from dropping too far down between the rolls I.

m and *m'* indicate guide-rolls arranged adjacent to the front of the furnace M. The roll *m* serves to support the billet from running on the bottom of the furnace, and the roll *m'* serves to hold down the rear end of the billet from tilting up by preponderance of its forward extremity as it runs into the furnace. Said rolls *m m'* are preferably made adjustable up and down in their supporting-frame, and are operated by suitable sprocket-wheels and chains, *m*², and driving-gearing *m*³ in connection with operating-shaft I'.

n and *n'* indicate guide-plates which serve to assist in directing the billets into the furnace.

An important feature in my invention is the charging or propelling of the bars or billets as they come from a rolling-mill or transfer into the furnace by their frictional contact with surfaces or supporters having an advancing action, and I desire to include as equivalents for such purpose traveling belts and mechanisms which present oppositely-disposed advancing surfaces between which to receive, support, and advance the bars or billets delivered thereto.

In the present instance, as illustrated by Figs. 1, 2, and 3, I have shown the transferring-ways as having three positions of delivery—viz., the passways *f* for first and second chargers and at the end of the track. It will be understood, however, that the apparatus can be constructed with a greater or less number of positions for delivery, if required, without departure from the nature of the invention. It is also obvious that a greater or less number of tracks or ways F and carrier-belts G may be used accordingly as long or short billets are to be handled.

The transfer and charging apparatus arranged as herein described could be employed for conveying and feeding hot bars into the passes of rolling-mills in lieu of into the furnace. In such event the rolling-mill would be located in line with the charging-way—as, for instance, at the position in Fig. 1.

In Figs. 4 and 5 I have illustrated my invention as employed in a plant for making, transferring, and reducing billets complete from blooms into finished wire rods.

N denotes the furnace for heating the blooms to be reduced in the billet-forming mill B, which mill may be constructed as indicated in Fig. 4, and as described in detail in my previous application for Letters Patent, Serial No. 225,995, or be made with a series of rolls disposed to operate in continuous order, or in other suitable manner. From the final pass of the rolling-mill B the billets run out direct or through the guide *b* onto the roller-bed A, and are there cut up by shear C and transferred and charged by the mechanism which is above described, as fast as the billet-sections are formed, into the furnace M, for reheating or elevating the temperature to proper degree for the further reduction.

P indicates a continuous rod-rolling mill or rod-reducing train, which receives the billets from the furnace M and reduces them to wire rods, which rods are automatically reeled, coiled, or wound up, alternately, by the reeling apparatus at R R', a suitable switch device, S, being arranged for directing the rods alternately to the respective reels.

T indicates a chute for receiving billets in case any disarrangement occurs in the transferring or charging mechanisms, or in the event of a surplus of billets being run from the mill B in excess of what can be conveniently charged into the furnace M.

B' indicates the engine for operating the mill B.

In Fig. 5 I have illustrated a modification of the billet-forming mill, wherein the rolls are arranged operating in continuous order instead of by back-and-forth passes.

5 What I claim as of my invention, and desire to secure by Letters Patent, is—

1. The combination of a series of rolls having passes for reducing a bloom to the billet form, an automatic transferring and charging mechanism receiving the billets from said forming-mill, and a reheating-furnace into which the billets are delivered by said charging mechanism, substantially as set forth.

2. The combination of a series of rolls having passes for reducing a bloom to billet form, transferring mechanism receiving the billets from said forming-mill, a shearing mechanism cutting the billet into lengths, a charging mechanism, and a reheating-furnace into which the billets are delivered by said mechanism as soon as formed, substantially as set forth.

3. The combination of a series of rolls for reducing the bloom to billet form, a shearing, transferring, and charging mechanism for receiving the billets from said forming-mill, cutting them into lengths, and charging them, and a reheating-furnace into which the billets are delivered by said mechanism as soon as formed, and a reducing-train of rolls for completing the reduction of the billet into a wire rod or other desired finished product, substantially as set forth.

4. A transferring apparatus having tracks or supporting-ways and laterally-moving belts or carriers adapted for automatically effecting lateral transfer of the billets, in combination with automatic charging mechanism, substantially as described, having a series of oppositely-rotating rolls to the advancing surfaces of which the billets are delivered from said carriers, and means, as described, for imparting motion thereto for projecting the billets longitudinally to the heating-furnace or place of deposit, substantially as set forth.

5. The combination of the roller-bed or receiving-table, the tracks or transfer-ways extending laterally therefrom, overhanging chain belts having hooks or engaging lugs moving along said tracks, the belt-operating wheels and shaft, and charging mechanism, whereby the bar or billet may be discharged from said transfer devices and advanced in longitudinal direction, substantially as set forth.

6. In a billet-transferring mechanism, a transfer-way provided at intervals with openings through which a billet can drop, in combination with adjustable gates for opening and closing the same, substantially as and for the purposes described.

7. In a billet-transfer mechanism, the com-

bination, with transfer ways or tracks provided at intervals with openings and chains or devices for moving a billet supported thereon, of adjustable gates for closing said openings, substantially as and for the purpose set forth.

8. A transfer mechanism consisting of a table on which billets are received, a system of laterally-disposed tracks having gateways at intervals of their length, and overhanging traveling belts or chains having projections which engage and move the billet along the tracks, and charging mechanism disposed for receiving the billets as they fall through the gateway and moving them longitudinally, substantially as set forth.

9. A billet-charger provided with a series of oppositely-rotating rolls arranged in pairs, between the adjacent surfaces of which the billet is gripped and moved in the direction of its length by frictional contact of the surfaces, substantially as set forth.

10. A billet-charger having pairs of oppositely-rotative conoidal rolls, between the converging surfaces of which the billet is received and by rotation of the rolls advanced to the heating-furnace or place of deposit, substantially as set forth.

11. The combination, with the transfer-tracks and the endless belt carrier, of the charging-rolls disposed in pairs in position for receiving the bar as it falls from said transfer-tracks between their adjacent advancing surfaces, and means for rotating said rolls for imparting longitudinal movement to said bar, substantially as set forth.

12. The combination, with a heating-furnace, of charging apparatus having charging-rolls arranged on upright rotating shafts in pairs in position for receiving the bar or billet between the adjacent roll-surfaces, and means, substantially as described, for forcing one of said rolls in a pair toward the other, and thereby gripping the bar or billet between the advancing surfaces of the rolls, substantially as and for the purpose set forth.

13. The combination, with the charging-rolls, whereby the bar is advanced longitudinally, of adjustable guide-rolls disposed at the mouth of the furnace for directing the billet, substantially as set forth.

14. The combination, with the transfer-chains G, tracks F, and roller-bed, of the shearing mechanism disposed in relation to said roller-bed, substantially as and for the purpose set forth.

Witness my hand this 3d day of February, A. D. 1887.

FRED H. DANIELS.

Witnesses:

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