

B. F. McTEAR.
MANUFACTURE OF TUBES OR HOLLOW BODIES.
APPLICATION FILED OCT. 29, 1904.

Patented May 4, 1909.
3 SHEETS—SHEET 1.

920,168.

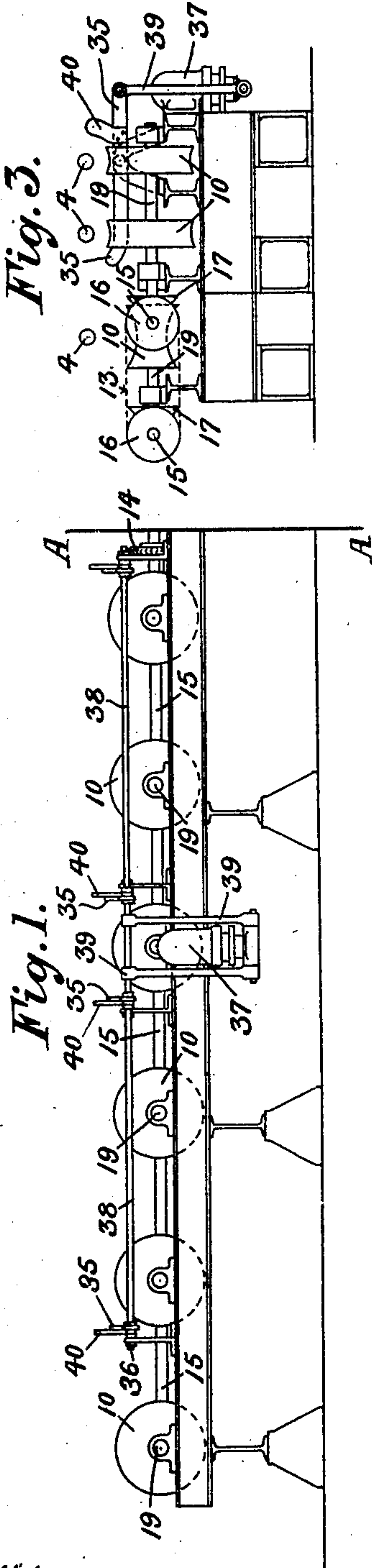


Fig. 1.

Witnesses
H. M. Kuehne
John A. Percival.

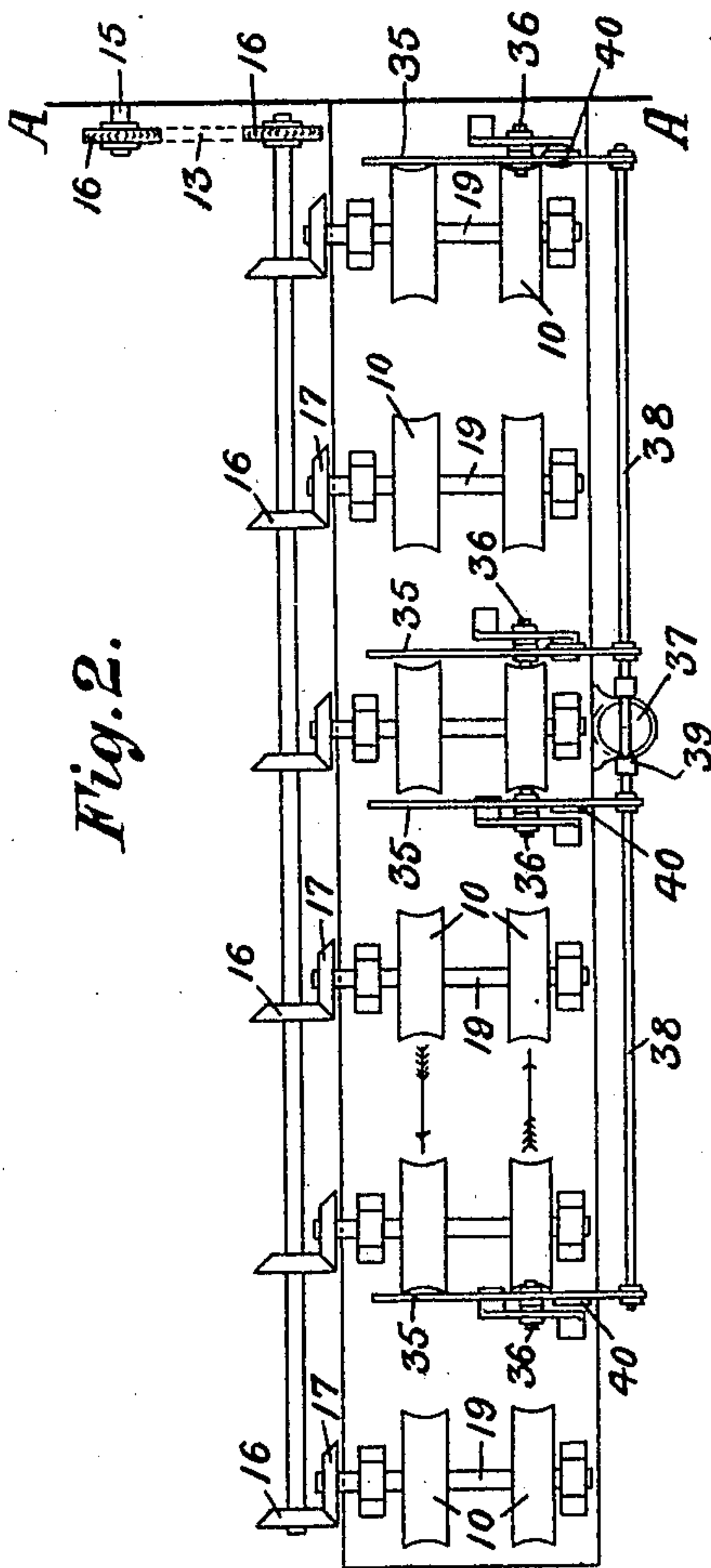


Fig. 2.

Inventor
Balfour Fraser McTear

BY *Richardson*

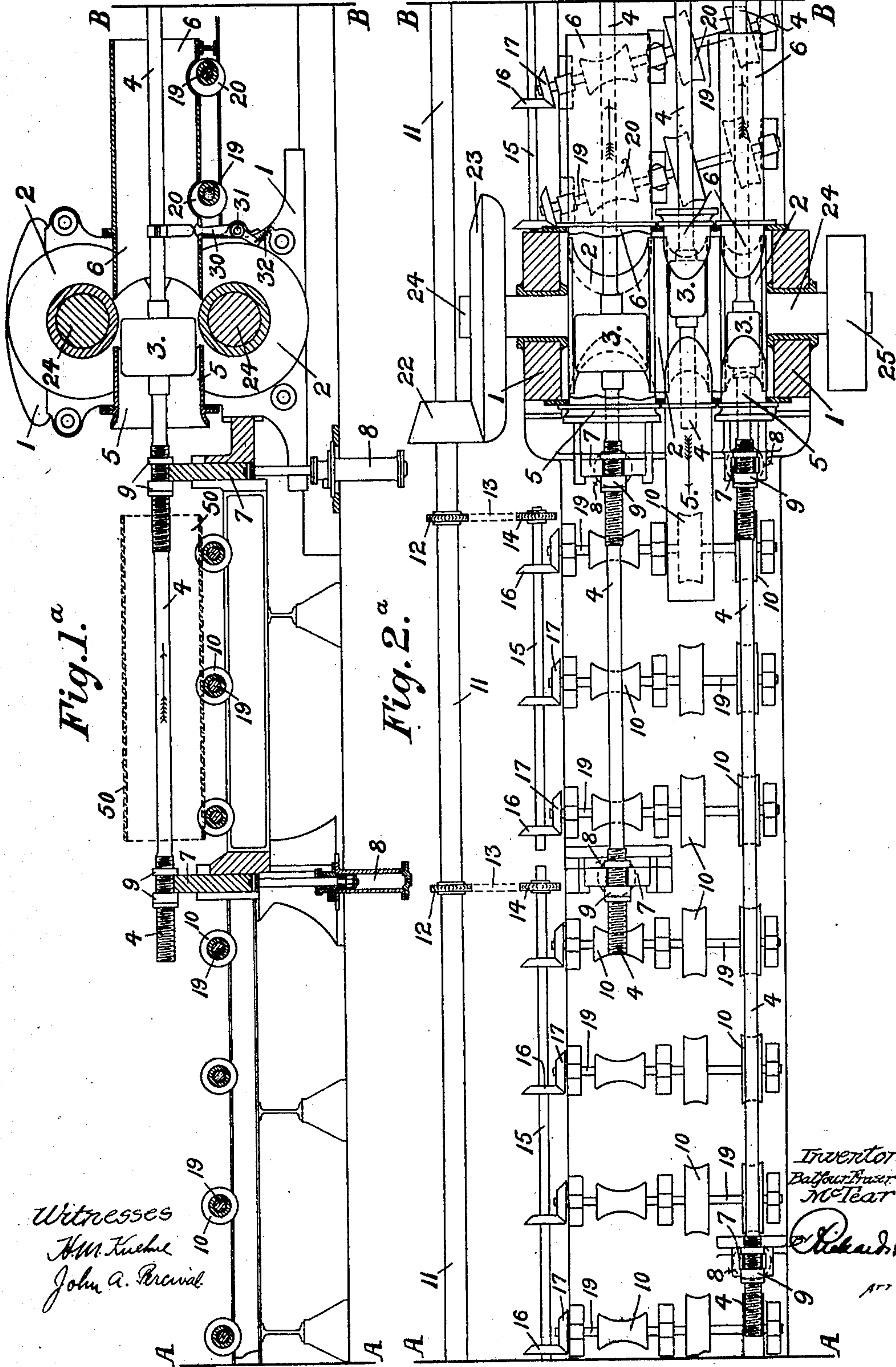
ATTORNEYS

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Witnesses
H. M. Kuehn
John A. Brawley

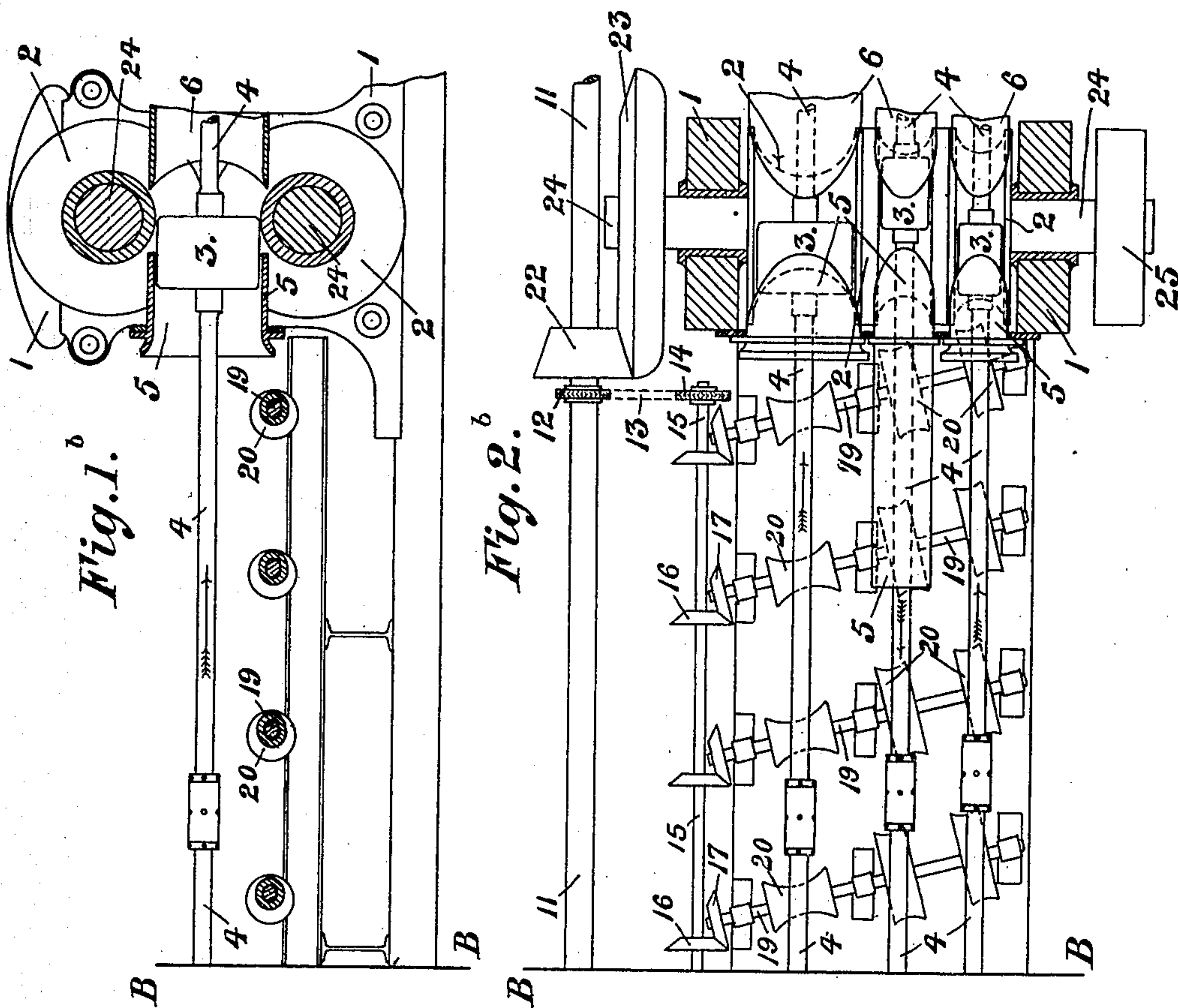
Inventor
Balfour Fraser
McTear
[Signature]
ATTY

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3 SHEETS—SHEET 3.



Witnesses
K. M. Kuehne
John A. Percival.

Inventor
Balfour Fraser McTear

BY *Richardson*

ATTORNEYS.

UNITED STATES PATENT OFFICE.

BALFOUR FRASER McTEAR, OF RAINHILL, ENGLAND.

MANUFACTURE OF TUBES OR HOLLOW BODIES.

No. 920,168.

Specification of Letters Patent.

Patented May 4, 1909.

Application filed October 29, 1904. Serial No. 230,577.

To all whom it may concern:

Be it known that I, BALFOUR FRASER McTEAR, a subject of the King of England, residing at Heyes Mount, Rainhill, in the county of Lancaster, England, have invented new and useful Improvements in or Connected with the Manufacture of Tubes or Hollow Bodies, of which the following is a specification.

This invention has reference mainly to the manufacture of seamless or weldless tubes of steel, iron, or other hard metals, but chiefly steel; and it has primarily for its object and effect to reduce the cost of manufacture of such tubes, and make it as low as possible; as this kind of tube at the present time, made by the present known methods, especially high class tubes, is very expensive to make, and consequently their sphere of possible employment is more or less restricted; and one of the ends sought to be attained by the present invention has been to extend this sphere, by the reduction of cost, and sale price, which at present is one of the chief impediments to its extension.

The invention is illustrated in the accompanying drawings in which:

Figures 1, 1^a and 1^b show the invention in elevation partly in section. Figs. 2, 2^a and 2^b show the invention in plan and Fig. 3 is an end view.

The machinery according to this invention comprises a plurality of sets of annularly grooved rollers—two of which are shown—spaced apart at certain intervals, and plugs, at each pair of the rollers, carried by rods, over which the tubes pass in their travel while they are passing between, and in contact with the two rollers of the machine, which reduce the diameter of the tube and force tube forward. These rods which carry the plugs are provided at one or both ends of the machinery with two sets of mechanical means for holding them in the longitudinal direction, at two points, spaced apart a slightly greater distance, than the length of the tube or body to be introduced into the machine, and to be operated upon; this means being capable of being connected up with, and detached or disconnected from the rod, alternatively; so that when the leading holder is being first detached or removed, a tube can be passed on to the plug carrying rod, after which this holder is brought into engagement with the rod, and thereupon, the other holder can

be removed, and upon it being removed, the tube can be fed forward into the first set of grooved rollers.

In the case of a machine being arranged as shown in the drawings, there are three sets of grooves in the rollers, and three sets of plug carrying rods, one for each set of grooves of the several successive sets of rollers. In such a case, the tube is passed first in one direction, through the mill, over one rod and its plugs, and through the first set of grooves of the rollers, then returned over another rod and through the second set of grooves of the rollers, and finally over the third rod and through the third set of grooves. This arrangement or construction of machinery enables the machine to be built within less space, and at a smaller cost than if otherwise arranged; but if desired, the machine may consist of a plurality of sets of successive rolls, with single grooves, arranged in line, so that the complete operation is performed by one pass of the tube through the machine longitudinally. Or, instead of the rollers being arranged as shown, three rollers may be employed one above the other with three sets of apertures. In the latter case, the machine may be continuously driven in one direction; while the other, the rolls are first driven in one direction, and then in the other, according to the direction the tube has to travel.

Referring now to the drawings, each of the roller machines comprises a frame 1 on each side; and upper and lower rollers 2, the axles of which are supported and revolved in the frames 1. Each roller 2 has three annular grooves, in the form of a semi-circle. In the first set of rolls, into which the tube is first introduced, the grooves which first receive the cylinder to be reduced in diameter will be of the largest size; and the grooves of the successive rolls, which are in the same axial line, will be of successively smaller size; and, similarly, the second and third sets of grooves of the several successive machines will diminish in size in the direction transverse of the tube through the machine.

The plugs (over which the tubes pass, and by which they are supported internally, and prevented from crimping or bending inward, as the tubes pass between the rollers 2,) are designated 3, they being supported on the carrying rods 4; while the tubes are also supported externally just at the points

where they are nipped by the rollers by external tubes 5 and 6 on the opposite sides of the rollers 2, and as close as possible to them, and the plugs 3. These combined external
 5 and internal supports for the tube prevent all crimping of the metal, and also bending of the tube into slight curves longitudinally at the points at which they are nipped. Regarding the holding means, by which the
 10 front end of the plug supporting rods 4 are held, in the case shown, this simply consists of a plate 7 with a notch in its upper edge, so that it can pass up and embrace the rod 4; such plates being worked vertically out of
 15 and into engagement with the rod 4 by hydraulic cylinders 8. The rod 4 is provided with shoulders or adjustable nuts 9 on each side of the holding plate 7, which will lie against the face of this plate on each side
 20 of the notch in it.

10 and 20 are "live" rollers beneath the rods 4 for moving the tubes longitudinally in the required direction, these rollers being driven from the main continuous running
 25 shaft 11, by sprocket wheels 12, chains 13, and sprocket wheels 14 on the shaft 15, which carries the bevel pinions 16 engaging with other bevel wheels 17 on the shafts 19, which carry the rollers 10. The axes of the
 30 rollers 10 are at right angles to the direction of movement of the tubes, and are provided only at the ends of the machine; while between the roller machines, the live rollers
 35 20 have their axes skewed in relation to the direction of length of the machine, by which means the tube is given a partial rotation, so that in passing through the several rollers 2, it will be operable upon all around
 40 uniformly, and so that the rotundity of the tube is maintained as well as possible throughout the operation. The rollers 2 themselves are driven by bevel wheels 22 on the shaft 11, and bevel wheels 23 on the shafts 24 of the rollers 2; while the upper
 45 roller is driven from the lower roller shaft by spur wheels 25.

The rod 4 has a movable support 30 carried on a hinge 31, just behind each set of rollers 2, this support being normally kept
 50 and pulled toward the vertical position by a spring 32. When the tube passes along, it knocks this trigger support 30 away, and then as soon as the latter end of the tube, being rolled, leaves the trigger 30, it flies
 55 back under the rod 4; and supports it before the tube gets out of the tube 6, and holds the plugs centrally in the grooves of the rollers 2 for the incoming tubes. To pass the tube on to the machine, the first gate or rod
 60 holder 7 is moved down out of the way of the rod; while the back holder 7 will be in place, and hold the rod. Then when the tube is passed on the rod 4, the front holder 7 is moved up to engage with the rod holder
 65 4, and the back holder 7 is moved down out

of the way, and the tube (marked 50 and shown in dotted lines in the drawings) is fed by the "live" rollers 10 into the bell-mouthed tube 5, and thence between the
 grooved rollers 2, the inside being supported
 70 by the plug 3. Thus the longitudinal thrust, due to the tube passing over the plugs 3, is taken by the holders 7 alternatively, and at the same time, enables tubes to be intermittently continuously fed into the machine.
 75 The tubes 5 and 6 are fixed to plates extending across the machine, and fixed to the frames 1; and projecting into the tail tube 6 are some of the "live" rollers 20 for feeding and conveying the tube along.
 80

At the front end of the machine, means is provided for transferring a tube from one set of "live" rollers 10 to another, namely, the tube will return after the first traverse
 down the machine through the central set of
 85 grooves of the rollers 2; and when it arrives at the front, it has to be transferred to the "live" rollers 10, opposite the third set of grooves at the last travel.

With regard to the transferring rollers
 90 10, at the end of the machine at which the tube is first entered, there are only a few rollers 10 in front of the first holding means 7 of the rod 4, as shown on the top of Fig. 2
 95 as the tube will then be short; then the next row of rollers 10 at the end of the machine extend out beyond the first set as shown in Figs. 1 and 2 (the operating shafts 15 being worked one from the other by the sprocket
 100 wheels 14 and chain 13); and this extension is caused by the particular position of the holding means 7 of the rod 4 of the last set of rollers, which is nearly in the same transverse plane as the first of the rollers 10, of
 105 the first set (see Fig. 2^a) that is, this holding means is in advance of the other holding means 7; and from the middle set of rollers—which are in front of the rod holding means 7 of the third set—the tube is transferred by the transferring means to
 110 those in line with them of the last set.

With regard to the transfer of the tube from the first set of rollers at the back end of the machine, to the second or middle set of rollers, this is effected by transferring devices identical with those shown in connection with the second and third sets of rollers, shown and set forth in connection with the drawings on Sheet 1. This is effected
 115 by levers or bars 35, fulcrumed at 36, and adapted to be tipped about this fulcrum, by a hydraulic ram 37, the plunger of which is connected to a rod 38 by connecting rods 39, such rod connecting all the outer ends of the levers or bars 35 together.
 120

When the tube lies on the back set of rollers 10, after being returned through the second set of grooves, the plunger of the ram 37 is forced down; thereupon, the back ends of the levers 35 are tipped up, and they lift
 130

the tube off this set of rollers 10; and these
levers 35 then being inclined, the tube runs
down them on to the near set of rollers 10,
it being stopped in this position by the stops
5 40. The tube is then in position to be car-
ried through the last set of grooves.

What is claimed is:—

Machinery for reducing the diameter of
tubes, comprising a number of sets of
10 grooved rollers and sets of feeding rollers
located between the different sets of grooved
rollers for conveying material from one set

of grooved rollers to the other set, said feed-
ing rollers having concaved peripheries and
having their axes inclined to the path of 15
travel of the work piece.

In testimony whereof I have signed my
name to this specification in the presence of
two subscribing witnesses.

BALFOUR FRASER McTEAR.

Witnesses:

S. GOODALL,

G. OKE.