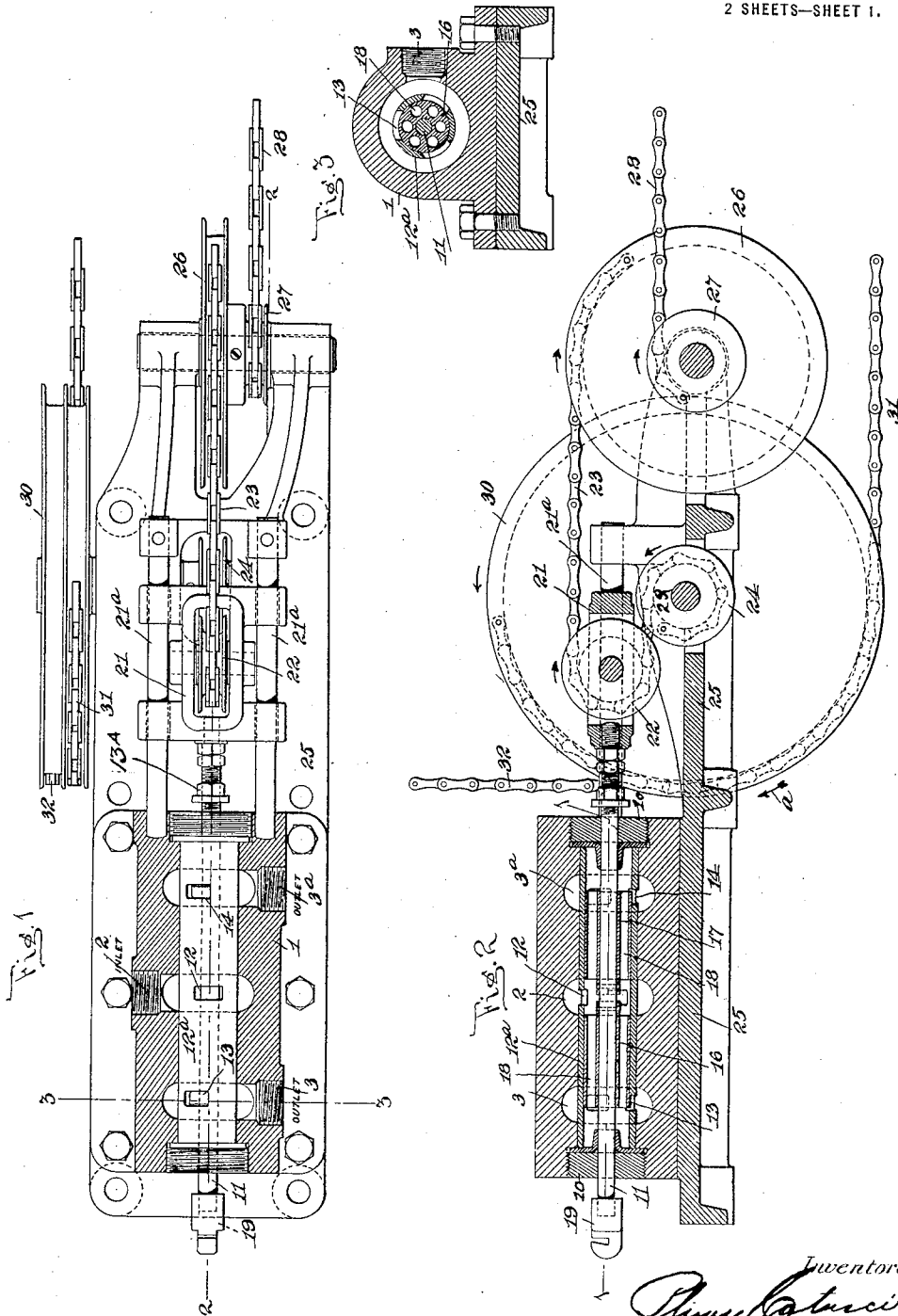


P. CATUCCI AND L. D. NADEL.
 FLUID REGULATOR.
 APPLICATION FILED NOV. 20, 1918.

1,350,782.

Patented Aug. 24, 1920.
 2 SHEETS—SHEET 1.



Inventors
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 Attorneys

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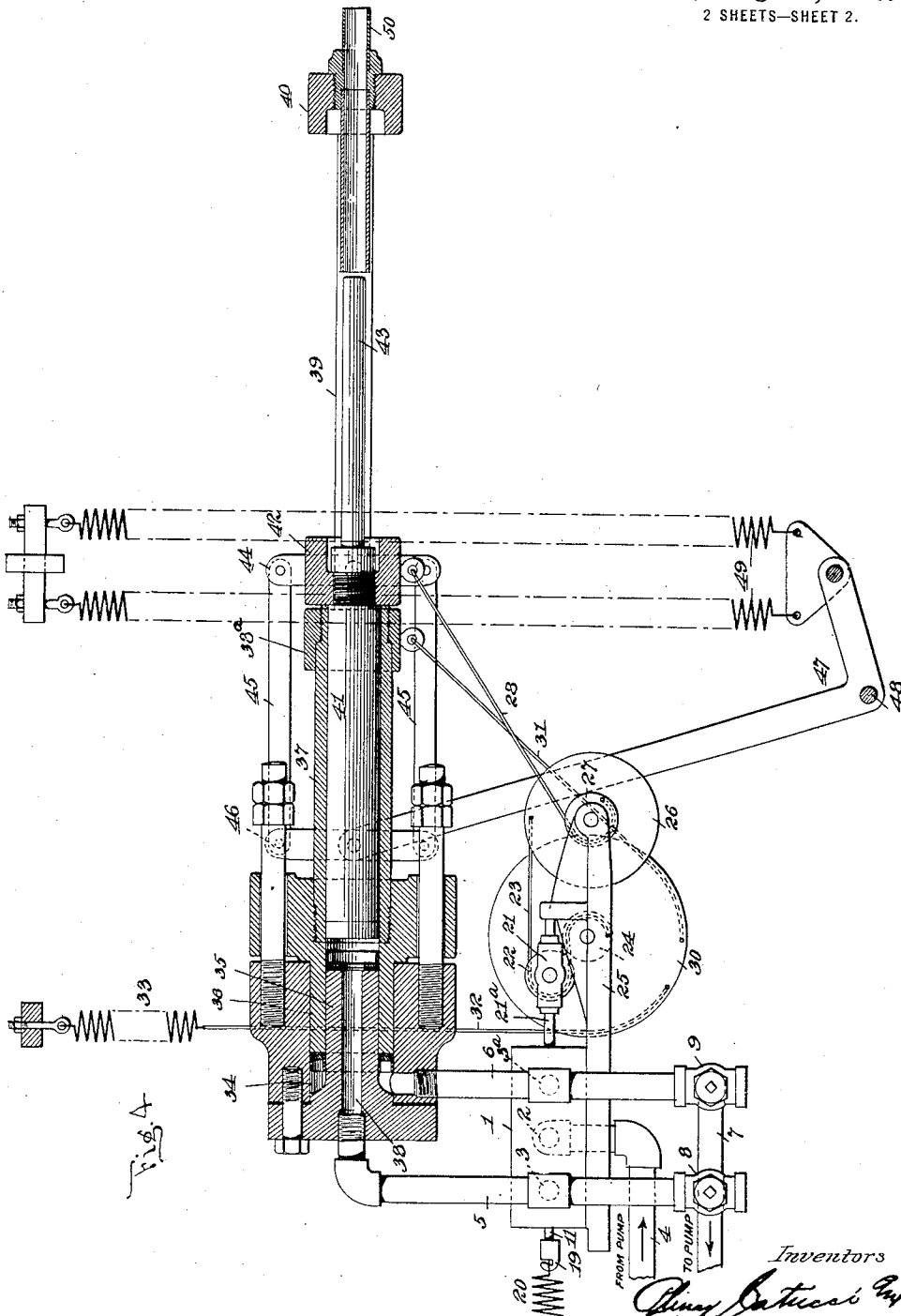


Fig. 4

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UNITED STATES PATENT OFFICE.

PLINY CATUCCI AND LOUIS D. NADEL, OF NEWARK, NEW JERSEY, ASSIGNORS, BY
MESNE ASSIGNMENTS, TO HARRIMAN NATIONAL BANK OF THE CITY OF NEW
YORK, TRUSTEE.

FLUID-REGULATOR.

1,350,782.

Specification of Letters Patent. Patented Aug. 24, 1920.

Original application filed November 20, 1918, Serial No. 263,301. Divided in part and this application
filed November 20, 1918. Serial No. 263,302.

To all whom it may concern:

Be it known that we, PLINY CATUCCI, a
citizen of the United States, and a resident
of Newark, in the county of Essex and State
of New Jersey, and LOUIS D. NADEL, a citi-
zen of the United States, and a resident of
Newark, county of Essex, and State of
New Jersey, have invented a certain new
and useful Fluid-Regulator, of which the
following is a specification.

The invention relates to the regulation of
fluids under pressure, and more particu-
larly to devices whereby the flow and pres-
sure of the fluid will be automatically regu-
lated by the work performed by the move-
ment of the fluid. The invention comprises
a device wherein the motive power is a fluid
and in which a plurality of parts movable
at different rates of speed are acted on by
the fluid and wherein the rate of speed of
each movable element is automatically regu-
lated and the speed of one element is main-
tained at a definite ratio to the speed of the
other.

The objects of the invention are to pro-
duce a device which is simple in construc-
tion, positive and accurate in operation,
which will not easily get out of order, and
which is capable of fine adjustment.

A further object of the invention is the
provision of means of the character herein
described, which are simple in operation and
construction, and thoroughly reliable and ef-
ficient in its purpose and operation.

With these and other objects in view to
be more fully set forth hereinafter, the in-
vention consists in the novel construction,
combination of elements, and arrangement
of parts which will be exemplified in the op-
eration and construction hereinafter de-
scribed in the specification and illustrated in
the accompanying drawings considered to-
gether or separately.

The inventive idea involved is capable of
receiving a variety of mechanical expres-
sions, one of which for the purpose of illus-
trating the invention, is shown in the accom-
panying drawings.

The invention will be first described in
connection with the accompanying draw-
ings, illustrating one embodiment of the in-
vention, wherein similar reference charac-

ters are used to designate corresponding
parts throughout the several views, and then
more specifically defined and indicated in
the appended claims.

In the drawings,—

Figure 1 is a plan view partly in hori-
zontal section of the device, the section be-
ing taken on the line indicated by 1—1 of
Fig. 2;

Fig. 2 is a longitudinal section on the
line 2—2 of Fig. 1;

Fig. 3 is a transverse section taken on the
line 3—3 of Fig. 1; and

Fig. 4 is a side elevation partly in longi-
tudinal section illustrating one application
of the device.

The device is illustrated in connection
with a tube bending apparatus which is the
subject matter of a co-pending application
for patent, filed on even date herewith,
Serial No. 263,301, but it is to be understood
that this application of the invention is
merely illustrative, and the invention may
be utilized in connection with other forms
of apparatus.

In carrying out the embodiment of the in-
vention illustrated, a cylinder 1 is provided.
The cylinder is provided with an inlet port
2, and outlet ports 3 and 3^a. The port 2 is in
communication, by means of a pipe 4 with
the outlet end of a pump (not shown). The
ports 3 and 3^a are, by means of pipes 5 and
6, in communication with the device to be
operated and through the medium of a pipe
7 with the inlet of the pump (not shown).
Between the pipes 5 and 7 is a valve 8, and a
similar valve 9 is interposed between the
pipes 6 and 7.

The cylinder 1 is provided at each end
with a stuffing box 10, and a valve rod 11 ex-
tends through the center of the cylinder and
projects through the stuffing boxes. The
bore of the cylinder carries a lining 12^a hav-
ing a plurality of openings 12 communicat-
ing with the inlet port 2. Similar openings
13 connect with the port 3 and with openings
14 leading to the port 3^a.

The valve rod 11 has secured thereto a
pair of valve pistons 16 and 17, which are
spaced apart a distance approximately equal
to the diameter of the inlet 2. The lengths
of the valve pistons are such that when the

rod 11 is in its normal position, the space between the pistons will be coincident with the inlet 2 with the openings 12 at the center of the space, and the outer ends of the pistons will partially mask the openings 13 and 14. Each piston has a plurality of radially arranged longitudinal bores 18 extending therethrough whereby the fluid from the pump is distributed to both ends of the cylinder 1 and to each or both of the outlet ports 3 and 3^a respectively.

One end of the rod 11 is provided with a hook 19 for the attachment of a spring 20, which tends to move the pistons 16 and 17 to the left in Figs. 1 and 2, and close the openings 13. An adjustable stop 13^a on the rod 11 limits the movement to the left in order that the piston 17 will not close the openings 12 and cut off the supply of fluid from the inlet port 2.

The end of the rod 11 opposite that carrying the hook 19 has secured thereto a yoke 21 which in turn carries a grooved pulley 22 over which extends a block link chain 23. The yoke is mounted on a pair of guide rods 21^a and is guided thereby. One end of the chain 23 extends around a grooved pulley 24, and is secured thereto. The pulley 24 is mounted in bearings in a base plate 25, which also supports the cylinder 1. The opposite end of the chain 23 extends around a grooved pulley 26 and is anchored thereto. The diameter of the pulley 26 is considerably greater than that of the pulley 22. Secured to and rotatable with the pulley 26 is a grooved pulley 27 to which is anchored a chain 28. The pulley 27 is of approximately the same diameter as the pulley 22.

Fast to the shaft 29 of the pulley 24 and rotatable with said pulley is a double grooved pulley 30 of a diameter greater than that of the pulley 26 and very much greater than that of the pulleys 22, 24, and 27. A chain 31 is anchored in one of the grooves of the pulley 30 and extends around the periphery thereof in the direction opposite to that in which the chain 28 is wound on the pulley 27. A second chain 32 is anchored in the other groove of the pulley 30 and is wound thereon in the direction opposite to that of the chain 31. It will be understood that instead of the chains 23, 28, 31 and 32, any other flexible connections may be employed.

The free end of the chain 32 is attached to a spring 33, or to any other device, such as a weight, for the purpose of tending to normally rotate the pulley 30 in the clockwise direction as indicated by the arrow *a*.

In the application of the invention illustrated, the pipe 6 is in communication with a single acting cylinder 34, the head of which extends as at 35 into the same whereby an annular cylinder is produced. An annular piston 36 is provided for the cylinder

34 and said piston carries and forms part of a circular single acting cylinder 37. The extension 35 forms the head of the cylinder 34, and a passage 38 therethrough connects the pipe 5 with said cylinder.

The forward or open end of the cylinder 37 carries a cross-head 38^a, to which the free end of the chain 31 is secured, and which is connected by a member 39 with a cross-head 40. The piston 41 of the cylinder 37 carries a cross-head 42, to which the free end of the chain 28 is secured, and an elongated plunger 43.

A yoke 44 is pivoted to the cross-head 42, and links 45 are connected by a member 46. The long arm of a bell-crank lever 47 pivoted at 48 is attached to the member 46. To the short arm of the bell-crank is attached a pair of springs 49 which are anchored above the device.

The operation is as follows:—

With the parts in the positions shown, the pistons 36 and 41 are in the innermost positions, having been forced back by the tension of the springs 49 acting on the piston 41 and the engagement of the cross-head 42 with the cylinder 37 which is part of the piston 36. The valves 8 and 9 are open and the fluid (oil, water, air or gas) will circulate from the pump, through the openings 12, bores 18 of valve pistons 16 and 17, openings 13 and 14, and pipes 5, 6, and 7, to the pump in a closed circuit.

When the valves 8 and 9 are closed, the return to the pump is shut off, and the fluid is forced through the upper extension of the pipes 5 and 6 to the cylinders 34 and 37. This will move both pistons 36 and 41 outward at approximately the same speed. The pull of the chain 28 will rotate the pulleys 27 and 26 in the clockwise direction at a much higher rate of speed than the pulleys 30 and 24 are rotated in the anti-clockwise direction by the pull of the chain 31, and the tendency of the chain 23 to rotate with the pulley will be greater than that permitted by the rotation of the pulley due to the pull of the chain 31. The pulley 22 will therefore be moved bodily to the right toward the pulley 24. This bodily movement of the pulley 22 will move the rod 11 and pistons 16 and 17 to the right to reduce the openings 14 and increase the openings 13, whereby more fluid will be admitted to the cylinder 37 through the pipe 5 than will pass to the cylinder 34 through the pipe 6. The speed of the piston-cylinder 36—37 will be reduced and that of the piston 41 increased until the relative speeds of travel of the pistons 36—37 and 41 are such that the pull of the chain 31 will rotate the pulley 24 in the anti-clockwise direction at the same rate of speed as the pull of the chain 28 will take up the chain 23. The longitudinal movement of the rod 11 will cease

and the plunger will move forward at a much greater rate of speed than will the member 40, and will, when both elements have reached the limit of movement, have traveled to the extremity of the tube 50 carried by the element 40.

When the members 43 and 40 reach the desired limit of movement forward the valves 8 and 9 are opened. The fluid will circulate in a closed circuit as before described, the spring 49 will force the piston 41 back into the cylinder 37 until the cross-head 42 engages the cylinder when the piston 41 and cylinder-piston 36—37 will be moved back together to the positions shown in Fig. 1.

As the members 38^a and 42 are moved back to the positions shown in Fig. 1, the spring 33 will cause the differential pulleys to be rotated in the opposite directions and restore the apparatus to the normal position.

In an apparatus of the proportions shown, the plunger travels at seven times the speed of the member 40 and the strokes of the pistons begin and end simultaneously.

It is to be understood that instead of employing a chain or cable form of apparatus for actuating the valve piston rod, any other form of differential mechanism may be employed.

In accordance with the provisions of the patent statutes, we have described the principle of our invention together with the apparatus which we now consider to represent the best embodiment thereof, but we desire it understood that our invention is not confined to the particular form of apparatus herein shown and described, the same being merely illustrative, and that the invention can be carried out in other ways without departing from the spirit of our invention, and, therefore, we claim broadly the right to employ all equivalent instrumentalities coming within the scope of the appended claims, and by means of which objects of our invention are attained, and the new results accomplished, as herein set forth, as it is obvious that the particular embodiment herein shown and described is only one of many that can be employed to attain these objects and accomplish these results.

Having now described our invention, what we claim and desire to secure by Letters Patent is as follows:—

1. A fluid operated device having ele-

ments constructed and arranged to be moved at different rates of speed, and means operated by the elements for regulating the movement of the elements.

2. A fluid operated device having elements constructed and arranged to be moved at different rates of speed, and differential means operated by the elements for regulating the movement of the elements.

3. A fluid operated device having elements constructed and arranged to be moved at different rates of speed, and means operated by the movement of the elements for regulating the movement of the elements.

4. A fluid operated device having elements constructed and arranged to be moved at different rates of speed, and differential means operated by the movement of the elements for regulating the movement of the elements.

5. A fluid operated device having two movable elements constructed and arranged to be moved relatively to each other at different speeds, and means operated by the movements of the elements for regulating the movements of the elements.

6. A fluid operated device having two movable elements constructed and arranged to be moved relatively to each other at different speeds, and differential means operated by the movements of the elements for regulating the movements of the elements.

7. A fluid regulator, having a fluid inlet, and a plurality of fluid outlets, and a piston valve actuated by means actuated by the fluid passing through the outlets for regulating the egress of the fluid.

8. A fluid regulator, having a fluid inlet, and a plurality of fluid outlets, and a duplex piston valve actuated by means actuated by the fluid passing through the outlets for regulating the egress of the fluid.

9. A fluid regulator, comprising a cylinder, an inlet port, two outlet ports, a piston valve movable longitudinally of the cylinder, said valve being adapted to vary the extent of said outlet openings, and means governed by the extent of the outlet openings for regulating the extent of said openings.

This specification signed and witnessed this 31st day of October, 1918.

PLINY CATUCCI.
LOUIS D. NADEL.

Witnesses:

JOHN L. LOTSCH,
MORTIMER LANZIT.