My invention relates to cables for communication circuits, hereafter called communication cables; and particularly to cables of this kind, in which the inductance is uniformly distributed. In order to obtain a uniform distribution of the inductance in Krarup cables, the individual conductors of the cable are, as is known, covered all along with one or more layers of wires, bands, or the like, of magnetic material. As the kinds of iron hitherto available possess only a relatively small permeability and have high iron losses, it was only possible to obtain a limited increase in inductance and, therefore, only a limited reduction in the damping in the cables of that kind. It was, consequently, hitherto not possible to employ that kind of cable for bridging distances considerably over 200 kilometres. Although it has recently become possible to produce highly permeable magnetic alloys, alloys of iron with nickel, still these alloys alone are but to a small degree suitable for increasing the inductance of the communication cables, as their permeability is not constant at different current intensities but is to a high degree dependent upon the current intensity.

In order to be able to employ communication cables with uniformly distributed inductance for very long distances, the conductors are, according to the invention, covered with several magnetic layers in such a manner that the permeability of the covering is as high as possible and at the same time constant as possible at different current intensities. The permeability of a material being generally all the more constant the lower the permeability, and being all the less constant the higher the permeability, magnetic layers, having a high constancy at a low permeability, are, according to experience, arranged close to the conductor, where the magnetizing forces are the strongest, whilst further away, where the magnetizing forces are weaker, layers are placed, the permeability of which is less constant but very high. As magnetic layers of high constancy at a low permeability, steel, iron or alloys of iron with a high iron content are preferably used. For the magnetic layers of high permeability but of relatively poor constancy, highly permeable alloys, for example, permalloy are suitably employed. By this means a comparatively large and at the same time a comparatively constant mean permeability is obtained for a wide range of current intensities, whereby the damping is considerably reduced and the possibility given of bridging large distances.

To obtain a greater constancy in the permeability also in the outer layers, consisting of highly permeable alloys, the latter layers may in known manner be wound with a larger pitch so that air spaces are left between the individual windings. By doing so, the permeability is, however, somewhat reduced. It is also possible to apply the inner layers of lesser permeability in the form of powder, and to employ wires or bands for the outer layers of high permeability. In many cases, it is sufficient to apply the arrangement according to the invention only at the ends of the cable.

In the drawings several practical forms of the invention are illustrated as examples, Fig. 1 representing a cable portion having an inner winding of material of low, but constant permeability, and an outer winding of less constant but high permeability; Fig. 2 representing a cable portion having an inner layer of powder of low, but constant permeability and an outer ribbon winding of less constant but high permeability; and Fig. 3 representing a cable portion similar to Fig. 2, excepting the provision of a very close outer wire winding.

Referring to Fig. 1, 2 is a conductor of a cable, upon which a closely wound winding 3, consisting of a material having a very constant but rather low permeability is placed, over which a winding 4, consisting of a band of material, having a high magnetic permeability of less constancy, is wound as an open spiral.

In Fig. 2 the uniformly distributed high inductivity is attained by surrounding the conductor 2 first with a material 13 of low but constant permeability in powder form. The manner of applying the coating of powder may be for instance that suggested in
the U. S. Patent 1,672,979 of June 12, 1928.
Upon this coating is then wound a wide rib-
bon material 14 of less constant but high
permeability.
In Fig. 3 the powder coating 23 immedi-
ately surrounding conductor 22 may be the
same as in Fig. 2, but the outer layer consists
in this case of a wire of less constant but
high permeability wound very closely.
I claim as my invention:
1. A conductor for communication cables
with uniformly distributed inductance, hav-
ing magnetizable material placed upon it in
at least two layers, the inner layer consisting
of magnetizable material of low but constant
permeability, the outer layer consisting of
magnetizable material of high but less con-
stant permeability.
2. A conductor for communication cables
with uniformly distributed inductance, hav-
ing magnetizable material placed upon it in
at least two layers, the inner layer consisting
of magnetizable material of low but constant
permeability and being applied in the form
of powder, the outer layer consisting of mag-
netizable material of high but less constant
permeability wound upon the powder layer.
3. A conductor for communication cables
with uniformly distributed inductance, hav-
ing magnetizable material placed upon it in
at least two layers, the inner layer consisting
of magnetizable material of low but constant
permeability and being applied in the form
of powder, the outer layer consisting
of magnetizable ribbon material of high but
less constant permeability wound upon the
powder layer.
4. A conductor for communication cables
with uniformly distributed inductance, hav-
ing magnetizable material placed upon it in
at least two layers, the inner layer consisting
of magnetizable wire material of low but
constant permeability wound upon the con-
ductor, the outer layer consisting of magnet-
izable ribbon material of high but less con-
stant permeability wound upon the wire layer
at a greater pitch than the wire layer.
5. A conductor for communication cables
with uniformly distributed inductance, hav-
ing magnetizable material placed upon it in
at least two layers, the inner layer consisting
of iron wire closely wound upon the con-
ductor, the outer layer consisting of a rib-
on of a highly permeable alloy wound upon
the wire layer in an open spiral.
6. A conductor for long distance communi-
cation cables, having a plurality of layers of
magnetizable material placed upon the con-
ductor, successive layers having opposite
magnetic characteristics with respect to con-
stancy and degree of permeability, to com-
plement one another in said characteristics,
whereby a conductor inductance uniformly
distributed over great distances is produced.
7. A conductor for long distance communi-